

Air Power Review

Volume 15 Number 2 Summer 2012

Air Power and Morale in the North African Campaign of the Second World War

Dr Jonathan Fennell

Stalemate: How the Future of Air Power might look in the shadow of the emerging fifth-generation Air Threat

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What's Sex Got To Do With It? Women, Peace and Security for Future Operations

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Air Commodore Dave Best

Book Reviews

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Royal Air Force Air Power Review

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Curtiss Kittyhawk III, FR241/LD-R, 250 Squadron taxiing at LG91, Egypt, during, Operation LIGHTFOOT, the first phase of the Alamein offensive in November 1942. FR2410 is an early "short tail" Mark III with a dorsal fin and also later served with 112 Squadron.



Bombs explode on Maleme airfield, Crete, during a daylight raid on 16 June 1941 by Bristol Blenheim IVs of 14 Squadron flying from LG21/Qotafiya III, Egypt. The aircraft on the ground are Junkers JU52s, many of them wrecked as a result of being landed at all costs in support of the German airborne invasion of the island on 21 May 1941.



The crew of an RAF Lysander inspect the burnt-out wreckage of an Italian aircraft at El Adem airfield.

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Armourers of 113 Squadron prepare to load 20lb fragmentation bombs and .303in ammunition into one of the Squadron's Bristol Blenheim Is at Ma'aten Bagush, Egypt, before a raid on Italian positions at Tobruk in August 1940.



Wrecked German tanks and vehicles litter an area of the Western Desert following an air attack by the RAF during the Battle of El Alamein in late 1942.

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Foreword

In this summer edition of APR we are delighted to feature contributions from a number of past and present CAS Fellows. The edition is also notable in that it contains work from several first time contributors.

The opening article is written by Dr Jonathan Fennell, a King's College London Lecturer in Air Power Studies based at RAF Halton. Historically based, the article looks at air power and morale. One of the key outcomes of the improved delivery of air power in the North African campaign of the Second World War was the effect that it had on the morale of ground forces. Morale can be understood as the willingness of an individual or group to prepare for and engage in institutionally encouraged actions. The disasters that beset the Eighth Army in the summer of 1942 were significantly influenced by a crisis in morale that fed into ineffective combat performance. This crisis in morale was turned around in dramatic fashion at Alam Halfa and El Alamein leading to more effective performance and ultimately victory in North Africa. The improved provision of air support for the Eighth Army played an important role in this recovery of morale and in the gradual erosion and destruction of German and Italian willingness to fight. The article contends that practitioners, theorists and historians must take account of the extent to which air power is a morale weapon if they are fully to understand the past and utilize air power to its maximum effect today and in the future.

The next article shifts to the contemporary operating environment and examines how the future of western air power may look in the shadow of a genuinely stealthy air threat. The author is Flight Lieutenant Kevin Terrett, a Tornado F3 pilot and Qualified Weapons Instructor, and a new contributor to APR. Specifically, the article looks at the Russian stealth fighter program, the PAK-FA, and argues that if the marketing brochure truly reflects the fielded capability of the platform, then the impact on Western air power at both the strategic and tactical level will be profound. It argues that simply procuring the Joint Strike Fighter and F-22 Raptor in the quantities proposed will not necessarily be enough to counter PAK-FA. Western air power, the author suggests, must also look to the development of networked air, ground and sea-based technologies capable of detecting and engaging the airborne stealth threat, an F²T²EA chain optimized for speed and a rebalancing of front-line training towards within visual range combat. The article concludes that the penalties for not taking action in the immediate future to counter the emerging stealth threat could be catastrophic.

Staying with the current and future operating environment, another new contributor to APR, Squadron Leader Colin Wills, has submitted an article examining the potential for unmanned combat air systems to gain control of the air in future warfare. Colin is a vastly experienced professional aviator, a Qualified Weapons Instructor Navigator with over 6000 hours, mainly on the Tornado F3. In an article that offers an interesting juxtaposition to the previous article by Kevin Terrett, he explores current Unmanned Combat Air Systems developments, such as BAE's *Taranis* programme, looking at Intelligence, Surveillance, Targeting, Acquisition, and Reconnaissance, and air-to-surface missions, including that portion which is the counter-air task. The article contends that the air-to-air component of counter-air warfare is as essential and asks

whether Unmanned Combat Air Systems, the next evolution of Unmanned Air Systems, could gain control of the air in future warfare? The threat environment in which weapon systems are required to operate will reinforce high end capability requirements. Furthermore, the article argues, political, legal, and ethical issues of using Unmanned Combat Air Systems cannot be underestimated, and require careful consideration.

Although not a traditional air power subject, the next article submitted by Flight Lieutenant Vix Anderton, a third new contributor to APR, is entitled 'What's Sex Got To Do With It?' and examines gender issues relating to future operations. Vix is a CAS Sykes Fellow and Chair of the RUSI Under 35s Forum. The article argues that the military ability to influence is predicated on understanding the target audience. This is as true for conventional warfare as it is for counterinsurgency and applies to an adversary's leadership, the local population, and the British people. Given half of the world's population is female, gender underpins many social and cultural issues. However, it is significantly overlooked by campaign planners and in operational execution. The role of women, particularly in developing countries, is largely underappreciated and misunderstood. This article explores the importance of women's security needs and the requirement for the British military to better understand gender issues. It is time, the author contends, that gender was acknowledged as a key component of military capability that should be used to improve the effectiveness of both current and future operations.

The final article for this edition is authored by Lieutenant Colonel Andrew Roe, a regular contributor to APR who once again has provided a fascinating article entitled "Bugsplat' and Fallible Humans: The Hi-Tech US Drone Campaign over North-West Pakistan'. It is an almost daily occurrence to read of U.S. armed pilot-less drones, or more correctly unmanned aerial vehicles (UAVs), killing suspected militants in north-west Pakistan. U.S. officials consider the precision strikes a vital weapon in the war against Islamist extremists. However, the attacks are a source of deep frustration and tension between Washington and Islamabad. Many in Pakistan say they violate national sovereignty and also cause widespread civilian casualties. For their part, the U.S. has criticized Pakistan for failing to crack down on fighters who stage attacks in Afghanistan and has stepped up UAV attacks in the tribal region to combat them. Washington considers Pakistan's semi-autonomous north-western tribal belt to be the main hub of Taliban and Al-Qaeda activity in the region. This article looks at the current U.S. air campaign over north-west Pakistan by outlining the advantages and disadvantages of employing UAVs. It concludes by drawing a number of thought provoking historical parallels.

This edition of APR contains 2 viewpoints. The first is provided by Group Captain Tim Below who is currently serving as Group Captain Strategy in the French Air Force's Centre d'études strategiques aerospaciales (CESA) in Paris. The viewpoint is entitled 'A Trilateral Renaissance of Expeditionary NATO Air Power'. Below discusses how the UK has enjoyed a 'special relationship' with the USA for over 6 decades, and close ties with its European neighbour France for even longer. Under the 2010 treaty on defence and security cooperation, and as the 2 leading expeditionary European air forces, the Royal Air Force and the French *Armée*

de l'air are working ever closer together. Meanwhile, as the USA seeks to refocus its defence posture towards the Pacific, through an initiative coherent with NATO's principles of Smart Defence, the Chiefs of these 3 air forces are seeking to enhance their operational effectiveness through closer collaboration. In this article, Group Captain Below examines the confluence of global geopolitical events of the last few years which is engendering a fast-deepening inter-relationship between these 3 air forces. He concludes that as demonstrated over Libya in 2011, although challenges remain, and although still dependent on the USA to provide mass in certain enabling areas, the 2 European nations are increasingly ready to take on leadership of European security in the air domain.

The second viewpoint is provided by Air Commodore David Best who spent 2011 working as ISAF's Director of Air Operations and Plans within the ISAF Joint Command, Kabul where he was responsible for day to day running of coalition air operations throughout Afghanistan. A key part of his job was to ensure that when major land operations were being planned, air experts were fully involved so that the full range of coalition air capability available was understood and used effectively. His piece discusses the wide range of contributions made by air power to NATO's comprehensive counterinsurgency strategy in Afghanistan and explains how much senior commanders appreciate the flexibility and asymmetric advantage that air power provides. The narrative concludes by offering some extremely thought provoking ideas about the challenges of the next couple of years and beyond as the Afghan Air Force starts to find its feet.

This summer edition concludes with 2 book reviews. Squadron Leader Chantal Baker, a CAS Fellow who is just concluding her studies at George Washington University, Washington D.C., offers a review of 'Development, Security and Unending War. Governing the World of Peoples' by Mark Duffield. The second review is by the aforementioned Group Captain Tim Below and is more of a review article, a longer piece offering detailed and insightful comments of 'Global Air Power' edited by John Andreas Olsen.

RAF CAPS Prizes and Awards 2011



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The Gordon Shephard Memorial Prize

The Gordon Shephard Memorial Prize is awarded in memory of Brigadier G F Shephard DSO MC RAF. The competition provides a unique opportunity for personnel to air their thoughts and ideas, directly relevant to the Royal Air Force or to the employment of air power more generally, in a Service paper or essay, with the chance of winning a cash prize of £200.

The winner of the 2011 Gordon Shephard Memorial Prize is Group Captain Alistair Byford for his essay entitled 'Fair Stood the Wind for France? The Royal Air Force's Experience in 1940 as a Case Study of the Relationship Between Policy, Strategy and Doctrine', which was printed in *Air Power Review Vol 14 No 3* (Autumn/Winter 2011).

The 2 Air Forces Award

In 1997, the Royal Air Force Historical Society agreed to a request from its United States equivalent organization, The Air Force Historical Foundation, to fund an annual award called 'The Two Air Forces Award'. The award will be given, on each side of the Atlantic, to the serving officer, airman or airwoman who writes the most pertinent article of the year on a Defence related topic. The award is selected by the committee of The Royal Air Force Historical Society.

The winner of the 2011 2 Air Forces Award is Wing Commander Steve Chappell for his essay entitled 'Air Power in the Mau Mau Conflict: The Government's Chief Weapon' which was printed in *Air Power Review Vol 14 No1* (Spring 2011).

The Salmond Prize

The Salmond Prize is awarded in memory of Air Chief Marshal Sir John Salmond who was appointed Chief of the Air Staff in succession to Trenchard. The £200 prize is awarded annually to the best essay on an air power topic submitted to RAF CAPS by a civilian or non-RAF serviceman or servicewoman of any nationality.

The winner of the 2011 Salmond Prize is Dr David Gates for his submission 'Missile-Defence Dilemmas' which was printed in *Air Power Review Vol 14 No 2* (Summer 2011).

Notes on Contributors

Dr Jonathan Fennell is a King's College London lecturer in Air Power Studies based at Royal Air Force Halton. Prior to this he was a management consultant in London and a Teaching Fellow in Defence Studies at the Joint Services Command and Staff College. Jonathan was awarded a Doctorate in History from the University of Oxford in 2008. His first book, *Combat and Morale in the North African Campaign*, was published in 2011 by Cambridge University Press. Jonathan's research continues to focus on twentieth century British and Commonwealth history and on the political, socio-cultural, institutional and economic factors that affect the conduct of war and the experience of soldiers on the battlefield. His current research project, which has as its main objective the delivery of a second contracted book for Cambridge University Press, takes a holistic approach to the study of the British and Commonwealth armies in the Second World War.

Flight Lieutenant Kevin Terrett joined the RAF in 1999. Primarily a Tornado F3 Qualified Weapons Instructor (QWI) pilot, he served with 111(F) Squadron and 43(F) Squadron at RAF Leuchars, Fife, accumulating just over 1000 hours on type. In 2008, he was selected to fly the F/A-18 Hornet with the Royal Australian Air Force on an exchange posting. Flight Lieutenant Terrett is currently flying the Hawk Tmk2 in a tactics and weapons related instructional role with IV(R) Squadron at RAF Valley, Anglesey.

Squadron Leader Colin Wills joined the RAF in 1979. He is Professional Aviator and a Qualified Weapons Instructor navigator, with over 6,000 hours, beginning with the F-4 Phantom, but mostly on the Tornado F-3. He was awarded an MLitt in International Relations from the University of St Andrews in 1997, and an MSc in Air Transport Management from City University, London, in 2004. Currently a staff officer responsible for worldwide counter-air and unmanned aircraft systems operational analysis, he is also a PhD candidate with King's College, London.

Flight Lieutenant Vix Anderton was awarded a CAS Fellowship in 2010 to read War Studies at King's College London. After graduating from the University of Manchester in 2004 with a degree in Economic Studies, Government and Political Theory, she graduated from the Royal Air Force's Initial Officers' Training Course in 2006. Her completion of the Joint Air Intelligence Course in 2007 was followed by a short tour as a Duty Intelligence Watch Officer in the Air Warfare Centre at RAF Waddington. In 2008, she was posted to II(AC) Sqn as the Sqn Intelligence Officer, a tour which included operational deployments on Op TELIC and Op HERRICK. She is currently serving in the Intelligence Branch and Trade Policy Office at the Air Warfare Centre and is the Chair of the RUSI Under 35s Forum.

Lieutenant Colonel Andrew Roe YORKS, CO 2 YORKS, and previously Military Assistant to the Surgeon General, was commissioned into the Green Howards in 1992. He has held various command and staff positions in Northern Ireland, Germany, Bosnia, Afghanistan, the Falkland Islands and Iraq. He is a graduate of the U.S. Army Command and Staff College and the School of Advanced Military Studies, Fort Leavenworth, Kansas. He has a PhD from King's College London and is the author of *Waging War in Waziristan: The British Struggle in the Land of Bin Laden, 1849-1947*.

Air Power and Morale in the North African Campaign of the Second World War

By Dr Jonathan Fennell

One of the key outcomes of the improved delivery of air power in the North African campaign of the Second World War was the effect that it had on the morale of ground forces. Morale can be understood as the willingness of an individual or group to prepare for and engage in institutionally encouraged actions. The disasters that beset Eighth Army in the summer of 1942 were significantly influenced by a crisis in morale that fed into ineffective combat performance. This crisis in morale was turned around in dramatic fashion at Alam Halfa and El Alamein leading to more effective performance and ultimately victory in North Africa. The improved provision of air support for Eighth Army played an important role in this recovery of morale and in the gradual erosion and destruction of German and Italian willingness to fight. Practitioners, theorists and historians must take account of the extent to which air power is a morale weapon if they are fully to understand the past and utilise air power to its maximum effect today and in the future.

Introduction

Literature on air power in the North African campaign has focused on how the Desert Air Force and British and Commonwealth Armies overcame the technical and tactical challenges of combining air power and land power effectively on the battlefield.¹ The lessons learned in North Africa played a crucial role in the evolution of British and American operational doctrine and practice during the Second World War; the conduct of operations in Sicily, Italy and Northwest Europe were directly influenced by the innovations developed in the desert. John Terrain has gone so far as to say that 'it is certain that the potent system of land/air warfare hammered out so painfully in the desert between November 1941 and October 1942 was . . . the turning point' in transforming a defeated armed force into a war winning team.²

This literature has also acknowledged that one of the key outcomes of the improved delivery of air power, in the form of close air support and interdiction, was the psychological effect that it had on ground forces. Brad Gladman, for instance, has argued that, at Alam Halfa and El Alamein, Allied air power 'totally destroyed the morale and fighting ability of the Axis forces,'³ leaving them like 'an eggshell awaiting the hammer blow.'⁴ David Hall, in *Strategy for Victory*, has also pointed out that aerial bombardment can have 'a negative effect on the morale of front-line . . . troops wholly out of proportion to the damage caused and the threat presented.'⁵

The history of air power is, in fact, replete with references to the morale effect of aerial bombardment. Much of the literature has focused on strategic bombing offensives, such as those carried out against Germany and Japan in the Second World War.⁶ More recently, scholars have also emphasized the critical importance of air power on the battlefield and the effect that it can have on front line morale.⁷ Mark Clodfelter has highlighted the capability of air power to 'crack military will in individual operational instances'⁸, while Stuart W. Peach has pointed out that the psychological impact of air attacks can matter a great deal in modern campaigns.⁹ Few air power studies, however, delve in depth into the morale effect of air power or provide much evidence, beyond the use of quotes from individual combatants, to show that morale is clearly and demonstrably affected by attacks from the air. This paper aims to provide a deeper perspective on the morale effect of air power by studying the North African campaign of the Second World War. It will provide evidence to show that air power played a crucially important role in both inculcating front-line morale and destroying it and, thus, critically influenced success and failure on the battlefield.

The paper will use a number of sources to provide a broader perspective on the relationship between morale and air power. In particular, it will rely on the weekly censorship summaries of the soldiers' mail. About one letter in every thirteen or fourteen sent by the soldiers in the desert was examined by the army authorities, to assess the troops' morale and the issues that were affecting it. These summaries described in detail the state of morale of the constituent parts and nationalities of Middle East Command, as well as the causes of good or bad morale. The summaries covered morale as widely and deeply as possible and only expressed views

that represented a considerable body of opinion among the troops in the desert, not isolated instances of over-exuberance or ill-temper.¹⁰ Every quarter, the Commander-in-Chief in the desert was obliged to write a report, compiled from these summaries and material available at divisional and brigade headquarters, on the state of morale of his troops. All these reports were subsequently passed on to London for inclusion in the War Office quarterly morale reports begun by the Adjutant General, Sir Ronald Adam, in February 1942 for his newly devised Morale Committee.¹¹ These, less detailed, official appraisals and other documents related to morale are also included in this analysis.

Finding agreement on what the term morale actually means is a considerable challenge. Indeed, three broad approaches to the definition of morale are readily identifiable in the literature.¹² The first describes morale as an affective state. British Defence Doctrine, for instance, defines morale as 'a sense of confidence and well-being'.¹³ The second considers morale as an aspect of group dynamics. According to Kimmel, O'Mara and Babin, 'most military writers and some organizational theorists describe [morale] as an organizational variable characteristic of the unit as a whole'.¹⁴ The third associates morale more closely with motivation, for example, Britt and Dickinson define morale as 'a service member's level of motivation and enthusiasm for accomplishing mission objectives'.¹⁵

There are major problems with both the first and second commonly used definitions. Troops can enjoy positive affective states while behaving in a manner that is completely contrary to the best interest of the military. For instance, a combatant might feel 'good' due to the fact that he has run away and is now safe from harm. Strong group bonds can also undermine positive military performance, such as happened in Vietnam when the importance of group survival often outweighed the need to complete assigned tasks.¹⁶ It is also reductive to suggest that morale can only exist in the context of a group. Individual morale is influenced by a complex range of multi-dimensional factors that go far beyond simple group dynamics.

The third definition gets closer to the mark in linking morale with motivation. However, it is important to differentiate between morale and enthusiasm. Individuals can be highly motivated to carry out tasks that they don't want to do, because they are disciplined or even coerced into action. Morale, therefore, can be defined as the willingness of an individual or group to prepare for and engage in an institutionally encouraged action or activity. This willingness may be engendered by a positive desire to act and/or by the discipline to accept orders to act. This definition clearly links morale with positive military performance and, therefore, makes sense of the strong emphasis that military organisations place on morale. It does not conflate morale with mood or group dynamics. Instead it recognises that military institutions require their personnel, first and foremost, to be willing to carry out orders. If troops are willing to carry out orders, any military will have a chance of success irrespective of the mood of their men and women or the cohesiveness of their groups. Morale, as General Sir Bernard Law Montgomery famously wrote, can, therefore, be recognised as the 'big thing in war'.¹⁷

The desert war provides an ideal case study to examine the relationship between air power and morale. Indeed, Montgomery and his generals, in their accounts of events in North Africa, placed morale at the centre of the story.¹⁸ More recently, this author has argued that Eighth Army's failures, at Gazala and Tobruk in May and June 1942 and on the El Alamein line in July 1942, were influenced significantly by a morale crisis manifested in extremely high rates of sickness, battle exhaustion, desertion and surrender. This situation was rectified in dramatic fashion, leading to a turnaround in the fortunes of Eighth Army between September and November 1942. This turnaround was driven by a resurgence of morale that decisively influenced the performance of Eighth Army at the climatic battle of El Alamein in October and November 1942.¹⁹

The character of war in North Africa highlighted differences in the quality of each side's equipment and technology. With little cover and almost limitless space, air power played a central role almost unequalled in any other theatre in the Second World War. Both the British and Germans viewed bombardment from the air as much from the point of view of disintegration of enemy morale as from that of material destruction.²⁰ For instance, the Germans' main close air support weapon, the Stuka dive-bomber, was employed with morale effects in mind. Elements of the Stuka's attack, such as the use of sirens attached to the bottom of the dive-bomber, the extreme angle of their descent (70-80 degrees) and the low height at which they dropped their bombs (c. 500 feet),²¹ played havoc with the psychology of the bombed soldier. Successive British reports, written during 1941 and on into 1942 and 1943, highlighted this fact. A report on the lessons learned in the Crete campaign in 1941 concluded that 'the dive bomber is most inaccurate [but] has an **unnecessary** detrimental effect on morale.'²² Another British report, written after the 'Crusader' offensive (November 1941 to January 1942), once again noted that 'dive bombing on an average does practically no damage' and that 'every effort should be made to educate gun detachments to this fact. They soon realise it after experience in action, but are apt to overestimate the potential of dive bombing before they have gained experience.'²³

A study on 'the moral effect of weapons,' carried out in 1943 on a group of 300 wounded soldiers in North Africa, illustrates this point. From the sample, 176 soldiers had experienced dive-bombing during the campaign. Of these soldiers, only 9 per cent suffered wounds. As a comparison, 60 per cent of those who had faced a German 88mm anti-tank gun had been wounded. Nevertheless, 40 per cent of those who had experienced dive-bombing attacks regarded the Stuka as their 'most disliked' weapon.²⁴ The study reported that the dive-bomber was 'disliked to an extent out of all proportion to its real effectiveness.'²⁵ Furthermore, 48 per cent of men disliked being bombed by dive-bombers more as time went on. This was compared with 33 per cent of men who disliked it less. The findings pointed to a lack of rationality among soldiers when faced with what the report called 'moral weapons.'²⁶

Warfare in the desert was as much about bluff and psychological supremacy as anything else. The study on the 'Moral Effect of Weapons' further illustrates this point.

Table One: Reasons for Disliking Weapons

Reason for Disliking Weapon	Percentage
Effectiveness (i.e. lethality and destructiveness)	19%
Accuracy	21%
Inability to retaliate	13%
Create a feeling of vulnerability	15%
Speed and surprise of attack	10%
Suspense	5%
Noise	5%
'Demoralizing effect' (admitted)	12%

The report pointed out that only the first two of these explanations (effectiveness and accuracy), representing 40% of the total reasons, were simple, rational physical reasons directly related to the lethality of the weapon in question; 'and even they are frequently attributed to weapons which, on the facts, do not possess them' (for instance, the Stuka dive bomber). The remaining 60% were all dislikes of certain psychological sensations.²⁷ The report stated that all of the men questioned had had experience of battle and had, in fact, been wounded. 'Yet in the majority of instances they would rather face weapons which they have logical reason to fear may kill them, than weapons which arouse instinctive fear.'²⁸ The report also pointed to a 'notable demoralising effect' arising from the disadvantageous comparison between British and German weapons generally; 'the feeling of inequality – almost of injustice – appears to be very important.'²⁹

The fundamental importance of air power to morale was highlighted in another report, written on 'War Neurosis at Tobruk' by Lieutenant Colonel E.L. Cooper and Captain A.J.M. Sinclair of the Australian Imperial Force (AIF). The report made it clear that during the first two months of the siege, while German planes ruled the skies, and 'when the severity of enemy air raids reached a maximum, there was almost a complete lack of aerial support from the RAF'. This absence of support from British planes 'for weeks at a time played a large part in the development of war neurosis in some men.'³⁰ The consequence of repeated experiences with the dive-bomber was that psychologists began to accept that 'a very high standard of morale and courage' was 'required to face enemy attack by Stukas and low flying fighters even if spaced over a long period of time.' It was all important, according to another report written on the 'Battle with the Dive-Bomber at Tobruk', that 'every man . . . must develop to the full the offensive spirit. Those not engaged in manning guns will fire rifles and light automatics. "Going to ground" when weapons are available must be forbidden.'³¹ This type of 'active' defence was designed to prevent men from cowering in slit trenches consumed by fear. It was believed that if men fired back they would feel empowered and therefore their morale would be protected.³² Battle schools in Britain and more realistic training in theatre were also designed to inoculate soldiers to the sounds of war and ideally prevent them from developing irrational fear syndromes caused by 'moral weapons.'³³

The detrimental effects of dive-bombing on morale were exacerbated in the desert as a consequence of the experiences of many of the British and dominion troops in Greece and Crete in 1941. On 13 October 1941, a month before the opening of the 'Crusader' campaign, the Prime Minister of New Zealand telegraphed Churchill about the upcoming offensive. 'In the light of our experience in Greece and particularly in Crete,' he said, 'you will understand that we are naturally apprehensive lest our troops should again and for the third time be permitted to battle without adequate air support and in circumstances in which they are unable to defend themselves against unrestricted air attacks.' Fraser wanted assurances that 'the question of air support,' which the New Zealand government regarded 'as a vital factor,' had been 'fully considered and appreciated by those responsible,' and that a situation in which New Zealand men were called upon to fight 'without the necessary means of defence and offence' would 'not recur.'³⁴

Churchill passed on his New Zealand counterpart's concerns to General Sir Claude Auchinleck, the Commander-in-Chief, Middle East Command, in a telegram sent on 15 October, in which he also referred to the fact that Air Marshal Sir Arthur Tedder, Commander RAF Middle East Command, had been doubtful of his ability to provide the air cover demanded by Fraser. The next day, the War Office once again telegraphed Auchinleck, this time assuring him that 250 Bofors Anti-Aircraft guns were being sent for use by Eighth Army. 'Never more' the telegram continued, 'must the army rely solely on aircraft for its protection against attacks from the air.'³⁵

Fraser need not have worried; a dramatic turnaround in the provision of air support was already under way in the desert. In September 1941, the Middle East (Army and RAF) Directive on Direct Air Support was issued under the signatures of the joint Commanders-in-Chief. New techniques for target selection, recognition, and attack were spelt out in detail for the first time. David Hall has highlighted the importance of this initiative, remarking that, 'in the course of the development of army air co-operation it was perhaps the single most important directive issued during the war.'³⁶

It is interesting to note how quickly the new system of air support began to have an effect on the morale of Eighth Army. The censorship summary for the week ending 23 September 1941 pointed out that 'since the circulation amongst all ranks of [the new directive] entitled Air support for the Army, no comments regarding non-cooperation from the R.A.F. have been noted.'³⁷ The censorship summaries reported that by 'the eve of the great Libyan offensive' ('Crusader') the 'increased amount of air support' had made a considerable difference to the morale of Eighth Army. In fact, they reported that 'the morale of the M.E.F. [Middle East Forces] has never been so high.'³⁸

The Desert Air Force's performance during 'Crusader' exceeded Tedder's expectations. This proved not only devastating to German and Italian morale but also a major factor in reinforcing the fighting spirit of Eighth Army. The censorship summary for the period 17 to 23 December 1941 concluded that the Royal Air Force's 'overwhelming superiority' and 'incessant

activity' had created a 'tremendous impression' on the troops. 'All those who were concerned in the Crete campaign' agreed that 'the RAF have proved far more devastating than the *Luftwaffe*' ever had.³⁹ A New Zealand report, written after the battle, confirmed that 'the lack of RAF support "bogy" has been completely banished.' All ranks now 'speak in the highest terms of the work of the RAF.'⁴⁰ A South African report stated emphatically that 'air superiority gives ground troops a tremendous moral advantage.'⁴¹ General Erwin Rommel, commander of the *Panzergruppe Afrika*, blamed defeat to a large extent on the material advantages enjoyed by the British and Commonwealth Armies, and specifically on 'the extraordinarily strong enemy air superiority.'⁴² The battle report for the *Panzergruppe* on 20 December 1941 wholeheartedly supported Rommel's assertion.⁴³

It is clear that by early 1942 the belligerents in the desert war saw air power as an effective morale weapon. By late May 1942, the Axis forces had built up a substantial advantage in aircraft numbers. They possessed 497 serviceable aircraft in the desert while the Desert Air Force had only 190. The Axis also had a superiority in aircraft for the whole Mediterranean theatre of about 1,000 compared to 739.⁴⁴ In many ways, the morale crisis that unfolded at Tobruk and on the Gazala line, in May and June 1942, was significantly influenced by this superiority in air power. As the campaign unfolded, British and Commonwealth morale deteriorated, leading to extremely high rates of sickness, battle exhaustion, desertion and surrender.⁴⁵ The effects on British morale of the *Luftwaffe's* concentration of firepower was described by one RAF officer, who wrote,

Jerry gave our forward 'drome . . . a 6 hour bombing raid . . . we suffered no casualties and only 1 plane destroyed and about 1 damaged, it is surprising how little damage bombs do materially but they are damaging to nerves and morale, at night there is nothing more terrifying and kept up [sic] soon gets you down through lack of sleep and nerves, I have not yet seen a man who is unconcerned.⁴⁶

Nevertheless, from the ashes of defeat, the Desert Air Force gradually began to again wrest control of the skies from the *Luftwaffe*. As Eighth Army retreated in a chaotic fashion towards the El Alamein line, the German war diaries show that this gradual turnaround more than any other factor seemed to drain the offensive spirit and morale of the Axis forces.⁴⁷ During the first five days of the offensive, 26 to 31 May, British fighters flew only around 1,500 sorties.⁴⁸ In the first week of July, a month later, the Desert Air Force flew as many as 5,458 sorties against Rommel's army.⁴⁹ The censorship summary for the same week pointed out that the 'general opinion' was that the 'Royal Air Force have been "doing a marvelous piece of work"'. One writer stated that he had never 'seen our planes in such large numbers in the sky'. Another remarked that 'it has been a Godsend to us to have air superiority'.⁵⁰ The censorship summary for 8 to 14 July noted frankly that

The Air Force has never in the past been over-popular with the M.E.F., but it has at last come into its own, and whatever animosity may have existed between the Services, will certainly disappear as a result of this campaign. All personnel gave unstinted praise to the work of

the Air Force, both for the accuracy of the bombing and the sustained and tireless effort produced. None is more generous in their tribute than personnel who participated in the mass withdrawal and who realize the perfect target they presented to the Axis air force.

One writer stated that 'I never saw so much transport. The whole desert for miles in depth was almost a solid block of lorries, cars, transporters, road machinery, tanks, armoured cars and all kinds of other things. We must have literally thousands upon thousands of vehicles all back safely. For once in our lives we had air supremacy otherwise it would have been sheer murder!'⁵¹ An Australian gunner wrote, 'we are supposed to have 5 to 1 over him [the *Luftwaffe*] in the air, but it seems to me about 50 to 1, and believe me the swine are getting more than they ever gave us, good old R.A.F.'⁵²

The war diaries of the German 90th Light Division reinforce this analysis.

The enemy throws all the Air Force at his disposal into the battle against the attacking Afrika Army. Every 20 or 30 minutes 15, 18, or sometimes even 20 bombers, with adequate fighter protection, launch their attacks. Although the visible success of these heavy and continuous bombing and low-flying attacks is negligible owing to the disposition of the fighting and supply units, the moral effect on the troops is much more important. Everyone prays for German fighter protection . . . Sometimes German fighters appear singly, greeted by the roaring applause of the troops, but naturally they are not in a position to attack such heavy bomber formations.⁵³

Rommel had pushed his army so far and so fast that he had completely outrun the *Luftwaffe's* ability to provide air cover. General Navarini, the commander of the Italian XXI Corps, considered the issue of such importance that, on 6 July, he issued an order of the day informing the troops that 'final victory is within your grasp. Do not let yourselves be overawed by some momentary predominance of enemy aviation.'⁵⁴ As Niall Barr has argued, 'the Axis air forces had put forth an enormous effort during the battle of Gazala and for the attack on Tobruk but could not sustain this level of activity indefinitely.'⁵⁵

All through the month of July, the newly named *Panzerarmee Afrika* had to labour under this constant bombardment, what the British soldiers began to refer to as the 'shuttle service'.⁵⁶ By 22 July, the German war diaries were still reporting that 'the enemy air force is numerically much superior to ours.' It has 'kept up continuous day and night attacks on our troops, it has caused us considerable losses, has brought the Italians' morale down to a very low ebb, [and] has hindered and partly curtailed supply.' Allied air superiority was so complete by late July 1942 that, in addition to the morale damage being done to the *Panzerarmee*, about 30 military transports were being lost a day to air raids.⁵⁷

Matters had comparatively improved for Eighth Army. The censorship summary for 15 to 21 July reported that 'the outstanding feature of correspondence . . . during the past week has

been the magnificent work of the Allied Air Forces,' which were 'responsible in a large measure for the high morale prevailing among all ranks.' The report stated that 'there was hardly a letter which did not contain praise and admiration for the thorough and determined manner' in which the Air Force had 'carr[ied] out its blitzkrieg,' and for the 'splendid protection' it had provided ground forces during the long withdrawal and in the new positions at El Alamein.⁵⁸

As RAF effectiveness increased, soldiers became more and more confident in the capabilities of the RAF compared with those of the *Luftwaffe*. Private E. Kerans of the 9th Durham Light Infantry described how 'the lads used to sit on the sides of their trenches [on the El Alamein line] and in comparative safety watch for hours one dog-fight after another.' The area he remembered 'was a graveyard of planes.'⁵⁹ Such dominance caused 'much satisfaction' among the troops, many of them having been frequently on the other end of aerial bombardment. There was also a regularly expressed conviction among the men, that 'eventually the morale of the enemy must break under the constant bombing and machine gunning' carried out by the Desert Air Force.⁶⁰

Eighth Army had survived the Axis onslaught of May, June and July 1942, but by August it had to prepare to defend again, against another attack on the Alam Halfa ridge, Rommel's last major offensive in the Western Desert. Montgomery, Eighth Army's new commander, was aware of the frail confidence of his army and the morale problems that had emerged during the summer months. He therefore decided to fight Alam Halfa as a limited battle. The July battles on the El Alamein line had shown that Eighth Army's strength lay in its determined infantry, the artillery, and the Desert Air Force. Its weaknesses were its armour and its inability to co-ordinate all arms effectively in the attack. Alam Halfa was a battle entirely conceived and executed with these strengths and weaknesses in mind. Montgomery held his armour back and refused to allow it to become embroiled in a tank versus tank battle with the *Panzerarmee Afrika*. Instead he wanted to minimise casualties and concentrate on what his forces could achieve, rather than, like Auchinleck before him, relying on what it was hoped they would achieve. He realised that his troops needed time to develop confidence in both themselves and their new weapons.⁶¹ Montgomery, therefore, decided on an essentially defensive battle in which he would draw Rommel onto his own artillery and anti-tank screen. In many ways Alam Halfa was a British application of German tactics used on a grand scale with the significant help of the Desert Air Force.

A report by the 19th Flak Division for *Panzerarmee Afrika* HQ on the firepower unleashed by the Desert Air Force during the battle of Alam Halfa gives some idea of the damage inflicted on German and Italian morale. The report stated that 15,600 bombs had been dropped on the *Panzerarmee* over the five days of the offensive. These had been distributed over a front averaging 12-15 km in length and 8-10 km in depth. That meant approximately 100 bombs were dropped per square kilometre during the offensive. The methods used by the Desert Air Force were specifically designed to undermine German and Italian morale. The report stated that 'bombs were not dropped simultaneously by all the aircraft in the formation; instead an

extensive area was covered by bombs being dropped one after the other.' The effect of such action on the troops was that 'in addition to the extensive material damage caused, the effect on morale was . . . great. The spirit of the troops was considerably depressed owing to the totally inadequate German fighter cover. Incessant night attacks in particular served to reduce the degree of readiness for action of both officers and men.' This was due to the factors of 'no sleep, continual waiting for the next bombs, [and the] dispersal of units etc.'⁶² Indeed, the British censorship summaries recounted a tale where a captured German 'flung himself flat' as a formation of Allied planes flew overhead; "'Gee, he must be bomb happy", remarked one of our men. "And so would you be", replied the prisoner, in perfect English, "if you had them over you every minute for four solid days"'⁶³

The marked superiority of Allied air power had a dramatic effect on the morale of Eighth Army as well. The first line of the censorship summary for 10 to 16 September 1942 recorded that 'the predominant feature of correspondence from all ranks of British troops in the Western Desert' was the 'general appreciation of the massive support given to our land forces by the Allied Air Forces, which has affected morale to an incalculable degree.'⁶⁴ The summary for 17 to 23 September also emphasised the performance of the Allied Air Forces. A gunner wrote, 'air co-operation was perfect and we'd only to name a target to have the R.A.F. bombing it ten minutes later . . . We drove their stuff . . . into groups and then left them to the R.A.F.' Another soldier stated, 'we harried him a good deal on his way back but didn't get really heavily involved. Our artillery and the R.A.F. gave him absolute hell and I sat on one ridge all day about 5,000 yards from a *Panzer* Division which the R.A.F. bombed every 45 mins and which the big gunners put about 10,000 shells into in one day. It was the most incredible sight I have ever seen and gave our chaps considerable satisfaction. We took some of those particular Germans prisoner the following day and they said it was [by] far the worst day they had ever experienced.'⁶⁵

Two months later at the battle of El Alamein, the British and Commonwealth forces in the desert had nearly 200 more planes than the Axis forces facing them (around 530 versus 350).⁶⁶ Overall Eighth Army possessed a rough two to one material advantage. However, Eighth Army had enjoyed quantitative advantages previously and still been defeated by the *Panzerarmee*. Montgomery stressed, in his message to the troops on the eve of the great offensive, that this time it was different, that Eighth Army was 'ready NOW . . . We have first-class equipment; good tanks; good anti-tank guns; plenty of artillery and plenty of ammunition; and we are backed up by the finest air striking force in the world.'⁶⁷ Brad Gladman has pointed out that 'the improvement in close air support provisions for Eighth Army had a massive impact on morale'. Indeed, it only took 30-40 minutes for close air support to arrive in support of ground troops at El Alamein, as opposed to an average of three hours during the 'Crusader' operation of late 1941.⁶⁸ The morale report for August to October, 1942 stated that:

the knowledge that the tools at their disposal were more numerous and effective than they have ever been, brought the spirit of the troops to a new high level and intensified

their assurance and grim determination which was to be fully tested and proved to the hilt in the twelve historic days that followed. On the evidence of this mail no army ever went to battle with higher morale.

It went on to point out that there had been 'three main topics of praise from Egypt and Libya . . . (i) rations, (ii) medical services, (iii) the R.A.F.'⁶⁹

The German war diaries identified a number of reasons for defeat at El Alamein. One of these was 'the continual heavy day and night bombing attacks, against which there was no defence' and which 'only added to the feeling of inferiority' suffered by the troops of the *Panzerarmee*.⁷⁰ Indeed, John Terrain has pointed out that between 23 October to 4 November, the RAF flew 10,405 sorties and the Americans 1,181 (on the Axis side, the Germans flew 1,550 sorties and the Italians about 1,570).⁷¹ According to Alfred Price, these attacks often failed to inflict serious damage or casualties, yet the ever-present threat of them proved extremely effective in destroying morale; 'if one fell across an enemy troop or vehicle concentration, the effect of more than a hundred closely spaced 250 and 500 pound bombs detonating in a few seconds caused a shock effect similar to that now produced by a B-52 operating in the battlefield support role.'⁷²

The desperate situation of the Axis forces, as a consequence of these bombing attacks, was illustrated by an Ultra intercept on 8 October 1942. Fuel and ammunition supplies were described as severely strained, but the rations situation was 'extraordinarily bad'. Fats were entirely lacking, flour would last 11 days only if the bread rations were cut, 'vegetables, fruit especially lemons, and extras such as jam either not available or completely insufficient'.⁷³ The result of this, according to Gladman, 'was under-nourishment, a sharp decrease in efficiency, high rates of sickness, and undoubtedly poor morale'.⁷⁴ Indeed, a large proportion of German casualties, as was the case with Eighth Army in the summer battles of 1942, were attributable to issues related to morale. The statistics show that 40 per cent of German and 63 per cent of Italian casualties were missing or prisoners of war; the rate for British and Commonwealth troops during the battle was 17 per cent.⁷⁵ In addition, extremely high sickness rates, a sure sign of morale problems, removed large numbers of men from the front line.⁷⁶ Mark Harrison has estimated that nearly one in five Germans were listed as sick during the battle, with the elite German 15th *Panzer* Division suffering a sickness rate as high as 38 per cent.⁷⁷ Problems with desertion and surrender prompted Rommel to encourage use of the death penalty at court marshal during July;⁷⁸ these problems persisted into October and November.⁷⁹ The fighting ability of the Axis forces in both a 'moral and material sense' had been destroyed.⁸⁰

As David Hall has argued, 'success in battle depended on the degree to which the army and the air force assisted each other, not as ancillary to the other but as equals in pursuit of a common objective'.⁸¹ This was not only because integrated and coordinated use of air and land forces could destroy the material means at the disposal of an enemy, but also because

it had a powerful effect on the morale of the forces engaged. The disasters that beset Eighth Army in the summer of 1942 were significantly influenced by a crisis in morale that fed into poor and ineffective combat performance. This crisis in morale was turned around in dramatic fashion at Alam Halfa and El Alamein leading to more effective performance and ultimately victory in North Africa. This paper has shown that the presence, or lack of it, of effective air support played an important role in this recovery of morale and in the gradual erosion and destruction of German and Italian willingness to fight. Practitioners, theorists and historians must take full account of the extent to which air power is a morale weapon if they are to best understand the past and utilize air power to its full effect today and in the future.

Notes

¹ Brad Gladman, 'The Development of Tactical Air Doctrine in North Africa, 1940-43' in Seb Cox and Peter Gray (eds.), *Air Power History: Turning Points from Kitty Hawk to Kosovo* (London, 2002); Brad W. Gladman, 'Air Power and Intelligence in the Western Desert Campaign, 1940-43', *Intelligence and National Security*, vol. 13, no. 4 (1998), pp. 144-62; David Ian Hall, 'The Long Gestation and Difficult Birth of the 2nd Tactical Air Force (RAF)', *Air Power Review*, vol. 5, no. 3 (2002), pp. 21-33; David Ian Hall, *Strategy for Victory: The Development of British Tactical Air Power, 1919-1943* (www.praeger.com, 2007); Alfred Price, 'Air Power at El Alamein', *Air Power Review*, vol. 5, no. 3 (2002), pp. 67-81; John Terrain, *The Right of the Line: The Royal Air Force in the European War 1939-1945* (Ware, 1997).

² Terrain, *The Right of the Line*, p. 381.

³ Gladman, 'Air Power and Intelligence in the Western Desert Campaign', *Intelligence and National Security*, p. 144.

⁴ Gladman, 'The Development of Tactical Air Doctrine in North Africa, 1940-43' in Cox and Gray (eds.), *Air Power History*, p. 194.

⁵ Hall, *Strategy for Victory*, intro., p. 2.

⁶ For an overview of the development of some of these doctrines see: Stephen Budiansky, *Air Power: The Men, Machines, and Ideas that Revolutionised War, from Kitty Hawk to Gulf War II* (London, 2004); Philip S. Meilinger, 'Trenchard and "Morale Bombing": The Evolution of Royal Air Force Doctrine Before World War II', *The Journal of Military History*, vol. 60 (April, 1996), pp. 243-70.

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⁹ Stuart W. Peach, 'A Neglected Turning Point in Air Power History: Air Power and the Fall of France' in Cox and Gray (eds.), *Air Power History*, p. 161. See also John Ellis, *Brute Force: Allied Strategy and Tactics in the Second World War* (London, 1990), pp. 12-13; Mark Connelly and Walter Miller, 'The BEF and the Issue of Surrender on the Western Front in 1940', *War in History*, vol. 11, no. 4 (2004) and Glyn Prysor, 'The 'Fifth Column' and the British Experience of Retreat, 1940', *War in History*, vol. 12, no. 4 (2005); B.H. Liddell Hart (ed.), *The Rommel Papers* (New York, 1953), p. 7.

¹⁰ Australian War Memorial (AWM) 54 883/2/97 Middle East Field Censorship Weekly Summary (MEFCWS), No. I (12 to 18 November 1941), p. 1.

¹¹ National Archives (NA) War Office (WO) 193/453 Morale Committee Papers, 25 February 1942 to 25 October 1945, 'Assessment of Morale by Statistical Methods', no date but probably 1942 or 1943. These morale reports were also based on intelligence reports from the Ministry of Intelligence, censorship reports on letters of complaint and enquiry received by the BBC and the *News of the World*, letters to the War Office and Courts Martial statistics.

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¹⁴ Melvin J. Kimmel, Francis E. O'Mara, Nehama Babin, 'The Development of a Unit Morale Measure for Army Battalions', *U.S. Army Research Institute for the Behavioural and Social Sciences*, March 1984, p. 2.

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¹⁶ Stephen D. Westbrook, 'The Potential for Military Disintegration', in Sam C. Sarkessian (ed.), *Combat Effectiveness: Cohesion, Stress, and the Volunteer Military* (London, 1980), p. 257.

¹⁷ NA WO 277/16 J.H.A. Sparrow, 'Morale', p. 2.

¹⁸ B.L. Montgomery, *The Memoirs of Field-Marshal Montgomery of Alamein* (London, 1958); Brian Horrocks, *A Full Life* (London, 1960); Major-General F. de Guingand, *Operation Victory* (London, 1947); Field Marshal Earl Alexander of Tunis, *The Alexander Memoirs, 1940-1945* (London, 1962).

¹⁹ Jonathan Fennell, *Combat and Morale in the North African Campaign: The Eighth Army and the Path to El Alamein* (Cambridge, 2011).

²⁰ NA WO 193/423 *British Medical Journal*, April 4, 1942, Article reviewing a survey by the American Committee for National Morale by R.D. Gillespie, AWM 54 526/6/19 'The Crisis at El Alamein', 30 June to 4 July 1942, p. 58.

²¹ South African Military Archives Depot (SAMAD) Chief of the General Staff (CGS) Gp. 2, Box 651 'Tobruk, the Battle with the Dive Bomber', p. 2.

²² SAMAD Divisional Documents (Div Docs) Box 248 'Lessons From the Battle of Crete'.

²³ AWM 54 526/6/2 'Libya, Day by Day, and the Battle for Egypt'. Report on withdrawal from Libya to El Alamein 27 May 1942 to 1 August 1942. Part I Section I, Libya (Advance to Agheila 18 November 1941 to 12 January 1942). Appendix C: Notes by a Light Anti-Aircraft Battery Commander.

²⁴ NA WO 222/124 'The Moral Effect of Weapons, Investigation into Reactions of Group of 300 Wounded Men in North Africa', 1943, p. 2.

²⁵ *Ibid.*, p. 3.

²⁶ *Ibid.*, p. 4.

²⁷ *Ibid.*, p. 5.

²⁸ Ibid.

²⁹ Ibid.

³⁰ AWM 54 481/12/120 'War Neurosis at Tobruk' by E.L. Cooper, Lieut. Col. and A.J.M. Sinclair, Capt., Australian Army Medical Corps, Australian Imperial Force.

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³² SAMAD CGS Gp. 2, Box 651, 'Report by the Senior Medical Officer at Tobruk on the Psychological Effects of Dive-Bombing on A.A. Personnel', Annex 'A', pp. 1-2.

³³ See Fennell, *Combat and Morale in the North African Campaign*, pp. 234-8.

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³⁵ NA WO 259/38 Telegram from War Office to C in C Middle East despatched 16 October 1941.

³⁶ Hall, *Strategy for Victory* (Westport, 2007), chap. 7, p. 5.

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³⁸ AWM 54 883/2/97 MEFCWS, No. I (12 to 18 November 1941), p. 1.

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⁴⁷ SAMAD Div Docs, Box 54, Index to Advanced Air HQ Western Desert Intelligence Summary no. 167, 'Effects of our Bombing'; SAMAD UWH, Narratives, Box 376, Crisis in the Desert, May to July 1942, El Alamein, p. 5.

⁴⁸ Terraine, *Right of the Line*, pp. 371-2.

⁴⁹ Ibid., p. 376.

⁵⁰ ANZ WAI/1/DA 508/1 Vol. 1, MEFCWS, No. XXXIV (1 to 7 July 1942), p. 5.

⁵¹ ANZ WAI/1/DA 508/1 Vol. 1, MEFCWS, No. XXXV (8 to 14 July 1942), p. 2.

⁵² Ibid, p. 22.

⁵³ AWM 54 526/6/19 'The Crisis at El Alamein', 30 June to 4 July 1942, p. 58.

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⁶¹ Montgomery, *Memoirs*, pp. 107-115.

⁶² SAMAD UWH, Draft Narratives, Box 316 War Diary of Panzer Army Africa 28 July to 23 October 1942, pp. 79-83. Reply to query about bombs dropped made on 6 September 1942 by 19th Flak Division, 8 September 1942.

⁶³ ANZ WAI/1/DA 508/1 Vol. 3, MEMCWS, No. XLIV (10 to 16 September 1942), p. 1.

⁶⁴ *Ibid.*, p. 1.

⁶⁵ ANZ WAI/1/DA 508/1 Vol. 3, MEMCWS, No. XLV (17 to 23 September 1942), p. 1.

⁶⁶ Barr, *Pendulum of War*, p. 276. Alfred Price has estimated that up to 920 aircraft were combat ready when the offensive opened. See Alfred Price, 'Air Power at El Alamein', *Air Power Review*, p. 70.

⁶⁷ IWM Bernard Law Montgomery Papers vol. 53, Eighth Army, Personal Message from the Army Commander, 23 October 1942.

⁶⁸ Gladman, 'The Development of Tactical Air Doctrine in North Africa' in Cox and Gray (eds.), *Air Power History*, p. 193.

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⁷² Price, 'Air Power at El Alamein' *Air Power Review*, p. 80.

⁷³ Gladman, 'Air Power and Intelligence in the Western Desert Campaign', pp. 147-8.

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Stalemate: How the Future of Air Power might look in the shadow of the emerging fifth-generation Air Threat

By Flight Lieutenant Kevin Terrett

PAK-FA: a weapons system that has the potential to strike fear in to the heart of Western air power for decades. This article will examine the background and proposed open source capabilities of the Russian stealth fighter program and argue that if the PAK-FA marketing brochure truly reflects the fielded capability of the platform, then the impact on Western air power at both the strategic and tactical level will be profound. The paper argues that simply procuring the Joint Strike Fighter and F-22 Raptor in the quantities proposed will not necessarily be enough to counter PAK-FA. Western air power must also look to the development of networked air, ground and sea-based technologies capable of detecting and engaging the airborne stealth threat, an F2T2EA chain optimized for speed and a rebalancing of front-line training towards within visual range combat. The penalties for not taking action in the immediate future to counter the emerging stealth threat could well be catastrophic to our national intent and global impact.

Introduction

On 29 January 2010, the eyes of the aviation world were fixed upon the maiden flight of an aircraft that has the potential to change the balance of military air power as we know it. The Sukhoi T-50 / PAK-FA (Prospective Airborne (K)Complex of Frontline Aviation) is designed to be stealthy, agile, aware, fast and lethal; in short, all of the attributes required to be designated a fifth-generation fighter platform. The Sukhoi T-50 constitutes the Russian answer to the US F-22 Raptor in the battle for supremacy over both the battlespace and the international market place. This milestone was closely followed by the Chinese fifth-generation fighter project with the maiden flight of the Chengdu J-20 on 11 January 2011.¹ If the hyperbole surrounding the Sukhoi and Chengdu platforms is to be believed, and our international competitors are successful in achieving a fifth-generation fighter capability, then the technological dominance enjoyed by Western-aligned air forces over recent decades will be at best challenged and at worst, lost.

A true indication of how the Sukhoi T-50 and Chengdu J-20 will fare against the F-22 Raptor or the F-35 Lightning II Joint Strike Fighter (JSF) will not reveal itself until the aircraft actually meet in combat. Aside from the F-22, all of the other projects are currently too immature for a direct and accurate comparison to be fair or worthwhile. However, if our competitors are successful in achieving the potential claimed by Sukhoi and Chengdu, then the stealth threat represents the greatest challenge to Western technological and air power dominance for decades.

Whilst Sukhoi have advertised the pedigree and potential of the T-50, many in the West have sought to play down the impact that the aircraft is expected to have. In February 2011, following the platform's maiden flight, US Air Force Secretary Michael Donley told reporters:

*"I didn't see anything ... that would cause me to rethink plans for the F-22 or F-35"*²

However, US political reaction may have been flavoured by the recent decision to cut the number of F-22s to be delivered to the USAF, along with a fear of tarnishing the chances of the largely American-manufactured F-35 JSF in the export marketplace. Furthermore, the West has seen wildly over-inflated claims of prototype Russian fighter aircraft capability before that have failed to come to fruition. For example, the Mig-25 Foxbat was touted as capable of flying over three times the speed of sound with unparalleled agility, worrying US politicians enough to commission the design of the F-15 Eagle. It wasn't until Victor Bolenko defected with his Mig-25 to Japan in 1976 that the true capabilities of the Foxbat were revealed as falling well short of Russian claims.³ Certainly, the much publicised engine trouble suffered by one of the Sukhoi T-50 prototypes at the 2011 Moscow Airshow has provided some ammunition to the aircraft's detractors.⁴

Proliferation

Perhaps a more pragmatic view is that whilst the eventual capability of production standard Very Low Observable (VLO) supersonic air threats remains to be seen, they have the potential

to proliferate amongst our premier economic and ideological competitors within the UK military's Future Force 2020 planning timeframe. General He Weirong, Deputy Commander of the People's Liberation Army Air Force (PLAAF), expects the Chengdu J-20 to enter operational service in the 2017-2019 timeframe.⁵ Additionally, Russian Air Force commander-in-chief, General Alexander Zelin, recently told reporters that he expects the first of the 200 production T-50s earmarked for the Russian Air Force to be delivered in 2014-2015.⁶ Even allowing for the traditional delay associated with in-service dates for military aviation development projects, this timeline puts the T-50, and aircraft like it, squarely in the bracket of threats that need to be considered without delay. General Roger Brady, Commander US Air Forces in Europe, gave an indication of the US view in February 2011, when he remarked:

"I don't know if it's (Sukhoi T-50) really a fifth-generation aircraft. What I do know is that it's very clear that they're working on a fifth-generation technology. The key is, we must continue to do fifth-generation and sixth-generation research and put money against it because other people clearly are,"⁷

The development process and financial muscle of the Sukhoi project has been significantly bolstered by Russia's partnership with India. It has been reported in the Russian media that India has provided thirty-five per cent of the six billion dollar development costs and intends to procure between two hundred and two hundred and fifty airframes.⁸ It is widely felt in the aviation industry that the involvement of Indian technological and economic power is key to the Sukhoi project as it severely reduces the likelihood of failure along the lines of previous Russian military aviation projects. Vietnam is expected to be the second export customer and the Republic of Korea has recently placed the Sukhoi T-50 on the initial contenders list for its F-X III fighter replacement tender.⁹

China has yet to commit publicly as to how many J-20s will be purchased for the PLAAF. However, it has been speculated that the J-20 is expected to replace the Chinese SU-27SK Flanker B and SU-30MKK Flanker G fleets. A direct platform swap would result in approximately four hundred J-20 airframes accepted in to PLAAF service.¹⁰ Consequently, it can be seen that the proliferation of VLO threats may well be significant, with the potential for up to a thousand VLO platforms pencilled in to the combined Sukhoi and Chengdu order books.¹¹

Global Relevance

It has been argued that a VLO air threat will make obsolete conventional third and fourth-generation fighter aircraft (such as Typhoon, Rafale and Gripen) that don't enjoy stealth technology.¹² Whilst it is too early to be confident of such stark conclusions, it seems certain that if opposition stealth platforms can achieve even half of the kill ratio that the F-22 Raptor currently enjoys against more conventional fighter aircraft during training exercises, then the balance of power in the air will have shifted significantly.

Western-aligned air forces have long enjoyed a technological dominance of the air above the battlespace with the ability to detect a threat and engage the enemy with long range, active

radar guided missiles. If enemy air platforms can deny detection to Western surface and air-based radars until extremely short range, then conventional third and fourth-generation platforms will have surrendered technological superiority, and control of the air will no longer be so easily attained. Even if an air force is able to deploy F-22 Raptors or F-35 JSF aircraft, the potential capability of opposition VLO platforms may well drag the kill ratio towards parity, with no guarantee that military or political objectives can be achieved within an acceptable cost.

When the number and identity of important European allies who are not F-35 JSF customers and have no true fifth-generation platform in their near future is taken in to account, then the prognosis for Western-aligned military coalitions faced with a VLO threat comes in to stark focus. Currently, only the European air arms of the UK, Italy, Holland, Denmark and Norway expect to procure F-35 JSF aircraft. Notably, France, as a key UK and NATO partner nation, has no plans to procure a fifth-generation platform at the time of writing; although Dassault Aviation, the French aircraft manufacturer, is currently playing a leading role in the Neuron project, a supersonic, VLO Unmanned Combat Aerial Vehicle (UCAV) capable of delivering nuclear weapons.¹³

As seen with both the F-22 and F-35 JSF projects, the price tag of developing stealth platforms is beyond the reach of many nations¹⁴, meaning that VLO threats will not be present in every future theatre of operations. Therefore, the argument follows that a lack of global proliferation somewhat reduces the relevance of the VLO threat platforms. For example, the 2011 military intervention in Libya highlights the continued utility of third and fourth-generation fighter platforms in dominating the airspace over a 'poor' nation state that lacks the means to procure a fifth-generation fighter.¹⁵

The counter-argument to this school of thought must be that such a national viewpoint may well relegate the state in question from the global top table should a dispute involving a VLO-equipped adversary occur. Such a nation will be unable to operate in certain theatres without significant risk of loss to its combat forces. Thus, there would be some international events which that nation would be unable to shape decisively on an independent basis, although as part of a coalition it may be able to contribute to some low key military tasks.

The global impact of agile, stealth threats must also be balanced against the suggestion that both Russia and China intend to follow a more engaging and aggressive foreign policy in the immediate future. Russia's involvement in the 2008 South Ossetia war, as well as the recent re-introduction of long range patrol flights by the Russian Air Force strategic bomber fleet are evidence of a more outward-looking and militaristic stance than at any time since the end of the Cold War. Furthermore, Vladimir Putin has consistently argued during the 2012 Russian presidential campaign for a stronger military and Russian development of weapons superior to those of any potential enemy.¹⁶ China has also shown evidence of a determination to project military power beyond its borders with the public confirmation of its first indigenous aircraft

carrier project by the People's Liberation Army Chief of Staff in June 2011.¹⁷ Consequently, it cannot be discounted that in the coming decades the West might find itself at odds with Russia, China or a nation to which a VLO platform has been exported, making a fifth-generation air threat a distinct possibility.

Platform Capability

To examine what impact VLO threat aircraft might have on air power employment in the future, we must first consider what capability such a platform may possess. For the purposes of this article, the Chengdu J-20 platform is too immature and shrouded in secrecy to analyze projected capability to any meaningful level. However, due to slightly more longevity as a project, the Sukhoi T-50 has enjoyed a wider exposure and has therefore drawn considerable speculation concerning its projected capability. Consequently, a brief overview of the Sukhoi T-50's potential abilities will be examined, with the obvious caveat presented by the aircraft's relative immaturity and the secrecy that surrounds a military aviation project.

The open-source pictures of the Sukhoi T-50 prototype prove that the platform is VLO capable. Sukhoi have claimed that the T-50 will have approximately 1/40th of the radar signature of the SU-35S.¹⁸ There is currently uncertainty as to whether the production T-50 will be an all-aspect VLO platform, such as the F-22. The aft and lower central portions of the prototype T-50 fuselage appears not to have been shaped appropriately for true VLO capability. This would result in an enlarged radar signature if the aircraft were to be viewed from the beam or stern, and therefore a longer range at which the aircraft could be detected from those aspects.¹⁹

The prototype T-50 is currently fitted with interim engines. Therefore, there is still much uncertainty as to how much VLO coverage the production T-50 will have as some aft fuselage re-shaping may occur before the production engines are fitted. It may also be that Sukhoi is minimising the exposure of the platform's potential capability whilst the prototype is in the public eye for exploitation and analysis. There is no doubt that the current aircraft design lends itself to a significant VLO capability when viewed head on.²⁰

Agility

It seems possible that the T-50's lack of beam and stern VLO design is as a result of a compromised design philosophy in favour of extreme agility. For example, the inclusion of axi-symmetrical three dimension Thrust Vector Control (TVC) engine nozzles will give the aircraft a more significant beam and rear-aspect radar signature, but a superb manoeuvre capability. In comparison, the F-22A Raptor has only two dimension TVC nozzles because the design team favoured stealth over agility. The design of the T-50's fuselage and control surfaces has led to a consensus that the manoeuvrability of the platform will be second-to-none. This will provide two tactical strengths to the aircraft. Firstly, the T-50 will have the ability to out-maneuvre almost all adversary platforms in a within visual range (WVR) fight. Secondly, the T-50 is expected by observers to be capable of out-maneuvring any missiles launched against it.²¹

Engines

It is envisaged that the T-50 will be comfortably-capable of a tactical speed range well over the speed of sound, with enough internal fuel for significant combat persistence. Conventional, mechanically-scanned fighter aircraft radar may only detect the T-50 at very short range, consequently, the platform has the potential to successfully launch its missiles first, undetected by its adversary, or to get close enough for a WVR 'dogfight' with an unaware, less agile opponent. If the T-50 is detected at the sort of ranges expected, it is postulated that no current Western fighter type aircraft, except possibly the F-22 Raptor, will have the ability to out run or outmanoeuvre the T-50 without being engaged.²²

Avionics

There is speculation that the platform's avionics design will be based upon an evolution of the SU-35S architecture. Initial claims made by the manufacturers are that the aircraft will enjoy five Active Electronically Scanned Array (AESA) radar apertures with a combination of X-band and L-band emitters. Current brochure information suggests that the T-50 will have L band AESA transmitters in the leading edge of the wings, with X-band radar receivers in the nose, cheek and tail of the aircraft, giving the T-50 a 360 degree radar detection capability.²³ Most third and fourth-generation fighter aircraft are only capable of using their radar approximately 60 degrees either side of the nose.

Traditionally, fighter aircraft radars transmit in the X band (8 – 12 GHz) of the electromagnetic spectrum as this is the best trade off between accuracy and signal attenuation in the airborne environment. Consequently, VLO technology is 'shaped' specifically to defeat X-band radar emissions. Although L-band (1-2 GHz) radar emissions lead to some inaccuracies in detection, they do enjoy an increased effectiveness over X-band radar waves in tracking current VLO fuselage shapes. The potential inclusion of L-band radar technology in the Sukhoi platform leads to the inescapable conclusion that the platform is intended to compete in the most demanding theatres of operations against the VLO threats of F-22, F-35 and J-20.

It is also suggested that T-50 will continue the Russian tradition of fielding top-of-the-range Infra Red Search and Track (IRST) technology.²⁴ It has been argued that IRST represents the future of long-range passive detection of VLO aircraft due to the difficulty both technologically and financially of masking the heat produced by fast-moving fixed wing aircraft. IRST has the obvious drawback of being unable to see through cloud. However, in clear airspace, IRST has proven to be a useful crutch in maintaining awareness on a target which is attempting to deny radar tracking through electronic defences, chaff and manoeuvre, effectively attempting to cover the weak spots in radar-based tracking. Therefore, it can be argued that, in an air-to-air war that is increasingly occurring above the tropopause against targets capable of minimising radar detection, IRST is a useful addition to any avionics suite.

Weapons

It is thought that the aircraft will be capable of carrying eight air-to-air missiles in two internal missile bays, compared to the Joint Strike Fighter load of four internally carried missiles and the F-22's six. It is widely believed that the first aircraft in to service will carry an extended-range version of the AA-12 Adder medium-range active air-to-air missile and an updated AA-11 infra-red missile for visual combat. For extremely close-in combat, the T-50 is expected to be armed with a derivative of the Gsh-30 series 30mm gun currently carried by the SU-35S Flanker. In the air-to-surface role, it has been suggested that the T-50 will be capable of internally carrying a clipped-wing version of the KH-38 anti-armour / ship missile, the KH-58 anti-radiation missile and a Russian version of the GBU-39 small diameter bomb.²⁵

It has also been reported that the T-50 will be able to be fitted with eight external fuselage hard points for weapons carriage to allow for extra payload at the expense of RCS, should control of the air allow. It is expected that these hard points will be developed from the SU-35S Flanker design; therefore a similar cocktail of guided air-to-surface weapons is imagined for the T-50 to allow for compatibility in the logistical chain.²⁶

On balance, it would appear that the design philosophy for T-50 is that of a highly potent combat aircraft able to operate at high altitude and extremely high speeds with the technology to camouflage itself against opponents until the last possible moment. This is not a platform designed to run away from a fight. Against third and fourth-generation threats the T-50 appears to have an avionics and weapons advantage that will allow it to detect and kill at range with its foe unaware of its presence. Against a VLO threat, such as the F-35 JSF, the tactical employment may well be to deny detection until the last possible moment, achieve first-detect, employ long-range weapons at the first opportunity and use high speed to cover the remaining distance to a WVR manoeuvring fight. The extreme agility of the T-50 is expected to help it to out-maneuvre any missiles fired against it as well as opposing fighters in the ensuing visual fight.

Military Impact

The Problem

The strategic effect of agile, VLO threats capable of high speed will be immense and constitutes an original problem for the West. The mere presence of enemy VLO platforms in an operational theatre will change the risk level and thus the tactical modus operandi of Western air power.

For example, the defence of High Value Air Assets (HVAA), (force multipliers such as ISR platforms, strategic and tactical transport and air refuelling (AR) aircraft) will be a considerable challenge against a threat which cruises comfortably at well over the speed of sound and can't be detected by radar until much later than a conventional fighter. The head start that a multi-engine transport aircraft will need to out run a fast, VLO platform will be in the order

of hundreds of miles, and the fact that the detection of the threat may not occur until a small fraction of the defensive ranges required, adds considerably to the problem.

Consequently, traditional force multiplier platforms will be forced to operate hundreds of miles from the threat, thus limiting their effectiveness due to a lack of proximity to the battle space. For example, AR platforms will be forced to operate further away from contested airspace, thereby reducing the combat persistence and influence of friendly AR-capable fixed and rotary wing assets in the combat area. In relation to risk levels and task necessity, a VLO air threat might mean that transport aircraft may not fly at will, severely hampering the logistical effort and combat effectiveness of any ground campaign. A further conundrum will be posed in that the Western aircraft with the most advanced on-board detection technology, and therefore best suited to protecting HVAA platforms from a VLO threat, will be the F-22 and F-35. If these fighters are detailed to protect HVAA platforms then there will be fewer of our own VLO aircraft to undertake offensive strike missions on targets located in the dense integrated air defence system (IADS) networks found in many of the world's contested areas.

The Implication

The Sukhoi T-50 and Chengdu J-20 will likely reverse the trend of comfortable kill ratios expected by Western air planners towards parity. Modern fighter aircraft, and the personnel that fly them, are expensive commodities that cannot be produced or replaced overnight. Consequently, nations can ill-afford to absorb high-attrition rates to their pool of fighter aircraft, either financially or in the context of safeguarding a minimum number of platforms purely for the defence of national borders. This is especially so in an age where many countries are reducing the number of fighter jets in their inventories due to national economic problems or reconfiguring their force structures for a higher transport to fighter aircraft ratio for low air threat, counter-insurgency operations. A VLO capable adversary in the theatre of operations will have an enormous impact on the calculation of prospective losses for an airborne military action, not just for fighter aircraft, but for the extremely precious force-multiplier platforms as well. Consequently, lacking possession of a fifth-generation fighter capability will most likely confine a coalition partner nation to the lower-level support tasks of a campaign where an aircraft such as the T-50 is the primary air threat. The inability to field a credible counter to such a threat would therefore likely deny significant political and military influence on the direction of such a campaign and do significant damage to the nation's military reputation.

The Solution

The F-35 JSF promises to be an extremely capable counter to this potential stealth threat. However, Western society has become expectant of a kill ratio considerably more favourable than the parity that some foresee in a JSF versus T-50 fight. Furthermore, conventional Western fighters can expect to come off second best against the sort of capability touted for T-50 and J-20. At a strategic level, where media support, public opinion and simple economics count for so much, one has to question how much political appetite there might be for

involvement in an operational theatre in which an aircraft with the potential of the Sukhoi T-50 constitutes the primary air threat.

Tactical Impact

A high-speed, VLO threat will mean that the speed at which an air force is capable of conducting the F²T²EA Kill Chain (Find, Fix, Track, Target, Engage, Assess) will be even more crucial than it is today. Presently, Western air forces enjoy a long-range detection capability on an adversary that allows the luxury of time for the F²T²EA chain to occur on favourable terms. This means that friendly fighter aircraft are able to detect air threats, classify them as hostile, employ active weapons and successfully run away from any enemy missile fired in response. The emerging VLO threat will likely change this status quo.

If a high-speed target is not detected until comparatively short range, then the time available to process the Kill Chain is reduced. This will present significant tactical problems to tomorrow's fighter pilots in that detection of the VLO threat will be late and the time to positively identify the threat as hostile and engage will be minimal. There are several implications for this. Firstly, a compressed F²T²EA chain will almost certainly result in a higher attrition rate for Western aircraft. Secondly, there may well be an enhanced risk of fratricide as the pressure of survival on aircrew to engage such a capable threat at long range will be greater, leading to the increased likelihood of an itchy trigger finger.

Previously, target detection capability and active radar guided air-to-air missiles have conspired to achieve a high proportion of kills at a range greater than the capability of our opponents' long range missiles. This has largely negated the need for a Western fighter to get close enough to the threat to need to enter a visual manoeuvring fight, where the odds of survival are drastically reduced for the Western pilot. A VLO, high speed threat will achieve short-range detection as well as an ability to close the range from electronic detection to a visual range with an enemy extremely quickly.

Consequently, unless detection methods that overcome stealth technology can be developed, most VLO versus VLO platform engagements will take place at very short range, well within the distance at which it is possible to escape from modern air-to-air missiles. For example, open source documents state that the range at which the Chinese PL12 active air-to-air missile is inescapable is thirty-five kilometres (twenty-two nautical miles). Unclassified sources have also suggested that the AN/APG-81 radar fitted to the F-35 JSF would not detect the T-50 until approximately thirty nautical miles at best.^{27, 28} This would allow very little time for the threat to be assessed before an ensuing missile attack on the Western fighter becomes inescapable. For this reason, a far higher number of VLO versus VLO engagements will culminate in a WVR dogfight, with the protagonists following short-range, high-energy missiles to a manoeuvring fight. Each participant will be unable to run away from the fight without surrendering inordinate tactical advantage by being 'shot in the back'. By extrapolation, the survival odds of an unaware third or fourth-generation fighter detected at long range by a stealth threat are slim.

In particular, the T-50's expected agility will likely redefine air-to-air and surface-to-air missile guidance requirements. If the threat platform is able to out-maneuvre an incoming missile, then the probability of a kill becomes effectively negated as the missile cannot get close enough to physically damage the target. Consequently, missiles that are successful against aircraft like T-50 and J-20 will have to be capable of high speed and considerable close-in agility. The air arms of the United States learnt to their cost the dangers of a reliance upon long-range missile technology over WVR 'dogfighting' skills during the Vietnam war, where the ten to one kill ratio of the Korean War fell to almost one to one as the F4-C Phantom tangled with small, agile MIG aircraft.²⁹ To avoid re-learning the same lesson in the future, we must make sure that not only is missile technology continually developed, but that our aircrews are capable of dealing with an opponent adept at WVR manoeuvring.

Potential Solutions

The most obvious counter to a stealthy air threat is to procure a platform with superior VLO characteristics, the requisite technology for first detect capability and a weapons system advanced enough to achieve a high probability of kill. For the air arms of the UK, that solution is the F-35 JSF. However, no matter which mathematical formulae is used to calculate the final price tag of the JSF program to the UK taxpayer, there can be no doubt that it will be expensive in financial and political terms; thus the number of platforms procured for use by the RAF and RN may not be of the volume required to conduct simultaneous offensive and defensive operations. This will, most likely, force us to look to like-minded allies to provide additional VLO platforms for future operations against an agile, stealthy air threat. Given that many of our principle European allies, notably France, are not partners in the JSF project and have no tangible VLO platform procurement plans at present, the prospective members of such a coalition are small and geographically diverse.

Additionally, JSF has its critics; most notably in its apparent lack of manoeuvrability, payload and persistence.³⁰ This suggests that whilst JSF might achieve more than parity with the proposed capability of platforms such as the T-50 and J-20, we might not expect to see a marked superiority in quality. Therefore, it would be prudent to consider other facets of combat air power, such as tactics, additional technology and training, to maximise the chances of overcoming the potential VLO threat. This is especially so as the bulk of British offensive air combat capability for the coming decades will be provided by the fourth-generation, non-VLO Typhoon.

Tactical Solutions

One solution for overcoming the agile, VLO threat would be to overwhelm it through a substantial numerical advantage. On a very simple level, this could be achieved simply by throwing enough third and fourth-generation aircraft, such as Typhoon and Rafale, at the less-proliferated VLO threat to force it to run out of missiles, fuel or situational awareness. If executed correctly, this doesn't necessarily mean a suicide mission for the conventional fighters because they will have the advantage of numbers, although the tactic would still be

classified as high risk. With the limitation that stealth aircraft surrender much of their VLO capability by carrying external weapons, third and fourth-generation aircraft in sufficient numbers might exploit a potential lack of combat persistence. Simply put, if T-50 and J-20 are to operate as a true VLO platform then they are limited to an internally-carried weapons payload. Once the threat platform has run out of missiles, it can no longer employ offensive air power individually, effectively relegating itself to providing situational awareness to other platforms.

Additional Technology

This option might well be unpalatable for most nations due to the possibility of a high level of attrition. A more sensible use of numbers by the UK in detecting stealth threats might be through a tailored Integrated Air Defence System (IADS) with network enabled capability and datalink employment. The T-50's apparent lack of an all-aspect VLO capability may leave it susceptible to detection by any radar (airborne, sea or land-based) that has a view of the aircraft from the beam or tail aspect. Therefore, a positioning of radars around the battlespace to create a 'multi-axis radar pocket' that maximises the chances of at least one networked radar unit constantly able to see the side or rear of the T-50 will optimise the chances of detecting and tracking the aircraft.

The appearance of VLO technology as a threat will mean that research in to an IADS capable of detecting it will have to be financed. As mentioned previously, L band radars have been shown to have a potential in this area despite the inaccuracies inherent for airborne employment. Continued investment in research and development in this area will almost certainly yield increasingly positive results. IRST also represents an avenue of hope in VLO detection as it is difficult and costly to mask IR emissions in a fighter aircraft.

Fitting conventional fighters, such as Typhoon, with an upgraded VLO detection system, based on the data-fusion of off-board networked radars and on-board L-band, X-band, IRST and Electronic Protection Measures (EPM) technology, would negate a large chunk of a VLO threat platform's capability. The full suite may be expensive, but no doubt cheaper than procuring a new aircraft with a similar avionics suite in tandem with the VLO fuselage shaping required to realise a true fifth-generation capability. This option might give the UK an ability to combat the T-50 and J-20 threat without the need to opt for the prohibitively expensive option of fully replacing the Typhoon Force with JSF.

The agility of aircraft such as the T-50 must become the baseline design for future anti-aircraft missile manoeuvrability. Even if the T-50 and J-20 projects do not achieve the manoeuvrability capability expected of them, the possibility exists that highly agile, unmanned aerial vehicles free of the manoeuvring limitations of the human body will almost certainly become a threat within the lifetime of missiles in or about to enter the inventory. The detection problem that the stealth threat presents to Western air forces is considerable enough, but if the threat platform can manoeuvre itself out of the lethal ranges of missiles targeted at it then

the whole tactical concept of shot doctrine and missile kinematic performance will have to be re-defined.

Helmet-mounted missile cuing systems (HMS) will go some way towards overcoming an agility disadvantage in a visual, manoeuvring fight, and it is essential that JSF and Typhoon are fitted with such systems in light of emerging threat capabilities. From the author's personal experience of HMS on the F/A-18, these systems are a useful crutch and can give up to ninety degrees of angular advantage to aircrew in a turning fight. However, HMS does not replace the need for traditional ACM knowledge and proficiency, especially if the opponent is fitted with a similar system, which effectively neutralises the advantage.

In keeping with the potential that multi-axis, networked air and ground units could be used to detect a VLO threat, the use of capable, long-range strategic Surface Based Air Defence (SBAD) and maritime systems may well be essential. SBAD technology has already shown its capability against stealth aircraft, most notably in the Yugoslavian SA-3 shoot down of a USAF F-117 Nighthawk on 27 March 1999 during Operation Allied Force. The battery commander, Colonel Zoltán Dani, suggested subsequently that he detected the platform by modifying the SA-3 radar to operate on unusually long wavelengths that weren't anticipated by NATO forces or the F-117's designers.³¹

SBAD detection techniques have shown much potential against stealth technology. However, the bulk and weight of the equipment required to detect passively has, to date, kept the capability on the surface. Procurement of a long-range VLO detecting SBAD or maritime capability would, however, add an extra layer of defense against the VLO threat platforms of the future. The true advantage of having such a system would be the ability to operate HVAA platforms within the Missile Engagement Zone (MEZ) of a friendly long-range SBAD system with some element of protection against a VLO threat. The ability to detect VLO platforms from multiple directions from the ground or sea may also provide for earlier threat detection, allowing the HVAA to escape or the threat to be engaged. Surface-to-air systems such as the Russian S-400 / SA-21 Growler are said to have anti-stealth capability. If this is the case, then perhaps the UK should consider the procurement of a similar system to provide a protective umbrella for both our force multiplier aircraft and deployed forces, thereby releasing platforms like JSF for offensive operations.

Training

If VLO air combat is to be lethal, high altitude and at close range, then there is a pressing need to reverse the trends of recent years and re-emphasise the importance of training and currency in WVR air combat manoeuvring (ACM). If hostile aircraft become capable of getting very close to allied fighters before being detected, then it follows that we must ensure that the skills of our pilots to fight 'close in' are second to none. Anecdotal evidence suggests that the quantity and quality of ACM training in some Western air forces has decreased in recent years due to a reliance on the technological superiority in detection and corresponding increased kill range.

ACM has lost traction in some training regimes due to the fact that it uses fuel quicker than any other flying discipline and represents a low number of flying hours for a sortie generation rate. Despite a breathtaking improvement in the capability of flight simulators in recent decades, it is still impossible to truly recreate the sight, sound and feel of ACM in any environment other than the air. It may be that the only chance that a Typhoon pilot has to prosper against a T-50 is the use of manoeuvre, guile and electronic protection to survive to a visual merge before he or she can shoot back. Consequently, we must ensure that our pilots can take on and defeat a platform in a visual fight against which they have a considerable agility and detection disadvantage. The best method of achieving this is more emphasis upon ACM training and currency in both training units and front-line squadrons.

Summary

If the Chinese and Russian fifth-generation fighter projects achieve the proliferation and potency expected of them, then they have the potential to change the employment of air power by the West in the future operating environment envisaged within the UK military's Future Force 2020 planning timeline.

Both Russia and China have recently demonstrated a desire for a well-equipped military and an appetite for projecting a forceful foreign policy. If, as seems likely, the Sukhoi T-50 and Chengdu J-20 proliferate amongst our strongest competitors, then these platforms constitute a threat that the UK cannot ignore within its currently stated political policies.

An in-theatre stealth air threat will almost certainly force the UK to pursue any military campaign in tandem with like-minded allies that also possess a fifth-generation fighter capability. Currently, many of our closest European allies are a considerable distance away from possessing a true fifth-generation fighter platform, leaving the potential membership of a VLO fighter-capable coalition small and politically diverse. It may be that due to political and financial constraints, the lack of a fifth-generation capability will bar a nation from admission in to any future military airborne coalition involving a dispute with a T-50 or J-20 equipped state. At the very least, such a capability gap will reduce a nation to the periphery of international influence over contested airspace containing a fifth-generation air threat. Although the F-22 Raptor and F-35 JSF will most likely perform well against the Sukhoi T-50 and Chengdu J-20, for the first time in decades the West's future technological dominance of the air is open to question.

An in-theatre VLO threat will constitute a considerable challenge to any joint commander attempting to concurrently protect friendly strategic joint force concentrations and conduct an offensive joint action campaign. Additionally, the escalation in the potential for friendly losses may skew the balance of risk versus reward for our politicians, thereby limiting the influence that our nation is capable of bringing to bear.

Consequently, if we are to retain our current ability to dominate contested airspace in the shadow of an agile, VLO threat, fielding F-22 and F-35 in the quantities that are

currently expected in to service, whilst an encouraging first step, is the very least that needs to be achieved.

The key to combating the agile, high-speed stealth threat for a JSF-equipped UK will be an effective and efficient VLO aware targeting cycle and kill chain. Firstly, we must be able to detect, fix and track the threat by investing in networked technology such as L-band radar,IRST and SAM systems similar to the S-400 / SA-21 Growler. Additionally, we must reduce the threat of fratricide by optimising the speed in which a VLO aircraft can be classified as either friend or foe to give aircrew and SBAD operators the time to make a consistently correct engagement decision.

To successfully engage the threat, we must ensure that our air-to-air and surface-to-air missiles are agile enough to cope with the adversary's potential manoeuvrability. Equally, in a time of dwindling numbers of fighter aircraft, we have to work out how best to protect our HVAA platforms, whilst allowing them to operate close enough to the battlespace to carry out their tasking effectively within an acceptable level of risk. Specifically, we need to be able to provide a protective, networked IADS umbrella of airborne and surface systems with the ability to detect and engage VLO platforms. Of paramount importance, and much less expense, the combat air squadrons of the RAF and Fleet Air Arm must re-balance day-to-day training to focus more on the importance of WVR ACM expertise and tactics.

Countering the VLO threat has the potential to have a high price tag. Conversely, the opportunity cost of being ejected from, or barred entry to, a theatre of operations due to an inability to deal with an agile, VLO air threat might be catastrophically expensive in both financial and political capital. Therefore, if we are to retain a cutting edge air combat capability, not only must this emerging threat be matched, but we must also have the ability to achieve at least temporary, local air superiority over stealth threat platforms for a given time period of our choosing. However it is achieved, the agile, VLO threat will have to be countered; the ramifications of not doing so could well be disastrous.

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Sukhoi T-50

The Potential for Unmanned Combat Air Systems to Gain Control of the Air in Future Warfare

By Squadron Leader Colin Wills

Current Unmanned Combat Air Systems developments, such as BAE's *Taranis* programme, focus on Intelligence, Surveillance, Targeting, Acquisition, and Reconnaissance, and air-to-surface missions, including that portion which is the counter-air task. The article argues that the air-to-air component of counter-air warfare is as essential. Could Unmanned Combat Air Systems, the next evolution of Unmanned Aircraft Systems, gain control of the air in future warfare? There is currently a paucity of analysis within the UK into Unmanned Combat Air Systems undertaking this task. The threat environment in which weapon systems are required to operate in will reinforce capability requirements. The effect that political, legal, and ethical issues of using Unmanned Combat Air Systems might have upon decision makers cannot be underestimated, and also requires consideration. This article examines the implication of these issues and the future utility of Unmanned Combat Air Systems gaining control of the air.

Introduction

Control of the air is the foundation for all conventional military operations against an adversary with an air defence capability. Could Unmanned Combat Air Systems (UCAS), the next evolution of Unmanned Aircraft Systems (UAS), gain control of the air in future warfare? Current UCAS development focuses on detecting and destroying Time-Sensitive Targets, utilising Intelligence, Surveillance, Targeting, Acquisition and Reconnaissance (ISTAR), and Suppression of Enemy Air Defence (SEAD) roles, the air-to-surface portion of the counter-air task. The air-to-air component of counter-air warfare, a true Time-Sensitive Target issue, is as essential. The importance that situational awareness plays in warfare is vital. Networked Enabled Capabilities (NEC) will be fundamental in establishing consistent and reliable battlefield situational awareness, and will form the basis upon which UCAS are developed and employed. Will the character and nature of warfare, forcing aircraft operations over distances not previously considered necessary, be such that UCAS are the only viable solution? There is currently a lack of cohesion and clear thought on the future utility of UCAS, particularly within the UK, which requires informed input. Ultimately, UCAS capable of gaining control of the air could offer a revolution in the way warfare is conducted in the 21st Century.

A transformation in the way warfare is conducted is in progress. This new era promises significant advances in capabilities, adaptability, and agility. A fundamental rethink is taking place in the way Command and Control (C2) is conducted, and the ways in which military objectives are achieved. A broad range of technologies has begun to enable the integration of joint-forces not previously possible, with a whole series of technological advances coming together. During the initial stages of World War I, military aviation was mainly concerned with the role of reconnaissance; however, the potential for bombing and air-to-air combat soon became apparent. 1915 saw the development of fighter aviation, including mechanical interrupter gears, which enabled guns to fire through the arc of spinning propellers. By 1916, control of the air emerged as the crucial issue in the Germans' Verdun offensive and the British Somme counteroffensive. A revolution was beginning; control of the air was increasingly viewed by air and ground commanders as a means of allowing the observation and air-to-ground attack of enemy ground forces. By 1917 it was evident that poor reconnaissance of an enemy's disposition could cost all the gains of a successful previous attack.¹ The 1st April 1918 saw the establishment of the Royal Air Force (RAF) by amalgamating the Royal Flying Corps and the Royal Naval Air Service.² Air power had come of age and was now seen as an integral part of military operations, with control of the air acknowledged as being an essential element of any campaign.

The RAF's *AP3000: British Air and Space Power Doctrine* emphasises the importance of the counter-air task, stating, 'Control of the air is the *primus inter pares* of the four air power roles. It has doctrinal primacy because it enables freedom of manoeuvre in all of the military domains: air, land and sea.'³ Churchill stated 'The only security upon which sound military principles will rely is that you should be master of your own air.' Although sometimes forgotten, perhaps even by military leadership, this maxim is as extant today, as it was in 1918.

For example, the Luftwaffe during the Battle of Britain in 1940, and the Argentinean Air Force during the 1982 Falklands War, lacked any form of control of the air, and suffered the consequences. The more advanced an adversary's counter-air capability, the more important gaining and maintaining control of the air, and the more sophisticated a force's own counter-air capabilities needs to be. The ability to conduct the full gamut of air operations, unhindered, against enemy forces is vital, enabling deployment and resupply, and protection of those forces and supplies once deployed. During the 1982 Falkland's War the Argentines started from a position of considerable strength relative to the British Task Force, yet their apparent lack of any coherent air strategy meant that they quickly lost air superiority over the Falkland Islands. The loss of a number of British ships during the 1982 Falkland's War illustrated the consequences of the British Forces not having air superiority either.

Unmanned Aircraft System/Unmanned Combat Air System Terminology

It is important to understand the UAS/UCAS terminology currently used.⁴ The term UAS itself is often misunderstood, with the consequence that there is a lack of consistency with terminology. Many 'experts' refer to the air vehicle component of a UAS as a 'drone'. This is a legacy term, more fitting to the German World War II V1 Doodlebug, or target drones, used for gunnery practice. V1s were designed to impact a target, and not to be recoverable; they were effectively cruise missiles. Herein lays the problem when defining what in fact an Unmanned Aerial Vehicle (UAV) is. A UAV is not a cruise missile. In modern parlance, a UAV is an Unmanned Aircraft (UA) designed to be reusable. The Office of the US Secretary of Defense 2005 '*Unmanned Aircraft System Roadmap: 2005 – 2030*' describes UAV as:

A powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, ... can carry a lethal or non-lethal payload. Ballistic or semi ballistic vehicles, cruise missiles, and artillery projectiles are not considered unmanned aerial vehicles.⁵

Whilst there is no internationally agreed policy regarding UAS definitions, there are a number of working agreements that attempt to align common lexicon, as far as is possible. The terms Unmanned Aircraft (UA), UAV, UAS, Unmanned Combat Aerial Vehicle (UCAV) and UCAS are used in this article. Although there are subtle differences between NATO and US terminologies, these align with the vocabulary most international UAS analysts use. There is currently no agreed definition of UCAS. Until there is conformity, the author defines UCAS as UAS designed to carry weapons, utilising a level of automation/autonomy, which may also be capable of ISTAR tasks, **designed to survive in highly contested airspace.**

Two-Seat, One-Seat, or No Seats?

Powered unmanned aircraft have been operating almost as long as manned powered flight. There have been a number of false dawns, however, preaching the virtues of unmanned aircraft. General Hap Arnold, Chief of the US Army Air Force, predicted what might be possible, when he observed on VJ Day in 1945:

We have just won a war with a lot of heroes flying around in planes. The next war maybe fought by airplanes with no men in them at all... Take everything you've learned about aviation in war, throw it out of the window, and let's go to work on tomorrow's aviation. It will be different from anything the world has ever seen.⁶

Although not quite prescient, Arnold's words, almost 70 years later, are gaining relevancy. Current debate amongst academics and military professionals, centres on unmanned versus manned aircraft. Previous arguments have questioned the requirement for one-seat versus two-seat. Along with the trend towards single-seat aircraft operations, doctrine and tactics have evolved to take advantage of the evolution that technological advances have allowed manned flight to utilise. With the demise of non-pilot aircrew, will advances in aviation systems mean there will be fewer requirements for pilots? Have we come full circle, where navigation accuracy and the precision of weapon delivery is the predominant requirement for combat air power? Historically, the science of navigation has taken precedence over many other aspects of warfare. The Gulf Wars of 1991 and 2003, and counter-insurgency operations in Afghanistan and post-war Iraq, have demonstrated the vital role that precision weapon delivery plays in modern warfare. Max Hastings observes, in his thought provoking rendering of World War II, *All Hell Let Loose: The World at War 1939 – 1945*, 'An aspect of the conflict common to warriors in all three dimensions was that navigation was a life-or-death science. A British Army training report noted that soldiers would forgive almost any fault in their officers except incompetent map-reading...'⁷ It can be argued that the primacy of navigation, and all that the mastery of it brings, is now firmly established as the priority of any nation that wishes to have, and use effectively, a military force.

Since the beginning of manned flight, pilots have been regarded as pivotal in the flying and operating of powered aircraft. Innovators added to the surge in aviation progress, with developments leading to aircraft capable of the full range of civil and military tasks, including transport, Air-to-Air Refuelling (AAR), reconnaissance, bombing and air-to-air combat. When the RAF's Tornado GR-4 goes out of service, the RAF will have no role for fast-jet qualified WSO. There are reasons for this – the main one being that, with the advent of the single-seat Typhoon, and the probable introduction of F-35 Joint Strike Fighter (JSF), there is no 'perceived' requirement for fast-jet WSO. The fact that pilots have historically been required to fly aircraft that facilitate achieving the requisite military task should not be a driver for future doctrine, tactics, or procurement. Technology is following a natural trend that will achieve the required task more efficiently, allowing greater time, effort, and resources to be focused on systems that will not require a human interface in an aircraft, or potentially, even monitoring systems.

Future UCAS Developments

UCAS have the potential to offer an innovative set of options offering advantages to air power in terms of expanded missions, tactical deterrence and, importantly, through-life costs savings. UCAS may eventually be capable of the full gamut of air missions, including: ISTAR, AAR, Close

Air Support (CAS), SEAD, interdiction, EA, and conceivably, control of the air in its entirety, including Defensive Counter Air and Offensive Counter Air operations.⁸ UCAS can have a number of advantages: they can have a small radar-cross-section (RCS), if low observable technology is used, as well as being capable of carrying a large payload. UCAS could have long endurance, enabling persistence and availability, and with no aircrew, allowing operations in a toxic environment. Although the preservation of aircrew is undoubtedly important, it is questionable whether this will be paramount in any decision on UCAS development. Humans operating in high-performance combat aircraft have had to contend with the physiological constraints that high altitude flying and 'Gravity' forces place on the human body. In 2010, the F-22 Raptor was grounded for a number of months, following the loss of an F-22; the cause was suspected to be the aircraft's oxygen system malfunctioning and incapacitating the pilot. The F-22, like the F/A-18C/D, uses an on-board oxygen-generation system.⁹ While rectifiable, it illustrates the problems of having a human in the cockpit. A UK medical study concluded that 'Good evidence is available to show that aircrew of high performance aircraft will experience degeneration of the cervical spine during their career which is greater than that observed in the normal population.'¹⁰ Mitigating the effects on aircrew may be a partial driver, but it is the potential reduction in procurement and through-life costs, aligned with persistence,¹¹ that will be the main drivers for UCAS development.

Although Rules of Engagements (ROE) constraints and moral and political necessities may initially militate against full autonomy, the development of Artificial Intelligence (AI) and Human-Machine-Interface (HMI) technology may offer a level of integration which enables a greater degree of flexibility when conducting Combat Identification (CID) and Collateral Damage Estimation (CDE), than that of a Human-in-the-Loop (HITL) system. This would allow missions to be planned and then executed using on-board decision making – with a Human-on-the-Loop (HOTL) monitoring the system and taking action only when necessary, and perhaps, totally autonomously. Concentration of force is a fundamental principle of war that is particularly well suited to air power. Experience has shown that air power concentrated in both time and space is more effective in achieving an objective than if it were dispersed over a wider area and longer time. Moreover, a concentrated force will use support forces more efficiently, increasing overall capability and survivability. The Composite Air Operation (COMAO) concept involves packaging a large number of aircraft, with a variety of roles, to complement each other to achieve a task. Benefits of operating in large formations include minimising attrition by optimising mutual support and saturating adversary IADS.¹² Fundamental to the future employment of UCAS, will be their utility within COMAO packages. Ultimately, it may be possible for a large COMAO formation of combat and support aircraft, combining manned aircraft and UCAS, or made up entirely of UCAS, to operate together or autonomously. This autonomy may permit a quicker and more accurate response, allowing not only a high probability of survival, but ultimately the desired mission objectives being achieved. The current doctrine of gaining either air supremacy, or localised air superiority, will continue to be a priority for any COMAO.

Thus far, little rigorous investigation into the viability of UCAS conducting the full range of counter-air roles, including gaining control of the air, is being conducted by Western states. The UK has cooperated with the US, as part of a programme, (referred to as 'Project Churchill'), forming a partnership in establishing a Concept of Operations (CONOPS) for future UCAS – this ran from 2005 to 2009.¹³ Although the UK has not published any UAS/UCAS procurement timeline, the US has made available its likely developmental route for the utilisation of these systems. The US Department of Defense (DoD) has published a Roadmap for all of its unmanned systems, ground, sea and air, *FY2009-2034 Unmanned Systems Integrated Roadmap*, stating - 'The purpose of this...Roadmap is to propose a feasible vision for capitalising on unmanned systems technologies so that the Warfighter can conduct missions more effectively with less risk.'¹⁴ Although there are no known current programmes in the public domain researching the counter-air capability of UCAS, in November 2011, the author was briefed by a representative of BAE Systems that their Advanced Projects team are reviewing a wide range of options for future combat air systems, including a UCAS capable of undertaking control of the air missions.¹⁵ The US have published a number of documents outlining their strategy for future UAS/UCAS. In 2009, the Secretary of the USAF, Michael B. Donley, and the USAF Chief of Staff, General Norton Schwartz, signed the *USAF Unmanned Aircraft System Flight Plan 2009 – 2047*. This document sets out the USAF vision for the implementation of UAS/UCAS into USAF service, out to 2047. It states:

[UAS] and the effects they provide have emerged as one of the most "in demand" capabilities the USAF provides the Joint Force. The attributes of persistence, endurance, efficiency, and connectivity are proven force multipliers across a spectrum of global Joint military operations....The vision is the USAF postured to harness increasingly automated, modular, globally connected, and sustainable multi-mission unmanned systems resulting in a leaner, more, adaptable and efficient air force that maximises our contribution to the Joint Force.¹⁶

The USAF intends the '*Flight Plan*' to be an actionable plan 'to achieve the USAF vision for the future of UAS. The USAF will implement the actions described within to evolve UAS capabilities.'¹⁷ There are a number of assumptions which drive the focus for the USAF's vision, perhaps the most pertinent being, '...The range, reach, and lethality of 2047 combat operations will necessitate an unmanned system-of-systems to mitigate risk to mission and force, and provide perceive-act line execution...'¹⁸ A report from the US Defense Advanced Research Projects Agency states that 'a UCAV weapon system has the potential to fully exploit the emerging information revolution and provide advanced airpower with increased tactical deterrence at a fraction of the total life cycle costs of current manned systems.'¹⁹ Ultimately, if UCAS can do the required tasks more cheaply, and/or better than manned systems, then their development will have justification.

The debate over the future utility of UCAS is fierce, however, particularly within the US military hierarchy. In 2011, General Schwartz, apparently rejected the development of a completely

unmanned long-range bomber, stating that he did not think armed, unmanned aircraft have evolved to the point at which they can operate effectively.²⁰ Schwartz expressed the view, '...at least for the next 25 years, maybe 50 years, there's going to be a mix of manned and unmanned [aircraft]. Beyond 50 years, anything's possible.' He also stated that he is not ready to 'contemplate a nuclear sortie on a remotely piloted aircraft...at least in the near future.'²¹ His reasoning for this is not clear, after all, Intercontinental Ballistic Missiles, armed with nuclear warheads, have been part of the US arsenal for decades - these cannot be recalled. In contrast, at the same time, US Marine General James Cartwright, the vice chairman of the Joint Chiefs of Staff, has stated he believes unmanned bomber technology is ready for deployment.²² General Cartwright, who heads the Pentagon's top-level review panel with authority to determine all of the military's major hardware requirements, believes the US should buy an affordable bomber to replace its ageing fleet of conventional-only B-1s and nuclear-capable B-52s and B-2s.²³ Cartwright further stated that he would "...throw down the gauntlet by asking whether the bomber truly requires a human pilot, or if instead all of them could be remotely controlled...Nobody's shown me anything that requires a person in that airplane. Nobody." Whoever is correct, the US has had UCAS projects in development for a number of years, including a project run by Northrop Grumman; this programme is likely to be a demonstrator for the US requirement for the original Next Generation Long-Range Strike System (NGLRSS) programme, now referred to as the Long-Range Strike Platform (LRSP).²⁴

It is envisaged that developmental UCAS, such as Northrop Grumman's X-47B Unmanned Combat Air Demonstrator (UCAS-D), part of the overarching US Unmanned Carrier Launched Air Surveillance and Strike (UCLASS) programme, will conduct air-to-surface and surveillance missions.²⁵ This programme aims to demonstrate the technical feasibility, military utility and operational value for a networked system of UCAS. The X-47B first flew in 2011, with the aim of conducting trials from carriers in 2013. This programme was instigated by the Deputy Chief of Naval Operations for Information Dominance, who stated the US navy has identified a requirement '...for an aircraft carrier based aircraft system providing persistent...[ISR]... and strike capabilities that will enhance the versatility provided by an aircraft carrier...'²⁶ The US does at least appear to have a coherent plan. From approximately 2030 onwards, the *USAF UAS Fight Plan* foresees the MQ-Mc version capable of performing a number of roles including: autonomous swarm, aero-medical evacuation, personnel recovery, EW, SEAD, ISTAR, CAS, air interdiction, AAR as a tanker, missile defence, strategic attack, and, significantly, counter-air missions.²⁷

UCAS persistence would be enabled by a number of technologies, such as significant advances in propulsion and aerodynamics. Autonomous in-flight refuelling, potentially with unmanned tankers, and advanced power sources, would allow for increased endurance. UCAS would stay on task for as long as fuel permits, and then leave the hostile airspace to refuel and return. Similar to manned aircraft, it is currently envisaged that future UCAS will use stealth characteristics, Electronic Attack (EA), and defensive measures to penetrate hostile airspace. However, although UCAV could deploy over great distances and with a reduced logistic

chains, their operating tempo may stretch any manned airborne supporting systems. If the through-life cost of a UCAS means that these systems are treated as High Value Airborne Assets (HVAA), it may mean manned fighters, themselves HVAA, are required to protect them, thereby mitigating any advantage that these systems offer. It is important, therefore, that UCAS are capable of operating independently of other HVAA, with a high chance of survival. In order to operate effectively, UCAS will need to be able to dominate the air space in which they operate.

The US has had the ability to conduct long-range strike missions since World War II, giving it a decisive military capability. There is debate whether this will continue to be the case. Thomas Ehrhard and Robert Work in *Range, Persistence, Stealth and Networking: The Case for a Carrier Based Unmanned Combat Air System*, view the current US capabilities to operate at long range as deficient. They believe that both land- and sea-based US fighter assets lack the necessary range and persistence for air campaigns in non-permissive scenarios. Current aircraft are best suited for striking targets at between 200 and 450 nm from their operating bases/carriers. Anti-Ship Ballistic Missiles (ASBM) and cruise missile threats are likely to force US Carrier Strike Groups to operate at least 1000 nm from adversary borders.²⁸ Why is this relevant? Mark Gunzinger, from the US Centre for Strategic and Budgetary Assessments, believes that a number of States, including China and Iran, are investing in Anti-Access/Area-Denial (A2/AD) doctrine that '...poses a direct and formidable challenge to the traditional forms of US conventional power-projection in all operating domains.'²⁹ According to Gunzinger, scenarios involving such A2/AD systems would require the US and its allies' short-range land- and sea-based combat aircraft to operate from much longer ranges than previously conceived, curtailing their ability to attack land targets deep in adversary territory, greatly reducing sortie generation rates. In addition, future, highly sophisticated, adversary IADS would likely make all areas impassable to non-stealthy aircraft and cruise missiles.³⁰ A RAND study, *Shaking the Heavens and Splitting the Earth: Chinese Air Force Employment Concepts in the 21st Century*, offers the view that tactical fighter aircraft may not be the optimum platform for providing counter-air capabilities in locations so far from the nearest viable air base; larger manned or unmanned systems, utilising extremely long-range weapon systems may offer the solution.³¹ Whether this is feasible is arguable, however, proper evaluation should be considered.

Cost Savings

The cost of personnel forms a large part of a country's military budget. For example the actual cost of employing an RAF flight lieutenant is calculated using their annual salary, plus other associated costs. In 2011, a flight lieutenant pilot was paid on average £50,000 annually, including flying pay.³² The actual capitation cost (the calculation used for overall cost) includes annual salary, plus pension contributions, bringing the average annual capitation cost for a junior officer pilot to £87,800. Notwithstanding that manpower will still be required to operate an autonomous system, taking aircrew out of the equation could mean substantial savings. The cost of training an RAF Typhoon pilot to a point where he/she can begin training on an operational squadron, for example, is £4 million, as of 2008.³³ Further training to actually become, and remain, capable of conducting operational tasks would be considerably more,

perhaps as much as £9 million - this is based on the capitation cost of the RAF Typhoon being £92,000 per hour,³⁴ with it taking approximately 60 hours further training on a squadron, before a Typhoon pilot becomes fully operational. Once operational, a Typhoon pilot currently requires 180 – 200 flying hours a year in order to conduct training, to remain operational.³⁵

The range of personnel costs will vary, according to rank; however, it can be broadly seen that by reducing manpower, costs can be significantly reduced. The operating costs of a UCAS would be significantly less, essentially because the UCAV would remain on the ground, containerised, unless or until it is actually required for operations or maintenance procedures. The more autonomy the system uses would also reduce manpower requirements. A major cost saving in training and personnel could be gained by the use of simulation. Advances in this area are creating opportunities for improvement in training that have previously not been possible. Most of the training and currency requirements could be achieved through Distributed Mission Training (DMT) systems. Although the UK Armed Forces use various simulation systems to some effect, it is the US, particularly the USAF that has been at the forefront of the development of DMT, with its Live, Virtual and Constructive (LVC) Integrating Architecture (LVC-IA) Plan. USAF training specialists believe that the increased use of simulators and the ability to connect simulators and/or aircraft at dispersed locations, and new applications of LVC are essential to enable fifth-generation pilots to acquire the required skills enabling training risks to be minimised.³⁶ LVC simulations allow aircrew and other personnel to conduct training to an extremely high-level of fidelity and at significant cost savings. These systems may actually allow for better training - by offering the scenario that everything always works - aircraft and weapon systems are always serviceable, C2 is robust, and the weather is suitable - but, if required, effectiveness of individual systems and weapons could be degraded, to simulate austere operating conditions. This is preferable to the haphazard way in which a significant amount of live flying training is currently conducted, where the vagaries of system serviceability and the whims of the weather, significantly impact on the value of training – the author contends at great wasted cost, and, ultimately, operational effectiveness. There is a balance to be maintained, of course; however, technological advances will allow for the utilisation of these DMT systems to greatly enhance the effectiveness of counter-air operations, with associated cost savings.

The International Context in which UCAS would be Used/ Threat?

UAS are currently assuming roles in air power that have traditionally been undertaken by manned aircraft, at least in permissive environments. Recent counter-insurgency operations in Iraq and Afghanistan have concentrated on ISTAR and CAS capabilities, using UAS in increasing numbers; however, these types of systems are not presently survivable in highly contested airspace, against an adversary with a capable IADS. The context in which these systems would be used is fundamental to their developmental path. Although the military capabilities of future threats to international security should be adequately assessable, the intent of those nations that threaten stability remains less easy to predict. An understanding of where these threats are likely to come from is essential. Identification of these possible adversaries is

realistically achievable; how they are deterred and, if required, militarily defeated, is not so easily attained. Any specious assumptions could lead to erroneous conclusions, in turn, potentially leading to the wrong procurement decisions. The West's main focus is currently on irregular warfare; whilst this type of conflict is likely to be on going for some time, possibly indefinitely, circumstances may drive nations to believe that the only way to survive, let alone prosper, is to instigate conflict in order to divert attention from internal domestic issues, or to establish dominance over natural resources. A lack of natural resources may prove crucial.³⁷ Future conflicts will likely range from peace keeping and policing roles, to minor interstate conflict, to the potential for large interstate warfare.

The UK's Development, Concepts and Doctrine Centre (DCDC) views the era out to 2040 to be a time of transition: 'Out to 2040, the focus of global power will move away from the US and Europe towards Asia. ...[the US] is likely to remain the pre-eminent military power, although, in political, economic and military terms, she is likely to be increasingly constrained as others grow in influence and confidence.'³⁸ Some analysts believe China is likely to overtake the US as the World's No 1 economic power by 2020.³⁹ There is also a view that China will reach technological parity with the US, sometime between 2040 and 2050.⁴⁰ Aligned with China's increasing economic power is its desire to become a major military power, able to influence the *status quo* in the Western Pacific. This will make China the centre of gravity for the foreign and military policies of the US and its allies in the coming decades. While the US does not view China as an existential threat to the US mainland, it believes that China poses a threat to stability in the region. China's emerging A2/AD doctrine will force States, especially the US, to mould foreign and military policies to militate against China gaining dominance in the Western Pacific and the South China Sea.⁴¹ Not only does China wish to include Taiwan in its sphere of influence, it also desires to hold sway over the abundant natural resources that lay beneath the South China Seas. China is also hedging against access being denied through the Strait of Malacca, through which most of its oil supplies transit.⁴² For many of the same reasons, the US and its allies do not wish China to hold dominance in this part of the world. The Middle East, with Iran at its centre, will also test international relations. Iran is also developing a strategy of anti-access and area denial.⁴³ China and Iran's A2/AD doctrine will likely force the US and its allies to operate from land bases and carriers at greater ranges than those currently planned. The development of ASBM and other systems capable of pinning forces down at ranges that make current weapon systems unviable in deterring aggression in these regions requires inspired evaluation. Air systems, *inter alia*, which are capable of operating at ranges outside of these threats are necessary. At whatever distances from bases, the dictum that control of the air is the foundation for all conventional military operations against an adversary with an air defence capability, will remain true.

What do the Experts Think?

A survey of RAF aircrew and officers, MOD engineers and aviation specialists, and pertinent civilians, collecting views on whether UCAS could gain control of the air in future warfare by 2040, and also, moral and motivational issues, *inter alia*, was conducted by the author.

The intention was to determine any emerging trends in thought, in particular, identifying divergence in interviewee's views, dependent on their experience and qualifications, both academic and military. Analysis of the responses has validated the hypothesis that investigating UCAS utility in the counter-air role has merit. There were 74 responses to the survey in total, of whom 47 were aircrew, ranging from junior aircrew to a number of senior commanders. Many of those interviewed have relevant experience in counter-air operations. Ninety-eight per cent stated they believed UCAS could gain control of the air by 2040. These are pilots, navigators, and counter-air specialists with an understanding of all the relevant strands and many vagaries that the fundamentals of air-to-air combat have traditionally entailed. It seems counterintuitive, but none was tempted to protect the man in the cockpit; none had the 'pilots/aircrew are gods' attitude which has prevailed in air forces around the world, ever since aircraft were first used as weapons of war. The civilians interviewed were included in the question regarding the moral use of UCAS. Eighty-six per cent of interviewees have no moral concerns with the use of UCAS. This does not mean, however, that consideration is not required when developing training for personnel, taking into account a potential lack of understanding of air power, if these personnel have not themselves been immersed in the philosophy of warfare, or indeed have not participated in combat operations. There may also be a risk of detachment when authorising weapon release, perhaps leading to a lack of emotional connectivity with the battlespace.

What motivates someone to want to join an air force to fly? Is it the act of being able to fly a complex, fast and very potent aircraft? Is it the prospect of flying helicopters in extremely challenging scenarios? Alternatively, is it merely the act of flying, in fact, flying anything? Some do not actually join to fly; a significant number of personnel know that they can never fly, but decide to join because they wish to be involved in aviation *per se*. If the RAF, or the UK military establishment, does become autonomous unmanned systems centric, or even semi-autonomous, the recruitment of personnel to conduct the roles required to operate and manage these systems will need to be tailored to ensure that the most suitable personnel were motivated to join the Services. What will be the character of these personnel? What intellectual qualities will be required? Will the whole ethos of the RAF change, and if so, will it matter? The views of the interviewees go some way to answering these questions. The questionnaire asked: 'Would a predominance of UCAS being the RAF's combat strength in 2040 affect the motivation for personnel wanting to join?' The majority, eighty-two per cent, do not believe recruitment will be affected, there will just be a different motivation; indeed, there was an underlying opinion that recruitment, whilst attracting a different type of person, could be enhanced. Future personnel would be attracted by the technology driven role of the RAF. Some interviewees opined that, whilst recruiting could be affected initially, overtime, perceptions would change, to the extent that it would not be a significant factor. Eighteen per cent had some issues, with the main concern being over the 'fighter ethos' being eroded.

What Weapon Systems would UCAS Require?

If UCAS were to be used in the air-to-air role, the weapon systems used would require intense scrutiny. Most conflicts since World War II have involved some form of aerial warfare. The Korean

War, the Israeli/Arab conflicts of 1967 and 1973, the Vietnam War and the Falkland's War involved air-to-air engagements, some of which required aggressive visual manoeuvring in order to engage and kill an adversary, employing either, short-range infrared (IR) air-to-air missiles (AAM) or air-to-air guns (AAG). However, since the 1980s, conflicts, such as the 1991 Gulf War, Bosnia and Kosovo, most successful airborne engagements have been conducted Beyond-Visual-Range (BVR) with Radar Frequency (RF) AAM, or Within-Visual-Range (WVR), with RF and IR AAM. Sometimes neglected in the enthusiasm for advanced technology is the gap between actual technical viability and any practical or operational benefit. That a given capability is technically feasible does not necessarily mean that it is operationally useful in an actual combat scenario. Frequently misunderstood, or indeed, little understood by some air power proponents, is the likelihood of an AAM actually achieving a kill. AAM Kill Probability (P_k) affects the choice of how many AAM need to be launched in order to kill an adversary aircraft. In addition, this in turn, affects almost every other consideration, such as the number of AAM carried on a fighter, affecting the required size of that fighter, and/or the number of fighters necessary to counter potential adversaries. The basis on which the formula for AAM P_k is founded, is the probability of a single shot kill (P_{ssk}). From this, the ratio of AAM to the P_k required is calculated. This depends on a number of factors, but will essentially be constructed on a series of AAM live-firing trials against the full breadth of expected adversary target profiles, and simulated firings, which are conducted in a Hardware-in-the-Loop facility, which is a ground-based test, using actual aircraft and missile sensors and the EA techniques, which would be used against them. These are normally centred on the ability of the Air-to-Air System (AAS), as a whole, to operate in the full range of conditions likely to be encountered during an air battle.

Pre-Vietnam War trials estimated the AIM-7 Sparrow RF AAM P_k was approximately 0.70. Its actual demonstrated P_k during the Vietnam War was 0.09 (56 of 612 kills).⁴⁴ US fighters were required to use the air-to-air gun on North Vietnamese Russian MiG fighters, almost 100 times more than anticipated.⁴⁵ Since the advent of BVR AAM, approximately 663 air-to-air kills have been recorded by Western and Israeli equipped BVR AAM-equipped forces. 16.1% (107 of 663) kills have been with RF AAM, of which only 3.9% (26 of 663) have been BVR.⁴⁶ During the Vietnam War, US fighter crews conducted approximately 600 air-to-air engagements in Southeast Asia from 1965 to 1973, achieving 190 kills against 75 losses - a ratio of 2.5:1.⁴⁷ From March 1965, to the end of US air operations against North Vietnam in January 1973, only two BVR kills (0.3%) were officially recorded out of a total of 612 reported AIM-7 AAM used.⁴⁸ The Yom Kippur War of October 1973 was a much shorter conflict, but the air-to-air combat was intense. Despite the large number of engagements, with 261 kills claimed, Israeli Air Force (IAF) F-4 Phantoms only fired 12 AIM-7 AAM, claiming 5 kills - 0.02 % (5 of 261); with one single BVR kill - 0.004 %.⁴⁹ During the major air battles between Israeli and Syrian fighters that occurred over the Bekaa Valley in Syria in June 1982, the Israelis are thought to have shot down 82 Syrian fighters.⁵⁰ Twenty-three AIM-7 AAM were launched, achieving 12 kills (.42 P_k), with only a single BVR kill achieved.⁵¹ From 1965 to 1982, 10.7 % (69 of 647) firings of RF AAM by US and Israeli aircrews occurred at distances beyond five nautical miles.⁵² From these only four achieved kills, giving a 5.8% kill percentage.⁵³

Attempts to achieve BVR firings by US and Israeli aircrews during these conflicts were few, and are indicative of the problems inherent in the early evolution of BVR combat. Prior to the 1991 Gulf War, 0.06% (4 of 614) kills achieved were BVR. Since 1991, 45% (22 of 49) kills achieved have been BVR. Statistically, this appears an exceptional increase, with the proportion of BVR kills increasing 69 fold.⁵⁴ However, how applicable is this? Since the 1991 Gulf War, with US and Allied Forces enforcing a No-Fly-Zone over Bosnia and Iraq, and during the 1999 Kosovo campaign, Western air forces have recorded ten AIM-120 AMRAAM kills, with 17 AMRAAM fired in total. Thirteen AMRAAM have been launched to achieve six BVR kills, giving a BVR P_k of 0.46.⁵⁵ Significantly, the Iraqi MiGs shot down were fleeing and non-maneuvring; of note, Serbian J-21 Jastreb aircraft engaged during the Kosovo conflict had no radar or Electronic Counter Measures (ECM), and the MiG-29 Fulcrums shot down had inoperative radars. In addition, there are no reports of ECM used by any adversary fighter, and no fighter had comparable BVR weapons. All engagements involved numerical parity or superiority.⁵⁶ Although a significant achievement for forces operating at great distances from their own bases, and proving the efficacy of AWACS and other assets, the fact that the opposition was relatively inept and incapable of posing any real threat needs to be acknowledged. This is absolutely essential when analysing the actual effectiveness of counter-air systems involved. Current AIM-120 AAM has demonstrated an overall 0.59 P_k in combat to date.⁵⁷ Too few AMRAAM have been used in air-to-air scenarios to offer any meaningful statistical analysis. Without a near-peer, or peer adversary, with all the capabilities these will have, AMRAAM performance in the 'real world' can only be guessed at by using open sources. From 1965 to 1991, 205 of 614 air-to-air kills were achieved by use of the gun; since 1991, including the 1991 Gulf War, there have been no gun kills in air-to-air combat, although two gun kills were achieved by A-10 air-to-ground attack aircraft against helicopters.⁵⁸ The requirement for a gun must be seriously questioned. The author considers it axiomatic that unless any AAS can operate effectively in a complex EA/denial environment, then any NEC, and all other sensors, weapons and qualities of aircraft and aircrew will be severely tested, particular if outnumbered in aircraft and weapon effects.

The US F-35 JSF is being procured for the USAF mainly as a replacement for the F-16 Fighting Falcon. Whilst it is relatively manoeuvrable, it is not in the same category as the US F-22 Raptor, UK Typhoon, French Rafale or the Russian Su-27 Flanker and MiG-29 OVT Fulcrum. How much research, development and expense should there be towards an air vehicle, whether manned or unmanned, that is capable of pure 'dog fighting' - that is, highly manoeuvrable, visual air combat? It is arguable whether this ability to out manoeuvre fighters is relevant in an era when long-range BVR AAM capability is of such importance. Whether future BVR weapon systems are robust enough to allow UCAS to conduct counter-air operations in future warfare is the core question. The kill probability of air-to-air missiles/systems is fundamental to future system procurement. High Off-Boresight (HOBS) weapon systems, aligned with NEC, may offer the way forward. Persistence is a key force multiplier of UCAS. However, for missions requiring engagement of an adversary, weapons expenditure may become a limiting factor. Although currently too large for fighter size aircraft, advances in the development of Directed Energy Weapons (DEW) may alleviate this problem by permitting a range of targets to be

engaged, either lethally, or non-lethally, allowing an engagement capability to persist for as long as aUCAV can remain airborne.⁵⁹ Whatever weapon system used, whether on manned or unmanned aircraft, their lethality, aligned with situational awareness, will be the critical nodes.

Automation or Autonomy?

The term autonomous is often used when referring to the operation of UAS/UCAS; this has caused some concern among certain sectors of the military and media, with the belief that the use of autonomous UAS/UCAS would not be acceptable in some scenarios. The debate over the meaning of autonomy is ongoing. DCDC defines an automatic system as 'A system, in response to one or more sensors, [that] is programmed to logically follow a predefined set of rules in order to provide an outcome. Knowing the set of rules under which it is operating means that its output is predictable.'⁶⁰ Autonomy is described by DCDC as, '...A system that is capable of understanding higher intent; will be effective, self-aware and their response to inputs indistinguishable from or superior to, that of a manned aircraft. As such, they must be capable of achieving the same level of situational understanding as a human.' Gillespie and West, in *The International C2 Journal*, describe autonomous/automatic systems '...[as] act[ing] on results from their own processing of instructions from external sources; without necessarily involving human operators after initiation. Automatic systems are directly controlled by either a human or quantified input parameters with no interpretation by the automaton.'⁶¹

It is evident that there is no consistent view of what autonomy is. DCDC's view of autonomy comes closest to the author's vision of UCAS employment, but this is still in reality only a high level of automation. With automation, DCDC describes 'its output is predictable'. It should be expected that any weapon system's output is predictable, when working correctly. Similarly, a pilot's output should be predictable, as would be UCAS's. Even adversary actions should be predictable. This is not in the sense that adversaries' actions can be predicted; but it does mean that 'systems' will follow a set of rules, defined within pre-programmed matrices, while manned systems will use tactics and procedures that are constrained by the laws of physics and convention. Unpredictable actions should not be confused with a pilot, for example, who carries out a manoeuvre that allows him to defeat an adversary in air-to-air combat, one that his adversary was not expecting. This manoeuvre would not be invented on the spot; it would be one that was within the pilot's skill-set; one that had been practised - one that would be the best manoeuvre for that situation. It may seem unpredictable to the adversary, but in reality, it is in the bounds of what the pilot and the aircraft could actually do - within the bounds of tactical doctrine and the laws of physics. Strict convention would have been followed to achieve the best result; if not, against a capable adversary pilot, the fight would be lost.

The author defines 'Automatic Systems', as systems which use pre-programmed instructions, however complex – these may be aided by AI software. He defines 'Autonomous Systems' as systems that make decisions which are not based on specific directions from pre-programmed instructions, but more random decisions, based on their own interpretation of influences. It is probable that UCAS will only act autonomously, when communications links are lost, and

then, only when the mission was essential, and in the sense that there is no human input to its decision-making, but as the decision making is based on pre-programmed instructions, the UCAS will still, in reality, be in an 'automatic mode'. The author argues that a high level of automation is actually how UCAS would be utilised. This is an important distinction, as it will help both military and political decision makers understand the legal boundaries within which new weapon systems are required to operate, according to the LOAC. Whatever interpretation is used, automatic/autonomous systems are already in the inventory of most militaries.

UCAS and the Law of Armed Conflict

The question of whether UCAS will be permitted to operate totally autonomously is an emotive one. The Law of Armed Conflict (LOAC), which is based on Customary International Humanitarian Law, as defined by the International Committee of the Red Cross⁶², may mean that authorities are not willing to take the risk of allowing decisions to be made by a 'machine', without reach-back to a command centre. Civilian personnel who are illegal combatants constitute a legitimate military target, can be legally prosecuted for their wartime actions, and do not enjoy the same prisoner of war protections as lawful combatants under the Geneva Conventions.⁶³ This is an obvious area of the LOAC requiring consideration, particularly concerning the programming of software, should UCAS be used autonomously. It could be argued that it is the software engineers who write the code for UCAS that are ultimately responsible for its actions. However, this is not the position with extant weapon systems that are autonomous. Cruise missiles, Anti-Radiation Missiles, Surface-to-Air Missile (SAM) and AAM, are just some examples of weapons systems that once launched, can use on- or off-board systems to continue to seek their target, independent of the launching platform. The US AEGIS sea-based, and the Patriot land-based SAM systems have been in service since the 1970/80s – these are intended to be operated automatically, in an environment that requires engagement decisions to be made more quickly than those by a human. Although mistakes have been made, these systems continue to be operated, with both technical and operational procedure improvements having been implemented. Military commanders have satisfied themselves that how these weapons operate and the level of risk that they pose in causing collateral damage is acceptable within the LOAC. Ultimately, individual States are responsible for ensuring that weapon developments adhere to Article 36 of the 1977 Additional Protocol I to the Geneva Conventions of 1949. Article 36 requires '...each State Party to ensure that the use of any new weapons, means or methods of warfare that it studies, develops, acquires or adopts comply with the rules of Customary International Humanitarian Law.'⁶⁴ The LOAC calls for the responsibility of a human to be in the loop when decisions are made for release of weapons. The 'Nuremberg Principle' obliges that someone will always be held accountable for an action that is taken that falls inside or outside of international law – that is, they are legally and morally accountable. Is it against Customary International Humanitarian Law if UCAS are used without a human at least 'on the loop'? The author does not believe so. As long as responsibility is taken within the command chain, at all levels of decision-making, then no laws are broken. The same logic would apply to UCAS as manned systems. It is straightforward – if the criteria could not be met, then UCAS would not be utilised autonomously. Criteria may change,

however, particularly if the stakes are high. The development of AI and HMI technology should offer a level of integration enabling a greater degree of certainty when conducting CID and CDE, than that of HITL systems. It would also allow missions to be planned and then executed using on-board decision making – with a HOTL monitoring the system and taking action only when necessary, and perhaps autonomously, if this is deemed desirable.

Conclusion

The advantages that extended endurance/persistence, and the potential for swifter and more efficient actions that UCAS bring to warfare, may be transformational. The A2/AD strategies that countries such as China and Iran are evolving, will stress current Western and planned manned air-breathing weapon systems. Systems that are capable of operating from ranges and for periods, hitherto not required, are needed to counter these new emerging strategies. UCAS have the potential to offer a revolutionary new set of options with enormous long-term payoffs to air power in terms of expanded mission tasks, tactical deterrence and, importantly, affordability. Missions could be conducted for extended periods, using less airborne platforms. Operating costs would be substantially less than that of manned systems, if used autonomously. If these systems were shown to be survivable, and capable of achieving the desired task, potential adversaries may well pause before entering into a conflict situation. Current development is concentrating on ISTAR and air-to-surface missions. If viewed dispassionately, there is nothing particularly difficult in conducting the air-to-air role, if situational awareness is adequate, and the weapon systems are effective. It is relative, however; viewed as a three-dimensional chess game, air combat has stressed the capabilities of modern air systems and aircrew, up to now. In reality, if the 'unknowns' are 'known', it is essentially a case of completing a set of prescribed manoeuvres and decisions, that, although complex at times, with the continuing development of computer processing power, should be programmable. Situational awareness is the key. If only partial situational awareness exists, a logical pattern of actions should still be programmable. Given any counter-air scenario, there is little doubt that a human, with the correct training, being in the right frame of mind, and having the required skill and situational awareness, could make the correct decisions. However, because most humans are affected physically and mentally when operating high-performance aircraft in dynamic and stressful environments, assimilating the information is extremely difficult without taking some time; whereas, if the process was automated to a level that did not require human input, then the outcome would probably be fundamentally improved. The days of fighter pilot versus fighter pilot in visual air combat may not be over, but they will surely continue to follow the trend of the past thirty years, becoming even less common in the future. With situational awareness, gained through NEC, there is no technical reason why UCAS could not carry out the full gamut of combat air tasks currently undertaken by manned fighters.

A UCAS, or any manned system for that matter, would not require being as manoeuvrable as current counter-air aircraft. This will be achieved by HOBBS weapon systems, aligned with NEC and weapons with a high kill probability, potentially DEW, negating the requirement for what is currently known as a 'knife fight in a telephone box', by fighter crews. The effectors for gaining

control of the air, combine sensors, aircraft, weapons, personnel, training, and the logistics chain. Effective ISTAR, SEAD, and general air-to-surface missions will require all of the current enablers; these have proven to be effective in most conflicts since the Vietnam War. There is doubt, however, in the efficacy of current air-to-air enabling assets - that is, the aircraft, sensors and weapons currently utilised. AAM have not fulfilled their initial promise. While statistics since 1991 show that the kill probability of air-to-air systems have significantly improved, these have not improved to the extent that they offer a guarantee of winning an air-to-air battle against a peer or even a near-peer adversary. Future negation systems offering a high kill probability are required. When countering an adversary with numerical superiority, the quality of own weapon systems, aircrew training and C2 are paramount. When opposing an adversary that has both superiority in numbers and weapon systems, and whose training and C2 is adequate, then it is highly likely that control of the air will not be gained.

The efficacy of whether UCAS conduct missions totally autonomously or semi-autonomously, controlled by a single pilot in a fighter, or an operator in a large aircraft, such as an AWACS, or from a stationary C2 node, should be assessable. This will take time and funding; technological advances will inform decisions based on a series of connected trials, programmes, and academic and scientific analysis. Until novel systems, not currently conceived, are available, it will fall to air-breathing systems to take the fight to the enemy. Ultimately, it may be possible for a large COMAO formation of combat and support aircraft, combining manned aircraft and UCAS, or made up entirely of UCAS, to operate together, or autonomously. This autonomy may permit a quicker and more accurate response, allowing not only a high probability of survival, but also achieving the desired strategic effect. UCAS would use the algorithms within their pre-programmed systems, using look-up tables that would contain all conceivable eventualities; computing processing technology should continue to advance, allowing systems to conduct operations to the level of a human, but faster and more accurately. AI programs, such as Agent software, could be used to aid the decision process, but only within a defined set of rules. Autonomous systems would not make random decisions without the constraints that would normally be placed on humans. Data fusion of information collated through NEC, allowing the employment of kinetic effects, such as AAM or DEW, could be utilised on UCAS. With a high level of automation/autonomy, and situational awareness, the 'system' could make all the appropriate decisions on required tactics, leading to successful engagements. Development of these systems should allow the appropriate effect to be obtained before the visual arena is entered – or at least to an extent that does not warrant development of close visual combat systems that require the air vehicle component to be highly agile. The capability to fly high and fast will still be applicable, allowing extra energy for launching AAM, and aiding survivability against both SAM and AAM.

Whether UCAS are developed or not, it is the economics and effectiveness of weapon systems which are likely to affect decisions on procurement and capability. Air-breathing systems that are capable of operating at range and for long periods will be required. Gaining control of the air is one of the main pillars of air power, and its importance will likely

remain extant. Unless there is some 'magic bullet' programme, the author believes that the development of UCAS, capable of achieving control of the air, is essential. More focused intellectual rigour is required in investigating the potential uses of UCAS, including that of gaining control of the air, in its totality. If nothing else, it is hoped that this article will generate 'informed' debate about their future utility.

Notes

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⁴⁵ Stillion, John and Scott Perdue, "Rand - Air Combat Past, Present and Future," (2008). http://www.defenseindustrydaily.com/files/2008_RAND_Pacific_View_Air_Combat_Briefing.pdf (accessed 15 May 2010). Slide - PPF - 19.

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⁴⁸ Project Red Baron III: Air-to-Air Encounters in Southeast Asia(U), June 1974. Vol. III, Part 1, Tactics, Command and Control, and Training. p. 13. Project Red Baron III: Air-to-Air Encounters in Southeast Asia - Executive Summary, June 1974. Vol. 1. p. 18. Cited in Watts, Barry D., *Six Decades of Guided Munitions and Battle Networks: Progress and Prospects* (Washington, D.C.: Center for Budgetary Assessments, March 2007). p. 140.

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⁵¹ Watts, "Doctrine, Technology and War". Chapter 4: Doctrine and Technology. Cited by Watts

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⁵² Ibid.

⁵³ Ibid.

⁵⁴ This is based on a combination of sources, including Stillion and Perdue., and also, Air Force Historical Research Agency, "Aerial Victory Credits." <http://www.au.af.mil/au/afhra/avc.asp> (accessed 18 April 2010).

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⁵⁶ Ibid.

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⁶⁰ Development, Concepts and Doctrine Centre, Joint Doctrine Note 3/10. *Unmanned Aircraft Systems: Terminology, Definitions and Classification*. p. 1.5.

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⁶² See International Committee of the Red Cross, "Customary International Humanitarian Law - Rules."

⁶³ Klein, LCDR USN John J., "The Problematic Nexus: Where Unmanned Combat Air Vehicles and the Law of Armed Conflict Meet," *Air & Space Power Journal* (2003). <http://www.airpower.au.af.mil/airchronicles/cc/klein.html> (accessed 23 September 2010).

⁶⁴ International Committee of the Red Cross, "A Guide to the Legal Review of New Weapons, Means and Methods of Warfare: Measures to Implement Article 36 of Additional Protocol I of 1977," in *No 864*, ed. International Committee of the Red Cross (Geneva: 2006).

What's Sex Got To Do With It? Women, Peace and Security for Future Operations

By Flight Lieutenant Vix Anderton

The military ability to influence is predicated on understanding the target audience. This is as true for conventional warfare as it is for counterinsurgency and applies to an adversary's leadership, the local population, and the British people. Given half of the world's population is female, gender underpins many social and cultural issues. However, it is significantly overlooked by campaign planners and in operational execution. The role of women, particularly in developing countries, is largely underappreciated and misunderstood. This article will explore the importance of women's security needs and the requirement for the British military to better understand gender issues. It is time that gender was acknowledged as a key component of military capability that should be used to improve the effectiveness of both current and future operations.

This article is based on the MA dissertation submitted to the King's College London War Studies Department in August 2011.

Introduction

So what has sex got to do with it? For this article, the answer is both everything and nothing. There is direct military relevance to the outcome of a conflict if half the population in the affected country - the women - are ignored; the effects on the operational outcome of a campaign that fails to recognise the importance of gender could be catastrophic. Yet gender issues are largely absent from current doctrine defining how we conduct operations. Recent doctrinal publications, including the well received JDP 04 '*Understanding*' and JDN 3-11 '*Decision-making and Problem Solving: Human and Organisational Factors*' purportedly seek to promote better appreciation of the complexities of the human domain in any operating environment. They highlight the necessity to consider social, political and cultural issues to gain deeper understanding of the operational environment, but appear to omit gender from these discussions. Gender is a term often misunderstood, particularly by largely male populations, such as the military, who typically associate its use with women and feminism.¹ The aims of this article are to demystify gender issues, highlighting the importance of comprehensive understanding of this to UK military operations; it will focus on what women bring to the table as this is often overlooked. According to the Development Concepts and Doctrine Centre, 'the battle of the narratives will be key, and the UK must conduct protracted influence activity, coordinated centrally and executed locally'.² The gendered dimension of this is of vital importance, influencing the outcome of future wars and delivering real post-conflict stability.

Are Women Important?

World Bank research recognises the positive impact of women's political participation. The Bank's corruption index demonstrates that such levels are lower where women's influence in public life is greater. Women are not just agents of development; they are directly affected by development choices and have often been shown to have different priorities to men. As an example, in the West Bank and Gaza, men generally choose infrastructure projects rather than social, economic or health programmes more normally favoured by women.³ Furthermore, since women in developing countries are often the primary users of many development facilities, water and sanitation projects that have been designed and run with the full participation of women have been shown to be more sustainable and effective.⁴

Economists have promoted the importance of women to a nation's economic development and have been trying to address women's unequal status since the 1970s. In 1989, a US Agency for International Development report highlighted gender as 'an essential and critical variable in development' as women make a major contribution to a nation's economic output and 'the use and expansion of women's productive capacities is a necessary condition for social and economic progress'.⁵ The report also highlights that women's education promotes a positive cycle 'which can lead to lower fertility [rates], better family health, reduced infant and child mortality, higher formal labor [sic] force participation and greater economic growth'.⁶ Statistics support claims that women's participation in economic activity has positive effects

for a country: women will, on average, spend 90% of income they control on their family, providing better nutrition, healthcare and education, compared to 30-40% by men.⁷ These reports take as a central premise the notion that a nation's economic potential cannot be met if half of the adult population is not economically active and that security cannot be achieved if that half of the population – the women – is unable to access basic services, including access to justice.

Conversely and despite this evidence, the contribution of women during times of conflict receives virtually no recognition and women are largely considered as victims. In reality, women play a wide variety of roles during a conflict; they can be active participants, combatants, providers, supporters and peace activists. These roles are not mutually exclusive and can vary during different stages of a conflict. As an example, women in North East India often act as mediators and facilitators, yet accounts from other conflicts highlight women as motivating men to fight.⁸ Women have also been active in demining efforts in Cambodia and collecting weapons in Albania.⁹ Yet women are frequently excluded from post-conflict activities, which can perpetuate insecurity if their security needs are not addressed.

Women and their experiences should not, however, be considered in isolation from the rest of the population or from cultural beliefs; it is vital to regard women in relationship to their community. For example, women's employment (a particularly complex issue) is considered desirable for its positive contribution to economic output. However, women often have existing responsibilities in the home, which do not lessen when they are economically active; even in the UK, for example, women carry out 2.5 times as much housework, childcare and domestic tasks on average as men.¹⁰ There are also cultural sensitivities: whilst it may be considered practical for a woman to work to increase the family income in the UK, many patriarchal societies consider it a man's duty to provide for his family. These are complex issues and are difficult circles to square, but this should not detract from their importance. Women have a vital role to play in all societies, one which is often neglected and needs to be further encouraged, to improve the economic and security prospects for those societies.

Gender, Security and the International Community

The United Nations (UN) has led the way in recognising the importance of gender equality. In 2000, the UN Security Council passed Resolution 1325 recognising the adverse effect armed conflict has on civilians, particularly women and children. This followed on from the 1979 Convention on the Elimination of All Forms of Discrimination Against Women and the 1995 Beijing Platform for Action, which advocated a policy of gender mainstreaming where the concerns of both men and women should be central to all activities from policy development to resource allocation. More recently, Resolution 1325 has been augmented by a number of Resolutions on Women, Peace and Security, and Sexual and Gender-based Violence.¹¹

Following the Cold War, there has been a debate about what constitutes security. In 1994, the UN defined human security as having two main aspects: first, safety from the chronic threats

of hunger, disease and repression and second, protection from sudden and hurtful disruptions in the patterns of daily life—whether in homes, in jobs or in communities.¹² This article subscribes to this broader UN definition and includes within it physical security. Assessing the contribution that women can make to achievement of these aspects of security demands a more detailed understanding of the important role they play within societies across the world. Women ultimately have different experiences of armed conflict to men and their perspectives, aspirations and priorities must be incorporated into any peace-building activity. An effective (population-centric) counterinsurgency strategy, for example, cannot ignore half of that population simply because it is seen as not having a voice or is difficult to access. What happens to women is not just a women's issue but 'is the central issue of stability, development and a durable peace'.¹³ The complex interplay of gender issues, within a conflict environment, can best be highlighted by experiences from on-going operations in Afghanistan.

Lessons From Female Engagement In Afghanistan: Necessary But Insufficient

The Western view of the role of women in Afghan society is often over-simplified and lacks both nuance and context. In 2001, as the US-led campaign to remove the Taliban from power began, Afghan women were widely portrayed as hapless victims of the Taliban. This narrative blithely ignored that women had been treated in similar way by the mujahidin, supported by the US in the 1980s, and that the Taliban imposed equally strict interpretations of behaviour on men including banning music, many books and the popular activity of kite-flying. When ISAF military operations expanded outside Kabul and into Helmand in 2006, it was largely assumed that women had no value as a target of influence operations in support of the counterinsurgency effort as they were hidden from public life. This assumption crucially undervalued the role of women in Afghan society and failed to both exploit influence opportunities and to address security issues for the complete population in a holistic manner.

The degree of influence and authority Afghan women wield varies dramatically, based not least on locality and education. Women derive their power from their extended social network, developed through marriage, and can exert leadership at the family, village and national levels through this network; *Pashtunwali* also gives women responsibility for a degree of conflict resolution between households, men and women, and occasionally between men. A woman's status also increases with the number of children she bears so it is often older women who are the most influential. Women also exert a degree of control over the use of resources within the family and senior women normally initiate the search for potential partners for male relatives, though neither boys nor girls have much choice about marriage.¹⁴ However, the effects of civil war have undermined many traditional sources of authority and rural women often have little decision-making power about the household budget or even the number and spacing of children.¹⁵

Generalisations about women's influence, or lack thereof, are of little use unless accurate local information can be collected and used effectively. Afghan women have criticised development projects that prioritise women's work over men without considering the impact this can

have on communities. Ignorance of such sensitivities can result in a backlash against the few rights that women do have. Twentieth Century Afghan history clearly shows a cycle of reform driven by the centre, often promoting women's rights, met by conservative rural resistance, often violent, as traditional ways of life are challenged. As such, it is vital that Afghan men are educated about the benefits of women's participation in economic and social life so they come to support and understand the needs of their wives, daughters, sisters and mothers. Gaining traction in this area will take time and effort but it is important. The role of gender in conflict or post-conflict situations should not be considered in terms of the potential value of either men or women to an operation but as a vital aspect to any population-focused security effort.

The importance of engaging with Afghan women has gradually been realised by international forces in Afghanistan. The US Marine Corps deployed its first Female Engagement Team (FET) in 2009, when female Marines were tasked to support a cordon-and-knock operation in Farah Province. The female Marines met with the village women, engaging in lengthy discussion as well as distributing school supplies and hygiene products. The After-Action Review noted that the two significant benefits of the mission had been information gathering and an information operations victory.¹⁶ The 2nd Marine Expeditionary Brigade began to employ more female teams and, in November 2009, International Joint Command Headquarters mandated that all International and Afghan security forces establish FETs.¹⁷ A UK female engagement approach was developed during 2010, with a Tactical Doctrine Note on FETs issued in April 2011. The FETs normally comprise one or two individuals per battlegroup to act as a conduit for information between British forces and the local population, particularly but not limited to its women. However, a lack of appropriately trained personnel with experience of dealing with gender issues or engagement, combined with a limited number of personnel with the appropriate language skills, has meant that progress has been disappointingly slow and UK FETs are unlikely to achieve a significant role before the end of combat operations in 2014. Furthermore, FETs continue to be poorly integrated into wider influence operations and patrols, often being employed at short-notice without adequate planning. This limited employment has not capitalised on the opportunities the FETs present. The prevailing military attitude towards female engagement appears largely to be one of "what can women in the military do for us" rather than "what can we do for local women". As conflicts become increasingly complex and the battle for influence continues, the ability to understand and address the security concerns of the entire population, including women and not just the male portion of it, will continue to be a critical component of successful operations and post-conflict planning.

In Support of Gender Mainstreaming

In stark contrast to the approach of western militaries, the UN has taken a more dynamic view of how to meet such challenges. The UN Department for Peacekeeping Operations (UN DPKO) released a policy directive on gender equality in 2006 to implement the UN's gender mainstreaming strategy, followed in 2010 by *Guidelines for Integrating a Gender Perspective*

into the Work of United Nations Military in Peacekeeping Operations. The DPKO's policy is built around four principles: inclusiveness; non-discrimination; standard setting; and efficiency. These principles require that both men and women are consulted about the decisions affecting them and that such decisions uphold and protect equal rights for all. They also require that peacekeeping missions provide a role model for gender equality, including women's participation in decision-making, to inspire local women and show communities the positive effects of integrating both sexes into the peace process. Finally, operational efficiency demands that peacekeeping missions harness all human resources capacity to sustain the peace process.¹⁸

UN peacekeeping missions now employ gender experts to promote and support gender sensitivity in the implementation of their mandate.¹⁹ There are currently nine gender advisers as part of mission headquarters on peacekeeping operations, supplemented by gender focal points in each functional unit, normally established as an additional duty. Gender advisors and focal points can be of either sex and have three priority tasks: to provide strategic planning and policy advice; to provide operational support; and to provide training and capacity development for mission personnel.²⁰ To further promote effective mainstreaming, Gender Task Forces are established at mission and headquarters levels. In Afghanistan, for example, the UN Assistance Mission in Afghanistan (UNAMA) is actively involved in supporting the Afghan Government's Gender Mainstreaming Task Force.²¹ These efforts are achieving mixed results, with varying degrees of success across areas of work such as women's participation in politics or peace negotiations, disarmament, demobilisation and reintegration (DDR), legal and judicial reforms and security sector reforms.²² Changing deeply ingrained social habits is a long and complicated process that is constantly evolving. Understanding and accountability of senior mission management will be crucial for driving future improvements.

The UN is not alone in recognising the importance of women and gender to the conduct of operations. The North Atlantic Council has been working with NATO member countries since 2007 to implement Resolution 1325.²³ According to its briefing paper on Women, Peace and Security, 'NATO is working to mainstream gender perspectives into its operations by educating and training staff, with a view to developing better operational procedures' and to 'increase female participation in the international military and political staff' of member countries.²⁴ However, while there are a number of publications on NATO's website regarding gender, there is little evidence that this is producing meaningful change in member countries and the conduct of operations. NATO Secretary General Anders Fogh Rasmussen has recognised the need to consider women's concerns in that 'the empowerment of women in unstable countries benefits not only them, but all of us. It is crucial component of a comprehensive approach to the security challenges of the 21st Century'.²⁵ In Afghanistan, this has led to the appointment of gender advisors in ISAF Joint Command and ISAF Headquarters. In 2009, NATO published a Directive on integrating gender setting out a number of key concepts including striving for a representative workforce, training for all staff on the protection, rights and needs of women and girls and the importance of involving women in operations and

missions.²⁶ It also suggested that deployment and national training programmes should include cultural awareness that provides appropriate understanding of the gender context in the area of operations.²⁷ Such training, however, focuses heavily on equal opportunities, diversity and sexual harassment rather than the gendered dimensions of conflict and affected populations. Then Chairman of NATO's Military Committee, Admiral di Paola, stated 'the challenge for NATO is to ensure that gender perspectives are an integral part of every mission that unfolds'; this remains work in progress.²⁸

The UK, as a permanent member of the Security Council, has endorsed Resolution 1325 and has led the way by publishing a National Action Plan (UK NAP) on Women, Peace and Security, which clearly recognises the importance of meeting women's needs and promoting gender equality to securing durable peace.²⁹ The Ministry of Defence (MOD) has commitments under the UK NAP to reduce the impact of conflict on women and to promote their inclusion in conflict resolution, including the greater integration of gender into defence activity and the need for all personnel to be aware of the women, peace and security agenda. However, these core principles have yet to be fully embraced by military culture and so-called 'women's issues' remain poorly understood and are deemed to be of low importance; Equality and Diversity training, for example, does not include gender issues on operations.

In increasingly hybrid conflicts, defence will have to act alongside other government departments and non-governmental organisations; the armed forces must seek to better understand and support activities designed to promote gender equality in conflict and post-conflict situations. Ultimately, what happens to women is not just a women's issue but is a central question for peace and stability that has fundamental consequences for communities. While addressing these questions is not the sole responsibility of the military, armed forces must do more in the application of gender mainstreaming principles, including the incorporation of gender considerations within joint doctrine. Gender equity has positive effects on security and development, is morally fair and is vital to the successful conduct of future operations when it is considered as a central tenet of influence activity.

Summary

Any military operation ultimately stands or falls on its understanding of its adversary and the environment in which its forces operate and gender is a crucial part of that understanding. There can be no lasting or meaningful security unless the needs of the whole population are met, so women's security concerns need to be addressed. The perspectives of both men and women need to be fully incorporated into policy, planning and programme delivery; in particular, women must be able to participate fully in all of these activities as they are so often underrepresented or ignored. The importance of gender issues, and the failure to understand and address them, has been particularly evident during counterinsurgency operations in Afghanistan and it is crucial that key lessons which have been identified are not lost for future operations of all descriptions. The principles of gender mainstreaming need to become a core part of military thinking and included in JDP04 on its next review. The MOD needs to

develop gender and cultural expertise across the rank structure as well as enhancing the gender awareness of all military personnel and this needs to go far beyond just the current and bureaucratically compliant Equality and Diversity training. In addition, it is vital that senior defence leadership and policy makers adopt these principles as an important part of war-winning strategies. The UK Government has already demonstrated its commitment to gender mainstreaming through the publication of the UK National Action Plan on Women, Peace and Security; the MOD must now embrace this nationally endorsed strategy and implement programmes that will fully deliver its intentions.

Notes

¹ Gender refers specifically to the socially constructed concept of traits and behaviours associated with each sex; men can be just as constrained by notions of masculinity as women can be by notions of femininity. The principles of gender mainstreaming promote the inclusion of all people, regardless of sex, in all planning and policy activities.

² Ministry of Defence *Strategic Trends Programme: The Future Character of Conflict* (Shrivenham, Defence Doctrine and Concepts Centre, 2010), p.6

³ Camille P Conaway, 'Charting Progress: The Role of Women in Reconstruction and Stabilization', Companion Article to the Special Report, Stabilization and Reconstruction Series, (Washington D.C., United States Institute of Peace, 2005) p. 17

⁴ *ibid.* p.20

⁵ Rae Lesser Blumberg, *Making the Case for the Gender Variable: Women and the Wealth and Well-being of Nations* (Washington DC, US Agency for International Development, 1989) p. xv

⁶ *ibid.*

⁷ Isobel Coleman, 'The Better Half: Helping Women Help the World', *Foreign Affairs*, Vol. 89 No. 1 (2010) p. 127; Cristina Killingsworth, 'Empowering Women in Conflict Zones: An Interview with Zainab Salbi', *Yale Journal of International Affairs*, Vol. 6, No. 1 (2011) p.14

⁸ *ibid.* p. 4; Donna Pankhurst, 'The 'Sex War' and Other Wars: Towards a Feminist Approach to Peacebuilding' in Haleh Afshar and Deborah Eade (Eds.) *Development, Women, and War: Feminist Perspectives* (London, Oxfam Publishing, 2004), p. 14

⁹ Conaway, *Charting Progress*, p.6

¹⁰ UK 2000 Time Use Survey <http://www.statistics.gov.uk/TimeUse/default.asp>

¹¹ Resolutions 1820 (2008), 1888 (2009), 1889 (2009) and 1960 (2010)

¹² United Nations Development Programme, *Human Development Report 2004: Cultural Liberty In Today's Diverse World* (New York, United Nations Development Programme, 2004), p.23

¹³ Ann Jones, 'Remember the Women?', *The Nation*, 21 October 2009

¹⁴ Jennifer Heath, 'Introduction' in Jennifer Heath and Ashraf Zahedi (Eds.) *Land of the Unconquerable: The Lives of Contemporary Afghan Women* (Berkeley and Los Angeles, California: University of California Press Ltd, 2011) p. 15

¹⁵ Neamatollah Nojumi, Dyan E Mazurana and Elizabeth Stites, *After the Taliban: Life and Security in Rural Afghanistan* (Plymouth, Rowman and Littlefield Publishers, Inc., 2009), p.91

¹⁶ Sasha Mehra, *Equal Opportunity Counterinsurgency: The Importance of Afghan Women in U.S. Counterinsurgency Operations* (Masters' Thesis, US Army Command and General Staff College

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¹⁷ Matt Pottinger, Hali Jilani, and Claire Russo, 'Half-Hearted: Trying to Win Afghanistan without Afghan Women', *Small Wars Journal*, 18 February 2010, p. 1

¹⁸ Department of Peacekeeping Operations [DPKO], *DKPO Policy Directive: Gender Equality in UN Peacekeeping Operations*, (New York, UN Secretariat, 2006), p. 3

¹⁹ Department of Peacekeeping Operations [DPKO], *Guidelines for Gender Advisers and Gender Focal Points in United Nations Peacekeeping Operations* (New York, UN Secretariat, 2008), p.4
²⁰ *ibid.*

²¹ DPKO, Progress Report 2010, p. 12

²² Department of Peacekeeping Operations [DPKO], *Ten-year Impact Study on Implementation of UN Security Council Resolution 1325 (2000) on Women, Peace and Security in Peacekeeping* (New York, UN Secretariat, 2010)

²³ NATO, *NATO Briefing Paper: Women, Peace and Security* (Brussels, NATO Public Diplomacy Division, 2010), p. 1

²⁴ *ibid.* p. 2

²⁵ *ibid.*

²⁶ NATO, *Bi.Sc Directive 40-1 Integrating UN SCR 1325 and Gender Perspectives in the NATO Command Structure Including Measures for Protection During Armed Conflict* (Brussels, Supreme Allied Commander Europe, 2009), p.1-2

²⁷ *ibid.* p. 1-2

²⁸ NATO, Briefing Paper, p. 2

²⁹ *UK Government National Action Plan UNSCR 1325 Women, Peace and Security* (London, HMSO, 2010), p1

‘Bugsplat’ and Fallible Humans: the Hi-Tech U.S. Drone Campaign over North-West Pakistan

By Lieutenant Colonel Andrew Roe

It is an almost daily occurrence to read of U.S. armed pilot-less drones, or more correctly unmanned aerial vehicles (UAVs), killing suspected militants in north-west Pakistan. U.S. officials consider the precision strikes a vital weapon in the war against Islamist extremists. However, the attacks are a source of deep frustration and tension between Washington and Islamabad. Many in Pakistan say they violate national sovereignty and also cause widespread civilian casualties. For their part, the U.S. has criticized Pakistan for failing to crack down on fighters who stage attacks in Afghanistan and has stepped up UAV attacks in the tribal region to combat them. Washington considers Pakistan's semi-autonomous north-western tribal belt to be the main hub of Taliban and Al-Qaeda activity in the region. This article looks at the current U.S. air campaign over north-west Pakistan by outlining the advantages and disadvantages of employing UAVs. It concludes by drawing a number of historical parallels; it is now almost a hundred years since airpower made its first appearance on the frontier.

Introduction

The social workers recalled arriving at a home that was hit, in Miranshah [Waziristan], at about 9.00 p.m. (May 2009) ... The drone strike had killed three people. Their bodies, carbonized, were fully burned. They could only be identified by their legs and hands. One body was still on fire when he reached there. Then he learned that the charred and mutilated corpses were relatives of his who lived in his village, two men and a boy aged seven or eight. They couldn't pick up the charred parts in one piece. Finding scraps of plastic they transported the body parts away from the site. Three to four others joined in to help cover the bodies in plastic and carry them to the morgue. But these volunteers and nearby onlookers were attacked by another drone strike, 15 minutes after the initial one. Six more people died. One of them was the brother of the man killed in the initial strike.

Case Study North West Pakistan, 'Convenient Killing'

Regardless if Osama is killed or survives, the awakening has started, praise be to God.

Osama bin Laden, videoed speech, broadcast 27 December 2001

Drones: A Weapon of Choice for the New Millennia

The precipitous and rugged Pashtun-inhabited borderlands of north-west Pakistan, designated the Federally Administered Tribal Areas (FATA), are now home to al-Qaeda's command structure, Taliban insurgents,¹ rogue elements within the Pakistani military, Uzbek Islamic militants² and Western *jihadists*.³ It is an out-of-the-way refuge to rest, heal, rearm, train, gain 'inspirational leadership' and plan for future operations across the porous border in Afghanistan, or against internal targets in Pakistan. It is also the area where many of al-Qaeda's top leaders are probably hiding and a regular target for U.S. drone strikes against radical tribesmen. Growing evidence suggests that it is a region in which militants can draw wide-ranging support from elements of Pakistan's all-powerful Inter-Services Intelligence Directorate (ISI).⁴ Recent Pakistani military operations destroyed militant forces and caused mass civilian dislocation, yet efforts to provide a lasting peace deal with the local tribesmen and the Taliban have proved futile. Gains, at best, have been cosmetic; the limited pressure exerted on the militants quickly dissipated. The region, particularly the troublesome, barren and remote areas of North and South Waziristan, remains dangerous, volatile and unpredictable with the potential to unhinge President Hamid Karzai's fragile regime in Afghanistan, threaten the Pakistani government, and pose a major challenge to regional stability.⁵

In the ongoing fight against militancy in north-west Pakistan, armed pilot-less drones,⁶ or more correctly unmanned aerial vehicles (UAVs), have become an indispensable element of United States of America (U.S.) policy in the region.⁷ Employing radically new technology, drones are controlled via satellite communications and flown by intelligence officers and private contractors (often retired military personnel) in the U.S., 7,500 miles away, using

joysticks that resemble video-game controls.⁸ They are America's state-sanctioned weapon of choice for hunting al-Qaeda and Taliban leaders (known as high value targets (HVTs)) in what is widely considered to be one of the most wild, impregnable and dangerous regions in the world. The remote-controlled aircraft, predominantly General Atomics Aeronautical Systems MQ-1 'Predators' and MQ-9 'Reapers,' offer computerised pinpoint attacks against key leaders and, hopefully, minimise the loss of innocent life.⁹ A successful hit is often referred to as a 'bugspat.' It is now nearly one hundred years since air power made its first appearance over the frontier. This article looks at the current U.S. air campaign over north-west Pakistan by outlining the advantages and disadvantages of employing drones. It concludes by drawing a number of historical parallels.

The Argument for the U.S. Drone Campaign – 'Mosquitoes' Over the Frontier¹⁰

The employment of advanced U.S. Central Intelligence Agency (CIA) hunter-killer drones¹¹ over militant strongholds in north-west Pakistan is a deliberate tactic to locate and conduct targeted killings of al-Qaeda and Taliban leaders.¹² Initially a small-scale intelligence, surveillance and reconnaissance mission focused on a relatively short list of high-level al-Qaeda leaders, the drone campaign has developed exponentially over recent years. It now includes the Taliban leadership, rank-and-file fighters and – in some cases – other militants determined to destabilise the region or prepared to provide sanctuary for al-Qaeda leaders and operatives. Front-footed strikes keep militant groups off balance, slowly but methodically rooting out key leaders. They force the abandonment of radio and mobile-phone communication, restrict freedom of movement and reduce the inflow of new recruits into the region. It is difficult to plan and conduct major operations when key commanders and operatives are constantly being killed or kept on the move. Drones also allow the U.S. to monitor routine activities and achieve tactical surprise. Due to the accuracy of attacks, militant infighting has become commonplace and panic and suspicion ubiquitous.

Drones accomplish these goals without putting soldiers on the ground, where a costly, protracted counter-insurgency campaign, with politically damaging casualties, could unhinge or overstretch the U.S. and its allies. Advanced computers and communication systems, new cameras and sophisticated technology, have made it possible to prosecute a campaign without the necessity for ground forces. Multiple drones hunt for targets using sensors, both by day and night.¹³ They go where troops cannot. Round-the-clock surveillance and detailed imagery allow operators to build up a rich and detailed picture of the 'pattern of life' in a particular area of interest, allowing a distinction to be made between peaceful tribesmen and those facilitating hostilities before a target is engaged with laser-guided bombs or Hellfire air-to-ground missiles.¹⁴ There are also no pilots to be shot down and captured, a challenge which the USSR experienced during its war with Afghanistan. Today's heat-seeking shoulder-launched portable missiles do not work above 3,000 metres and pose no threat to drones. Without a pilot there is no need to carry bulky survival equipment (pressurisation and temperature control) that keeps them alive. Drones can be smaller, stealthier and more efficient than conventional jet aircraft.¹⁵ It also makes it easier for Pakistan to permit their

employment, either tacitly or explicitly; the threshold for the use of drones is lower than manned aircraft.¹⁶ Medium-altitude drones can fly at heights of up to 50,000 feet above sea level and can loiter over a target for up to 40 hours before refuelling,¹⁷ thus providing continuous over-watch – a capacity well beyond the duration of manned aircraft.

Taking the human out of the cockpit permits persistent surveillance and tracking.¹⁸ Drones can survey an area of suspected militancy virtually indefinitely, often without the insurgents even realising it. Pictures gathered by sensors, including near real-time video, are examined by expert image analysts who look for signs of militant activity or other immediate threats, turning raw data into targeting data. In a challenging, fast-moving and complex battlespace, persistency is a valuable attribute. Drones enable target development to a level of detail which was previously unachievable by manned aircraft. They also permit a swift reaction, which is critical as events can develop quickly and windows of opportunity are often short-lived. Persistency also facilitates multiple drone attacks and follow-up action if required.

A US drone targeted a vehicle in South Waziristan tribal region of northwest Pakistan today [12 July 2011], killing six suspected militants just hours after another missile strike in North Waziristan killed 10 suspected rebels. A CIA-operated unmanned spy plane fired two missiles at the vehicle in Barmal area of South Waziristan Agency. Five suspected militants were injured in the attack, TV news channels reported. The missile strike occurred in an area close to the border with Afghanistan. Yesterday, US drones targeted a compound and a vehicle in North Waziristan Agency, killing 10 suspected militants. Several others were injured in that attack.¹⁹

It is instructive that in 2009, the U.S. Air Force announced that they would be training more UAV operators – who do not need conventional flight training – than new fighter and bomber pilots. Training UAV operators costs less than a tenth as much as training fast-jet pilots.

Consequently, the appeal of armed drones is understandable from a U.S. point of view. They can carry an array of sensors that facilitate targeted killings of high value targets and low-level militants at no risk to the personnel flying the aircraft. Exploiting advanced technology, they can deliver precise and overwhelming force without being seen and are more cost effective than conventional aircraft.²⁰ They are also able to present results that are easily measured and demonstrate progress against al-Qaeda, eliminating many of the most wanted HVTs. They can even pre-empt attacks on the U.S. and its allies. Some commentators suggest their use could win the war against terrorism all by themselves.²¹ 'The idea that drones offer a low cost, low risk solution is a seductive one in military circles.'²² They are also increasingly autonomous. A single operator can instruct a drone to remain in a specific airspace or track an individual vehicle; a single control station is capable of operating multiple aircraft at once. 'According to the official [a former White House counterterrorism official], "there are so many drones" in the air that arguments have erupted over which remote operators can claim which targets, provoking "command-and-control issues."²³

Evidence suggests drone strikes have had a positive effect on the region, without risking U.S. lives. They have succeeded in killing senior al-Qaeda leaders, degraded the movement and demoralised the Taliban leadership as well as the rank-and-file. Target intimacy has increased and individuals can be tracked from place-to-place and compound-to-compound. The pressure is unrelenting and militants have nowhere to hide. Drones have achieved this independently without the requirement for extensive cooperation with multiple actors. Despite significant numbers of Pakistani troops in the area, ground forces have done little to hinder militant operations, often turning a blind eye to unconcealed activities. Barack Obama warned during his presidential campaign that America must go after terrorist targets if Pakistan did not act first. It could be argued that the U.S. has had, and continues to have, little choice in the matter. The argument for employing drones unilaterally when confronted with an uncooperative government is understandable. Furthermore, there is growing evidence that drones do not result in significant civilian casualties, as many uninformed commentators suggest; missile accuracy prevents collateral damage and few innocent civilians have been killed. The targeting process is precise, often based on near real-time full-motion footage:

On the 5th [October 2009], officials at the Central Intelligence Agency, in Langley, Virginia, watched a live video feed relaying closeup [sic] footage of one of the most wanted terrorists in Pakistan. Baitullah Mehsud, the leader of the Taliban in Pakistan, could be seen reclining on the rooftop of his father-in-law's house, in Zanghara, a hamlet in South Waziristan. It was a hot summer night, and he was joined outside by his wife and his uncle, a medic; at one point, the remarkably crisp images showed that Mehsud, who suffered from diabetes and kidney ailment, was receiving an intravenous drip.²⁴

Pakistan's Interior Minister at the time, A. Reham Malik, who watched the video footage later noted: 'It was a perfect picture.'²⁵ The image remained just as stable and obvious when two Hellfire missiles were launched from a Predator overhead.

Predictably, the credibility of many Pakistani reporters, who advocate that drone strikes are indiscriminate and result in considerable collateral damage, is questionable; the truth is often distorted or misreported. Pro-Taliban journalists manipulate any strike to radicalise and mobilise local tribesmen. Evidence suggests that not all tribesmen are against drone strikes. A number of international media reports depict a positive tribal opinion of drone attacks.²⁶ Many approve of them because they remove the militants from tribal society. They are also a preferable course of action to a costly – in terms of life – counter-insurgency ground campaign. The Aryona Institute for Regional Research Advocacy (AIRRA), which undertook a public survey of U.S. drone attacks in part of the FATA, confirmed this. The study challenged widespread opinion that drone strikes are feared and hated. Instead, the report claimed that the number of civilian casualties has been greatly exaggerated and that the drones are accurate.²⁷ Others suggest that individuals killed alongside militants are unlikely to be innocent bystanders, pressured into providing hospitality. Instead they are highly likely to be supporters, collaborators or fellow militants (i.e. 'bad by association'). Moreover, the drones are

so precise that the law-abiding tribesmen do not fear drones when seen flying overhead; the chance of collateral damage is slim.²⁸ Accurate strikes do not necessarily lead to anti-American sentiment or an increase in militancy. However, drones have helped distort north-west Pakistan forever. Demographically, the tribal population has disaggregated and the region has become increasingly isolated and insular. It is unlikely that the drone campaign will abate anytime soon. Driven by a powerful multi-billion dollar industry and a target of defeating al-Qaeda, CIA drone strikes will continue at record levels, generating public outrage, both within Pakistan and the U.S.

Drones Have a Down Side...The Case Against

Drone strikes occur over the protest of many Pakistani politicians, who cite a gross violation of national sovereignty as the basis for opposing their employment.²⁹ Relations between the governments in Islamabad and Washington are deeply troubled by the issue. Pakistan has recently closed a number of air bases used for drone strikes and expelled teams of military advisors. 'For its part, the U.S. has frozen £500 million worth of aid and has made it clear that it will have no hesitation in launching further unilateral action in defence of its own security interests.'³⁰ Internally, there is also significant opposition in the Punjab and Sindh, Pakistan's two most populous provinces. The reason for this is increasingly clear. 'According to figures from the New American Foundation, based on press reports, between 2004 [the start of the drone campaign in Pakistan] and 2007 there were just 9 drone strikes, yet in 2010 alone there were 118 strikes, killing between 607 and 993 people last year. Since 2004, up to 2,500 people have been killed in the strikes.'³¹ The BBC summarised the U.S. approach to dealing with militants in north-west Pakistan simply as '... drones – marvellous inventions that can kill but not be killed, that can fly for hours, whose anonymous operators can strike from the silent comfort of an anonymous control room.'³² This one-sided view is not shared in Islamabad, where sovereignty and civilian casualties, amongst other issues, lie at the centre of the growing discomfort.

The CIA is concerned about civilian casualties and takes comprehensive and robust measures to minimise them.³³ Targeting is a precise and carefully controlled process, and not merely based on visual evidence. Cautious screening processes are in place and high-level approval to strike a target (up to the head of the CIA Counter-Terrorist Centre) is required when civilians are known to be in or near al-Qaeda and Taliban targets. If a school, hospital, or mosque is within the blast radius of a missile, detailed analysis occurs before a strike is authorised. Lawyers provide approval for offensive operations and strikes are frequently called off when it becomes clear that civilian casualties might occur. There has also been a conscious move away from destroying compounds to targeting vehicles, where the risk of collateral damage is reduced. Even when compounds have to be hit, smaller missiles are used to restrict damage and there has been a genuine effort to understand the second and third order effects of a drone strike on the local population. A flow of additional signals intelligence provides an electronic means of corroborating that a target has been correctly recognised. Still, if the operator does not know the language and the specific tribal culture intimately, how can

he determine what is normal and who is hostile when viewing the locale from above? The impression of a carefully-controlled high-tech precision weapon does not always stand up to scrutiny. Some critics suggest that more civilians are being killed than America and Pakistan will admit. Although accurate and reliable figures are difficult to obtain, there have been a number of mistakes; some have involved hitting wedding and funeral parties. A conservative estimate of civilian deaths in Pakistan suggests that one third of the deaths from drone strikes are civilian.³⁴ Others suggest it may be far higher.³⁵

A number of drone strikes have involved significant loss of innocent life.³⁶ One such example occurred in 2009:

U.S. drones launched an attack on a compound in South Waziristan. Locals rushed to the scene to rescue survivors. A U.S. drone then launched more missiles at them, leaving a total of 13 dead. The next day, local people were involved in a funeral procession when the U.S. struck again [allegedly 70 of the mourners were killed] ...³⁷

Indeed, in the foreword to an article on drones, published in *Military Review* in May-June 2011, the editorial team note: '*Military Review* expresses deepest condolences to the families of Navy Corpsman Benjamin Rast and Marine Staff Sergeant Jeremy Smith, who lost their lives in April 2011 in what may have been an accidental attack by a Predator drone flying in support of operations near Sangin, Afghanistan.'³⁸ Although this was a U.S. ground operation in Afghanistan, the alleged accident highlights the realities of using drones and human fallibility. Technical failures may also lead to civilian casualties and so-called accurate errors. But most strikes are conducted by anonymous 'reachback operators' (consisting of a pilot and sensor operator) sitting in the comfort of a control room, watching a near live video feed on a flat-screen monitor from a drone, many thousands of miles away in the CIA headquarters in Langley, Virginia. The calm 'cockpit' of a drone operator, with access to real-time intelligence and constant advice, should permit greater concentration and better decision-making. Civilian casualties should, in principle, be minimal. This is not always the case and misinterpretation of video images or incorrect identity cannot be ruled out. Reporting of alleged mistakes is commonplace:

Black smoke and dust choked villagers as they dug through the rubble [after a drone strike in north-west Pakistan]. Four year old Zeerek's legs were severed. His sister Maria, 3, was badly scorched. Both were dead. When their cousin Irfan, 16, saw them, he gently curled them in his arms, squeezed the rumpled bodies to his chest, lightly kissed their faces, and slid into a stupor.³⁹

Imagery is also degraded by altitude, dust-storms (which sometimes reach a height of 7,000 or 8,000 feet above sea level), fog, heat haze, cloud and rain. Each has the potential to cause ambiguity, uncertainty or broken observation. Moreover, tribesmen routinely carry guns throughout the borderlands. Modern weapons, particularly Kalashnikov rifles, are a symbol of

an individual's status. The art of marksmanship is taught at a very young age and tribesmen carry guns for self-protection. Drone operators can mistakenly equate anyone carrying a gun with a militant; this is not always the case. There may also be greater acceptance of civilian casualties when attacking a HVT, which could go some way to help explain increasing incidents of collateral damage.

To make matters more complex, many commentators view drone strikes as an illegal form of extrajudicial assassination, 'conducted by unlawful combatants'.⁴⁰ Even the most vociferous supporters of drone strikes believe they could be deemed illegal under the laws of war, despite Pakistan being given some control over who is targeted. The U.S. is not at war with Pakistan, nor was Pakistan harbouring Osama bin Laden and al-Qaeda forces before 11 September 2001. It is difficult to claim self-defence in attacking targets in north-west Pakistan. Philip Alston, an Australian human-rights lawyer who served as the United Nations Special Rapporteur on extrajudicial, summary or arbitrary executions, recommends:

States should publicly identify the rules of international law they consider to provide a basis for any targeted killings they undertake. They should specify the bases for decisions to kill rather than capture. They should specify the procedural safeguards in place to ensure in advance of targeted killings that they comply with international law, and the measures taken after any such killing to ensure that its legal and factual analysis was accurate and, if not, the remedial measures they would take. If a State commits a targeted killing in the territory of another State, the second State should publicly indicate whether it gave consent, and on what basis.⁴¹

Due to the covert nature of drone operations in north-west Pakistan, there is no mechanism for the investigation of civilian casualties and no compensation paid. Likewise, there is no disclosure of the safeguards in place to ensure that attacks are legal and accurate, or the accountability procedures for violations. The local media reports on how many militants were killed in each attack, but few external reporters have access to the site of a drone strike.⁴² FATA's legal status and lack of control prevents independent media from travelling there. Places like North and South Waziristan, which have seen offensive operations by the Pakistani army, are virtually closed to Western media. Instead, second-hand information, rather than eyewitness accounts, is often manipulated by pro-Taliban media outlets or biased Pakistani intelligence officials. The propaganda costs of drone attacks have been high. The CIA rarely comments on the detail of drone strikes – the programme is still technically covert. Likewise, drone strikes rarely attract public attention in the West unless a high-ranking al-Qaeda leader is killed.

Therefore, the lawless and isolated region of the borderlands provides a grey area in which the U.S. can operate with a degree of freedom. The U.S. government argues that it has the legal right to use lethal force against suspected terrorists in 'anticipatory' self-defence. By characterising terrorism as an act of war, as opposed to a criminal act, the 'Bush Administration reasoned that it was no longer bound by legal constraints requiring the

government to give suspected terrorists due process.⁴³ Jeffrey Sluka highlights another unique aspect of drone strikes: 'Virtual war dehumanises the victims, desensitises the perpetrators of violence, and lowers the moral and psychological barriers to killing.'⁴⁴ Others go a step further:

Equally discomfoting is the 'PlayStation mentality' that surrounds drone killings. Young military [and civilian] personnel raised on a diet of video games now kill real people remotely using joysticks. Far removed from the human consequences of their actions, how will this generation of fighters value the right to life? How will commanders and policymakers keep themselves immune from the deceptively antiseptic nature of drone killings? Will killings be a more attractive option than capture? Will the standards of intelligence-gathering justify a killing slip? Will the number of acceptable 'collateral' civilian deaths increase?⁴⁵

This is not a position shared by all. Some argue that drones do not 'lower the threshold to the application of force,' but enable 'a perspective that we didn't have when you had a person in the cockpit.'⁴⁶ However, a question that remains unanswered is whether drone operators are more or less likely to drop bombs than manned aircraft? Interestingly, an Air Force Research Laboratory study in 2010, which compared drone operators to gunship pilots, noted:

They reported such SOs (sensor operators) performed their surveillance and reconnaissance duties well, but emotionally struggled with their role in taking lives of others, regardless of the threat enemy combatants posed to U.S. and allied forces ...⁴⁷

Operators do not have the advantage of flying overhead at altitude in a conventional platform. Close-up 'zoom in' sensor footage of people, vehicles and buildings presents a unique set of pressures. Prolonged exposure to death and damage, even by near real-time video, is stressful and harrowing for seasoned operators. Drone operators suffer from combat stress.⁴⁸ Moreover, strikes are subject to a greater degree of analysis and evaluation after a mission than is possible with a manned platform. There are other alleged local side effects associated with drone strikes. Dr. Munir Ahmad, a 50-year-old psychiatrist in Miranshah, suggests that drone strikes are leading to mental disorders, especially among women and children in the tribal areas. In 2009 he was treating 160 patients a day suffering from unmanageable fright and anger.⁴⁹

Moreover, some speculate that the go-it-alone attitude of the U.S. undermines the fight against militancy in north-west Pakistan, strengthening the hand of al-Qaeda and the Taliban, threatening any prospects of long-term reform by alienating the moderate people in the region. But notably, the line between the two organisations is becoming increasingly blurred:

There is no difference between Al-Qaeda and the Taliban. The formation of Taliban and Al-Qaeda was based on an ideology. Today, Taliban and Al-Qaeda have become an ideology. Whoever works for these organisations, they fight against Kafirs [non-Muslims]

or disbelievers] ... However, those fighting in foreign countries are called Al-Qaeda while those fighting in Afghanistan and Pakistan are called Taliban. In fact, both are the name of one ideology. The aim and objectives of both organisations are the same.⁵⁰

While drone strikes may be a catalyst for militancy, the real source of disaffection in the borderlands is social inequality, a lack of development, overseas meddling and Western misunderstanding. Besides, drones can only function successfully when allied to high-quality local intelligence. Human intelligence is provided by the CIA's own network of informants living in the tribal areas, as well as via the Pakistani intelligence agencies. Poor or over-inflated intelligence can lead to errors. In addition, 'tips' from informants on the ground are often driven by undisclosed reasons. Sometimes intelligence is fabricated to prove an informant's value, or so they can make money. On rare occasions, an innocent individual is claimed to be al-Qaeda or Taliban because an informant wants rid of inconvenient opposition. This form of 'touting' has a long history on the frontier.⁵¹

Despite eight years of drone strikes in north-west Pakistan, the Taliban and al-Qaeda allies, such as the Haqqani Network, remain firmly in control of the tribal areas. Although the use of drones has killed some of al-Qaeda's top leaders and kept militants' networks off balance, creating an unstable environment, they have not dismantled al-Qaeda or prevented the Taliban from physically holding ground. Nor are they seen as protectors by the tribesmen. Moreover, al-Qaeda is not solely based in the tribal areas. Osama bin Laden was located and killed in the garrison town of Abbottabad by U.S. Navy SEAL commandos, far from the tribal borderlands.⁵² Many other top leaders have relocated to Pakistan's major cities, where crowded millions provide the camouflage that terrain and *pashtunwali* (the austere moral concept of tribal behaviour) once did. The worst place to hide is the most obvious one. Extremism is not restricted to the border area and is spreading into areas such as northern Sindh. However, those militants remaining in the borderlands of north-west Pakistan have amended their *modus operandi* to reduce drone strikes. They now communicate by courier and move cautiously in small groups, diverting their energy from planning attacks. Militants have abandoned easily identifiable all-terrain vehicles in favour of public transport and, on occasions, Pakistani military vehicles. As many tribesmen refuse to rent space or give hospitality to al-Qaeda operatives for fear of a drone attack, many have gone underground, resorting to hideouts, caves and tunnels dug into the mountainside.⁵³ They have also become more suspicious. Militants are convinced that U.S. spies are working in the tribal areas, planting GPS tracking devices or tiny silicon-chips to guide ordnance on to their exact target. After every raid the Taliban reacts with fury, abducting, torturing and killing anyone suspected of planting a transmitter. Outsiders, particularly Arabs and Europeans are viewed with mistrust as potential American agents.

Four Europeans who were captured last December after trying to join Al-Qaeda in Pakistan described a life of constant fear and distrust amongst the militants, whose obsession with drone strikes had led them to communicate only with elaborate secrecy and to leave their squalid hideouts only at night.⁵⁴

In a climate of fear, even locals have begun to suspect one another. Therefore, it is clear that drones alone cannot deal a *coup de grâce* to the insurgency and need to be combined with other covert operations.

Additionally, drone attacks may be losing the 'hearts and minds' of the tribesmen, terrifying the local population, and increasing the threat of national and international terrorism.⁵⁵ Some tribesmen allegedly view them as frightening and haphazard assassins, creating a climate of fear and mistrust. Therefore, far from reducing militancy and radicalisation, their perceived indiscriminate nature may be creating resentment, suspicion and tribal division, as well as increasing Pakistan's difficulties in subduing the region. Some even go so far as to suggest that the current approach is leading to a loss of Pakistani government control over its own population.⁵⁶ Drone strikes may also be fuelling Afghanistan's powerful and mutating insurgency.⁵⁷ The militant backlash, attributed to drone strikes, is ever more evident. 'Several recent high-profile terrorist attacks in Pakistan and beyond have been carried out in direct response to the drone attacks, including a number of suicide attacks in public places in Pakistan, a suicide attack on a police academy in Lahore which killed 18 people ...'⁵⁸ In reaction to U.S. drone strikes and Pakistani operations in tribal regions, attacks on NATO supply vehicles increased from just eight in 2008 to at least 99 in 2010. Of note, David Kilcullen, a former special advisor to the U.S. State Department and counterinsurgency expert, testifying before the U.S. State Foreign Relations Committee, cautioned: 'If we want to strengthen our friends and weaken our enemies in Pakistan, bombing Pakistani villages with unmanned drones is totally counterproductive.'⁵⁹ One commentator cautions:

Before the drone attacks began the Taliban weren't so obvious among us and the militancy wasn't as strong. But now every home in North Waziristan seems to have one or two Taliban living in it. The youth are joining them. Feelings against the U.S. and Government are rising because of the [drone] attacks. Al-Qaeda has been badly affected by drones – but it has also benefited too.⁶⁰

Furthermore, drone strikes allow the Taliban to portray the U.S. as cowards, afraid to face their enemies and risk death. They also suggest that drone strikes make them more determined to fight.

There are a number of additional issues that challenge the ongoing utility of drones. Many militant fighters view north-west Pakistan, particularly the cities of Quetta and Peshawar, as 'inside' Afghanistan and reject the Durand Line, imposed in 1893 to suit British needs, as the official border between the two countries.⁶¹ This is in stark contrast to those who consider that whatever happens east of the international border is something that concerns Pakistan alone. Through tight familial and tribal links, the tribesmen based in north-west Pakistan remain an integral part of the tribal structure that transcends the artificial divide. What happens east of the border affects those in southern Afghanistan; whatever happens west of the border affects those in north-west Pakistan. The desire for revenge (*badal*) and the anger arising from

the loss of relatives or the destruction of property in a drone strike are powerful motivators in individual militancy. Families of drone victims are required under *pashtunwali* to seek revenge, which makes them ideal recruits for the insurgency.⁶²

Pashtunwali is the dominating factor that affects tribal behaviour.⁶³ A core value of the code is the protection of the weak and innocent – the women and children. An assault on them is an assault on the honour of every local male. When men fight in fair combat, death is expected. But the death of women and children is an affront to the tribe. And airstrikes are not viewed as fair combat. Further, even the slightest provocation or insult to the honour (*nang*) of the Pathan is enough to engender revenge. Tribesmen have to avenge a blemish on their reputation; shame (*sharm*) is intolerable. Each drone strike, therefore, has the potential to create a martyr, depending on the standing of the individual killed, and generate three or four potential suicide bombers. Even when drones hit the right compound, the force of the blast can often demolish surrounding houses, crushing or injuring those inside. Unsurprisingly, there may be a growing link between the radicalisation of the local population and the number of drone strikes. Moreover, tribesmen with no previous interest in 'global *jihad*' now have a broadened perspective. Tribesmen do not give up because the U.S. has the best technology. Instead, asymmetrical campaigns lead to new militancy and outrage among the tribesmen. Drone strikes could be creating more militants than they kill. They may also be isolating the Pakistani army from the tribes. The jury remains divided on the true utility of drones.

Jasoos (Spies) in the Air – Parallels with the Past

Although almost a hundred years since airpower made its first appearance on the frontier, many of today's challenges, often above the same geographical locations, appear analogous with those of the past. Despite high resolution optics and greater persistency, drone operators, like the pilots before them, still find it difficult to positively identify and target militant tribesmen. Visual reconnaissance, even by high-tech near real-time video, is less effective than expected, due to challenging atmospheric conditions, poor weather and complex terrain. Success often turns out to be a matter of luck or chance encounter. It is also extremely difficult to distinguish between hostile and peaceful inhabitants from the air, especially as many tribesmen carry modern rifles for status and protection. Like the tribesmen of the 1930s and 40s, today's militants have become experts at camouflaging themselves physically and technologically from aerial observation. No longer hiding behind boulders and in deep ravines when an aircraft is heard overhead, safety is now sought in population centres, safe houses and remote hideouts. Militants have made changes to their *modus operandi* to negate the known technical capabilities of drones and CIA restrictions on their employment. Some of these techniques are as simple as individual camouflage and rugs or space blankets to absorb heat signatures or conducting false radio and telephone conversations or positioning heat sources to divert strikes. As a new scientific development comes online, local measures are put in place to nullify advances in technology. A complex cat and mouse game ensues.⁶⁴

Effective air power still relies on accurate intelligence and speed of employment. Like the RAF intelligence officers, who linked into the regional intelligence networks on the frontier, the CIA is supported by an army of intelligence and communication analysts. Equally, air power still requires local informers to achieve precision. Akin to those of the past, stool pigeons are prone to informing both ways and adept at providing misleading information for financial or personal gain; it is never easy to gain timely or accurate information in such a xenophobic environment. Similar to the slow-moving early bi-planes, drones are often accused of being an unfair and indiscriminate means of dominating the region, engendering permanent embitterment and alienation. Like their predecessors, drones also face criticism that their effect on the region is transitory, failing to put a lasting stop to the activities of the militants and in some cases fuelling the militancy. The drone, like the aeroplane, is still a weapon that the tribesmen cannot counter. Moreover, it is still viewed as a very unpleasant and troubling enemy. It is perhaps unsurprising with so many similarities between past and present that some local commentators see the employment of drones over north-west Pakistan as a continuation of a colonial-era policy. Wing Commander R.C.M. Pink would instantly recognise many parallels between today's drone campaign and the bombing and strafing activities he oversaw from 9 March to 1 May 1925.

But there are also significant differences, mainly due to advances in technology, policy and financial backing. The drive for greater technological advancement, driven by a multi-billion dollar drone industry, is in stark contrast to the early days of the Royal Flying Corps, where the aftermath of the Great War, including the shortage of suitable equipment, a lack of appropriate landing grounds and technical buildings, hampered the development of air power. General Atomics Aeronautical Systems, the defence contractor that manufactures Predator and Reaper, can barely keep up with today's demand. Moreover, at the end of a shift, private contractors and intelligence officers drive home to be with their families. In contrast, officers and airmen were posted to India for five years, often without families. Many lived and breathed every aspect of frontier life for the duration of their tour. Wing Commander Geoffrey Morley-Mower recalls:

Miranshah remains encapsulated in my memory, like a dream from a different century. Its location was as remote as the Cistercian monastery, and it shared other elements with a religious house. There were no women. The outer gate clanged shut at sunset. The P.A. [Political Agent] was as kind and strange as any abbot. The war against outlaws was a game which claimed fewer lives annually than the London-Brighton road. The flying was the best I've ever enjoyed. Much of it being close to the ground in wild country with the hills providing interest and danger; covering troops, picking up messages, scouting for road blocks in the steep defiles and dropping mail at the Tochi posts whose names will always be part of my personal poetry. Ghariom, Bichi Kaskai, Datta Khel, Kar Kama, Ladha, Damdil, Spinwam, Sara Rogha.⁶⁵

Today's operators will not have similar ingrained memories. Furthermore, there are no coloured paper warnings that attacks will occur if militants do not comply with government demands,

no war correspondents to provide firsthand accounts and no pilots to be shot down. Targets are hit with a degree of precision unheard of in the first half of the Twentieth Century. David Omissi notes that of the 182 bombs dropped on frontier tribesmen in November 1928, 102 completely missed the target villages.⁶⁶ Equally importantly, there are few inter-Service squabbles or rivalries; CIA unity of command and purpose pervades.

But perhaps the biggest difference with the past is that air power developed into a key component of the British approach to tribal control on the North-West Frontier. Experience proved that air power alone could not manage the region. Tribal territory was controlled and disciplined by a sliding scale of violence: first enticement, rewards and threats, next the tribal *kassadors* (tribal levies of policemen), then the lightly-armed scouts; only in extremis, when outbreaks were too excessive to be contained by the scouts, would the political authorities call on the army and RAF to restore order. Therefore, while air power played a central role in tribal management it was only one component of a truly joint and escalatory approach to the complexities for the frontier. Like today's drone campaign, the notion that tribal militancy could be solved by air power single-handedly is unrealistic and wishful thinking. The same logic applies to defeating al-Qaeda. A comprehensive, multi-strand political and military strategy will be required to re-establish order in north-west Pakistan and to finally root out al-Qaeda. Failure to address the long-term challenges of the region with a firm and consistent policy could be disastrous for both Afghanistan and Pakistan.

Notes

¹ Al-Qaeda – a network of Islamist ultra-radicals; Taliban – literally religious student(s), the term now largely used to indicate the Movement of the Taliban.

² Including the Islamic Movement of Uzbekistan (IMU) and the Islamic Jihad Union (IJU).

³ 'White Jihadis Key Target of Drones,' *The News*, 20 July 2011.

⁴ A. Giustozzi, *Koran, Kalashnikov and Laptop: The Neo-Taliban Insurgency in Afghanistan* (London: Hurst & Coy., 2007), 21-28. _____ (Ed), *Decoding the New Taliban: Insights from the Afghan Field* (London: Hurst & Co., 2009), 206. Admiral Mike Mullen, speaking as the Chairman of the Joint Chiefs of Staff before a Senate hearing in September 2011, made clear that the militant Haqqani Network is a 'veritable arm' of the Pakistan intelligence service. This was just the latest in a string of outspoken comments from the U.S. on Pakistan's well-documented links with Islamist terror groups (including the Afghan Taliban, the Haqqani Network, Gulbuddin Hekmatyar's fighters and the Lashkar-e-Toiba).

⁵ A.M. Roe, 'What Waziristan Means for Afghanistan,' *Middle East Quarterly* 18, no. 1 (2011), 37.

⁶ The 'drone' nickname comes from the constant buzzing 'beelike' noise that many early drones made in flight.

⁷ Drones are not new and have been in the U.S. arsenal for some time. On 26 February 1973, during a testimony before the U.S. House Appropriations Committee, the U.S. military confirmed that they had been utilising UAVs in Southeast Asia (Vietnam). The USAF 100th Strategic Reconnaissance Wing flew approximately 3,430 UAV missions during the war at a cost of about 550 UAVs lost to all causes.

⁸'The Predator War,' *The New Yorker*, 26 October 2009.

⁹'Pakistan Rehearses Its Two-Step on Airstrikes,' *New York Times*, 15 April 2009.

¹⁰The U.S. government runs two complementary drone programmes. The military's version, which is publicly acknowledged, operates in recognised war zones and targets enemies of U.S. troops stationed there. The Central Intelligence Agency (CIA) runs a parallel programme aimed at terror suspects around the world operating in countries that do not generally possess U.S. bases.

¹¹The CIA works in conjunction with U.S. special operations forces and with the assistance of civilian contractors. 'Pakistan Rehearses Its Two-Step on Airstrikes,' *NY Times*, 15 April 2009.

¹²'A targeted killing is the intentional, premeditated and deliberate use of lethal force, by State or their agents acting under colour of law, or by an organised armed group in armed conflict, against a specific individual who is not in the physical custody of the perpetrator.' P. Alston, 'Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions,' United Nations General Assembly A/HRC/14/24/Add.6 (2010), 3.

¹³Multiple drones enable a comprehensive 'soak' of an area of interest. They can also be layered to enable cross-cueing and redundancy – allowing the failing of any one asset to be compensated for.

¹⁴Pattern of life is maintained for the longest practicable period and includes times of anticipated civilian activity.

¹⁵There may not be a pilot in the cockpit but, for example, each Reaper requires approximately 180 specialists to keep it flying.

¹⁶An agreement to allow the U.S. to operate over Pakistani territory has never been publicly admitted, and successive Pakistani governments officially condemn the strikes as an incursion into Pakistani territory. However, since 2004, U.S. drones have been taking off from remote Pakistani airbases, principally the out-of-the-way Pakistani military installation known as Shamsi Air Base, located in the Quetta area near Washki. Other locations have included Jacobabad.

¹⁷Teams swap out every seven hours, to keep a fresh set of eyes on the ground at all times.

¹⁸'The Morality of Drones,' *EconoMonitor*, 5 July 2011. Available at: <http://www.economonitor.com/moran/2011/07/05/the-morality-of-drones/>

¹⁹'US Drone Strike Kills 6 Militants in Pakistan,' *The Press Trust of India Limited*, 12 July 2011.

²⁰The money saved in comparison to normal fighter jets is significant. A U.S. MQ 9 Reaper drone (originally a Predator B) costs *circa* \$10 million. By comparison, an F-22 fighter jet costs approximately \$150 million. In addition, the training for the drone pilot costs much less than training a conventional jet pilot. Drones are also a solution to the rising cost of producing human soldiers.

²¹J.A. Sluka, 'Death from Above: UAVs and Losing Hearts and Minds,' *Military Review* 91, no. 3 (2011), 70.

²²C. Cole, *Convenient Killing: Armed Drones and the 'Playstation' Mentality* (Oxford: The Fellowship of Reconciliation, 2010), 7.

²³'The Predator War: What Are the Risks of the C.I.A.'s Covert Drone Program,' *The New Yorker*, 26 October 2009.

²⁴*Ibid.*

²⁵ Ibid.

²⁶ For example: 'Drone Attacks Strike Debate in Pakistan.' Available at: http://www.rferl.org/content/Drone_Attacks_Strike_Debate_In_Pakistan/2192324.html

²⁷ 'Drone Attacks – a Survey,' *The News*, 5 March 2009. Available at: <http://criticalppp.com/archives/26239>

²⁸ 'In June [2011] John Brennan, President Obama's chief counter-terrorism advisor, claimed that there had not been a "single collateral death" from a drone attack in the previous year, an assertion strongly disputed by tribal leaders, human rights lawyers and independent researchers.' 'The Hidden Victims of US Drone Wars,' *The Times*, 5 November 2011.

²⁹ This coincided with the drawdown of the war in Iraq, allowing more drones, support personnel and intelligence assets to become available.

³⁰ 'Pakistan Will Remain A Suspect Until It Roots Out The Evil In Its Mist,' *The Daily Telegraph*, 15 July 2011.

³¹ 'Secret Strikes,' *The Guardian*, 18 July 2011.

³² 'Pakistan Article Says Drone Attacks "Displace, Not Defeat, Terrorism,' *Financial Times*, 21 July 2011.

³³ This includes: the law of distinction, which requires that attacks be limited to military objectives and that civilian or civilian objectives shall not be the objective of the attack; and the principle of proportionality, which prohibits attacks that may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, that would be excessive in relation to the concrete and direct military advantage anticipated.

³⁴ 'The Year of the Drone: An Analysis of US Drone Strikes in Pakistan, 2004-2010,' New American Foundation. Available at: <http://counterterrorism.newamerica.net/drones>

³⁵ Pakistan Body Count. Available at: <http://pakistanbodycount.org/drn.php>

³⁶ 'What Are Afghan Lives Worth?' Truthout, 7 July 2009. Available at: <http://truthout.org/070709B?>

³⁷ 'Now We See You, Now We Don't,' Truthout, 26 June 2009. Available at: <http://truthout.org/062609R?>

³⁸ J.A. Sluka, 'Death from Above,' 70.

³⁹ C. Cole, *Convenient Killing*, 8.

⁴⁰ P. Alston, 'Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions,' 21.

⁴¹ Ibid., 27.

⁴² In an attempt to document U.S. drone strikes, the 'Transparency Project,' supported by Jemima Khan, the former wife of the cricketer Imran Khan, issued digital cameras to local tribesmen to record the effects of strikes throughout the FATA.

⁴³ 'The Predator War: What Are the Risks of the C.I.A.'s Covert Drone Program,' *The New Yorker*, 26 October 2009.

⁴⁴ J.A. Sluka, 'Death from Above,' 75.

⁴⁵ 'A Killer Above The Law,' *The Guardian*, 2 August 2010.

⁴⁶ P. McLeary, S. Weinberger, A. Batey, 'Fly and Smite; Impact of Drones on Pace of War Draws Scrutiny,' *Defence Technology International* 7, vol. 5 (2011), 19.

⁴⁷ Ibid., 20.

⁴⁸ 'The Predator War: What Are the Risks of the C.I.A.'s Covert Drone Program,' *The New Yorker*, 26 October 2009.

⁴⁹ 'Pakistan Outrage Over Continued Drone Attacks,' BBC News, 26 January 2009. Available at: http://worldblog.msnbc.msn.com/_news/2009/01/26/4376849-pakistan-outrage-over-continued-drone-attacks.

⁵⁰ A. Giustozzi (Ed), *Decoding the New Taliban*, 282.

⁵¹ A.M. Roe, *Waging War in Waziristan: The British Struggle in the Land of Bin Laden, 1849-1947* (Lawrence: University Press of Kansas, 2010), 107.

⁵² 'US Forces Kill Osama bin Laden in Pakistan,' *NBC*, 2 May 2011.

⁵³ 'Drones Batter Al-Qaeda and Its Allies Within Pakistan,' *The New York Times*, 4 April 2010.

⁵⁴ 'The Predator War: What Are the Risks of the C.I.A.'s Covert Drone Program,' *The New Yorker*, 26 October 2009.

⁵⁵ 'Aerial Bombing Makes Terrorists,' *Truthout*, 24 May 2009. Available at: [http://truthout.](http://truthout.org/052409Y?)

Org/052409Y?

⁵⁶ J.A. Sluka, 'Death from Above,' 73.

⁵⁷ It is interesting to note that: '... U.S. air strikes were among the principal motivations for suicide attackers in Afghanistan, and at the end of 2008 a survey of 42 Taliban fighters revealed that 12 had seen family members killed in air strikes, and six joined the insurgency after such attacks.' Ibid., 72.

⁵⁸ Ibid., 14.

⁵⁹ 'Call Off Drone War, Influential U.S. Advisor Says,' *Wired News*, 10 February 2009. Available at: <http://www.wired.com/dangerroom/2009/02/kilcullen-says/#ixzz0xjLROPhJ>

⁶⁰ 'U.S. Drone Strikes in Pakistan Tribal Areas Boost Support for Taliban,' *The Sunday Times*, 10 March 2010.

⁶¹ A. Giustozzi (Ed), *Decoding the New Taliban*, 206.

⁶² 'Death from Above, Outrage Down Below,' *The New York Times*, 17 May 2009.

⁶³ A.M. Roe, *Waging War in Waziristan*, 41-52.

⁶⁴ Historically, after the initial terror, populations under air attack have learned to adapt to their situation and develop workarounds, whether they are in London, Essen, Tokyo or Hanoi. Douhet's theory of air terror driving the citizenry to force their governments to sue for peace has not been realised. Air attack usually steels the resolve or fatalistic acceptance of the people under attack. Japan, for example, was prepared to fight on following the atomic bomb attacks against Hiroshima and Nagasaki. See D.M. Giangreco, *Hell to Pay: Operation DOWNFALL and the Invasion of Japan, 1945-1947* (Annapolis: Naval Institute Press, 2009). It was the emperor's decision that brought about Japan's surrender. The oft-cited Kosovo Air Campaign was supposed to last only three days. It went on for 80 days and did not destroy the Serbian Army. NATO pre-campaign demands were mostly unmet, large refugee populations resulted, the local economy and that of the Danube River basin were severely crippled and NATO ground forces have been permanent occupiers ever since to enforce the peace.

⁶⁵ G. Morley-Mower, *Flying Blind: A Memoir of Biplane Flying Over Waziristan in the Last Days of British Rule in India* (New Mexico: Yucca Tree Press, 2000), 160.

⁶⁶ D. Omissi, *Air Power and Colonial Control: The Royal Air Force, 1919-1939* (Manchester: Manchester University Press, 1990), 166.

Viewpoints

A Trilateral Renaissance of Expeditionary NATO Air Power

By Group Captain Tim Below

Introduction

Since Churchill's famous *Fulton Missouri Iron Curtain* speech in 1946, the phrase 'special relationship' has been synonymous with the political relationship between the UK and the USA.¹ Whether it be in nuclear weapons cooperation or intelligence sharing, this relationship has weathered numerous variations of ruling political party ideologies on either side of the Atlantic, and surmounted the vagaries of cooler and warmer Anglo-American interpersonal relationships over the intervening six and a half decades, to endure as strongly today as ever. Fundamental to the very bedrock of NATO, the American presence in Europe underpinned the continent's security throughout the Cold War, and indeed has continued to underwrite its security since the collapse of the Soviet Union.

Preventative air operations over Libya in 2011 highlighted the presence of a third significant air power in Europe, that of the French Air Force, the *Armée de l'air*. Yet the apparent arrival of the French on the European scene is nothing new: the *Armée de l'air* was engaged in coalition operations over Bosnia, Kosovo, and Iraq, and is still active in the skies over Afghanistan today. Indeed, it was through drawing on a rich history of contemporary combined air operations with the *Armée de l'air* that the Anglo-French forces were able to act so effectively so rapidly after the UN endorsement of UNSCR 1973 authorising the protection of Libyan citizens and the enforcement of a no fly zone over Libyan territory.

Although French forces were withdrawn from NATO's integrated military structure by President de Gaulle in 1966, France remained a member of NATO, and a deeply responsible member of the European community. France and the UK have been close partners for years, but recent

developments in the dawning years of the 21st Century have brought us even closer together. Without doubt President Sarkozy's 2009 decision to rejoin the integrated command structure of NATO is a significant factor, raising France's military power within British consciousness; but the November 2010 signing of the Anglo-French treaty on defence and security cooperation is as much a factor, drawing the nations inextricably closer together and inculcating a burden sharing culture between them.² The third inescapable element in the present era of global austerity is of course the relentless financial pressure on European nations to deliver our commitments with fewer resources.³ Combining these factors in a security environment in which, as reaffirmed by President Sarkozy and Prime Minister Cameron at their Paris summit in February 2012, no situation could be envisaged in which the vital interests of either nation could be threatened without also threatening those of the other, the case for increased security cooperation and defence interaction becomes irrefutably compelling.⁴

So must the UK's modern evolving security relationships with the USA and with France necessarily compete, or can they coexist in harmony? While at first look, an observer would certainly hope that it were the latter, the reality is yet more favourable. Despite its relative might and the enormity of its military power, the USA itself faces its own challenges. On the one hand the rise of Oriental and Asian powers in the global hierarchy is inexorably drawing America's focus from the Atlantic to the Pacific; while on the other hand, the USA is not exempt from facing the same fiscal challenges as beset Europe, and it too is being required to reduce its military expenditure in the face of diminishing budget allocations. It is against this backdrop that a Europe which is able to better assure its own security, in which increasing numbers of nations are net providers not net absorbers of security, and which has both the capacity to assure its own security and the capability to lead those operations necessary to do so, is a Europe in which the USA can feel comfortable in making force reductions to fund force enhancements in the Pacific rim.

The Chiefs of these 3 air forces share a vision to increase their operational effectiveness through closer collaboration between their Services.⁵ Taken together, despite continuing force reductions, and although still presently dependent upon the USA for augmentation of their enabling capabilities such as air refuelling and surveillance, the air forces of NATO, of Europe, of contributing non-NATO nations such as Sweden and non-NATO non-European nations such as Qatar and the United Arab Emirates are already capable of highly effective application of air power, as demonstrated so vividly over Libya. But it is in leadership of such coalition forces that France and the UK are now stepping up to the mark to take on the European mace wielded so effectively by the Americans since the Second World War, and it is in this context of open coalitions that we should consider the emerging relationship between the UK, French, and US air forces.

Within that relationship is an emerging line of unified exploration steered by collaborative activity between strategy teams representing each of the air forces through the UK's Air Staff (AS), the French Centre d'études stratégiques aérospatiales (CESA), and the US Strategic Studies

Group (SSG). This triumvirate is by no means the final dawning of a Gaullist “directoriate,” but leveraging off each others’ investments in strategic thinking, it exists to articulate the airpower message of the strength, value, and relevance of our relationship to political decision makers, our own Joint communities, and the wider international community of air forces. Coined as the ‘Trilateral Strategy Steering Group,’ this tripartite team draws strength through its constituent members’ diverse collective means of air power advocacy, which range to various degrees between the teams from the respective Air Force leadership, across Defence, internal Service, academia, and both the private and public sectors.

Exercising increasingly with each other, as with each of our other allies, has been the bedrock of contemporary Western coalition air operations. With a common understanding of the roles and employment of air power, the political will to lead air operations when called upon to do so, and crucially having senior airmen with the operational expertise to do so, the Royal Air Force and the *Armée de l’air* are well placed to play a leading role in the assurance of Europe’s continuing security. Yet impediments remain, and the optimisation of our air forces’ effectiveness, synergy, affordability, and responsiveness will require improved command and control processes and infrastructure; an increased willingness to share information, constrained neither to the intelligence axis nor in terms of with whom sharing (to whatever appropriate degree) can be achieved; and in an era of global austerity, the confidence to parse sovereign capabilities and increase our mutual interdependence.⁶ These are lofty challenges indeed, but they are ones from which the UK, French, and US air forces must not shy away if they are truly to fulfil their potential as leading coalition air powers in the 21st Century.

Notes

¹ Cambridge Editorial Partnership, *Speeches that Changed the World*, (London: Quercus Publishing plc, Revised Edition 2010), 98.

² *Treaty between the United Kingdom of Great Britain and Northern Ireland and the French Republic for Defence and Security Co-operation* (London: The Stationary Office, 2010), <http://www.official-documents.gov.uk/document/cm79/7976/7976.pdf> accessed 20 Feb 12.

³ Reference the OpEd here once published

⁴ “UK-France Declaration on Security and Defence,” <http://www.number10.gov.uk/news/uk-france-declaration-security/> paragraph 5, accessed 20 Feb 12.

⁵ Joint Letter of Intent from Jan 11

⁶ Refer to the 3 Chiefs’ OpEd once published

Viewpoints

Airpower and Afghanistan

By Air Commodore Dave Best

Air Cdre David Best spent 2011 working as ISAF's Director of Air Operations and Plans within the ISAF Joint Command, Kabul. Responsible for day to day running of coalition air operations throughout Afghanistan, he also made sure that when major land operations were being planned, air experts were fully involved so that the full range of coalition air capability available was understood and used effectively. Looking to the future, he was responsible for air aspects of transition planning – as well as thinking about what air support might be required after security responsibility has been fully handed to the Afghan Security Forces at the end of 2014.

Introduction

This piece is the result of 12 months in Afghanistan during 2011, a year which was the most challenging and fulfilling of my 29 years service in the Royal Air Force. Airpower (in its widest sense) is a crucial component of NATO's comprehensive counterinsurgency strategy in Afghanistan, providing mobility, running the strategic airheads, designing and running Afghan airspace and operating powerful intelligence, surveillance and reconnaissance capabilities as well as delivering kinetic and non-kinetic air effects in support of military operations across a vast geographic area.

Senior leaders in theatre recognise airpower as a key asymmetric advantage, and one which allows ISAF forces to punch well above their weight. As a senior US Army general put it to me: *'the thing that allows our troops to fight insurgents of 4 – 5 times their own numbers is airpower. I'm not prepared to take more risk on that'*. The particular strength of fast air, which is used in close coordination with armed UAVs and attack helicopters, is its ability to cover large distances, often across major mountain ranges, very quickly and then deliver a range of

precise effects to suit the situation on the ground. This makes it an extremely efficient way of providing support not only to pre-planned operations, but also to troops who run into unexpectedly heavy opposition. In fact, on many occasions, the mere presence of a fast jet is enough to defuse a developing situation, and this ability to take the pressure off friendly troops without firing a gun or dropping a bomb can be very useful, especially when the situation is confused and ground commanders need a way of de-escalating a developing situation. The fact that the aircraft can also provide troops with a real-time surveillance picture is also very important in allowing commanders to assess options and determine the best way to deal with events.

By operating a central tasking system for all fast jets in theatre, regardless of their nationality, ISAF is able to make very efficient use of a relatively small number of aircraft. It is also able to direct the nearest aircraft to respond to a developing situation; the aim is to have an aircraft overhead troops who are in contact with the enemy anywhere in Afghanistan within a matter of minutes – 24 hrs a day, every day. This also includes the ability to provide air support to Afghan forces if the need should arise – a very important development and one which will help to ensure that as they continue to develop their own capabilities and increasingly operate on their own in difficult areas, Afghan forces receive the support that they need.

As the capability offered by unmanned aircraft increases and the surveillance capability of fast jets gets ever better, I see a blurring of roles between what we currently label as Close Air Support and ISR. In terms of tasking, I didn't care whether the pilot was in the aircraft or whether he was in a control cabin several thousand miles away. My job was to make sure that we provided the right effect in the right place at the right time. That sometimes meant using a Reaper for close air support and sometimes it meant getting a fast jet with a video downlink capability overhead a particular location as fast as possible. Whilst unmanned aircraft are able to stay aloft for many hours on end, they carry limited weapons, cannot cover distance quickly and are significantly more weather limited than manned aircraft; they therefore perfectly complement the fast jets, which carry a wide range of weapon effects but which even with air to air refuelling (another critical air component role), are limited to shorter sortie lengths. We therefore worked hard to make sure that our tasking methods were able to quickly harness the strengths of all of the aircraft available. This policy also extended to more 'exotic' surveillance capabilities, such as the UK's ASTOR system. Proper use of this type of scarce but powerful asset relies not only on its allocation to high priority tasks across the country, but also on making sure that a number of different surveillance assets are coordinated, so that a wide area can be monitored and specific 'tips' given to more tactical platforms in order that they can be focussed on the correct areas. The coordination of the bewildering number of ISR aircraft in theatre, ranging from large strategic types based out of country all the way down to small UAVs operated by land units, presented quite a problem. However, recent experiences of close cooperation between specialised platforms proved very successful in building accurate intelligence pictures of insurgent networks, thereby allowing ground units to plan operations against high value targets very precisely.

Another area in which air makes a crucial contribution to the campaign is that of mobility. In such a vast country with some of the highest mountain ranges in the world and where the ever-present IED threat makes road travel problematic, ISAF relies on air mobility to a very large extent. All 49 nations in the coalition bring their troops and a significant proportion of their logistic needs into theatre by air and there is little alternative to air travel when movement over significant distances is needed in theatre. Helicopters have, of course, proved to be an absolutely critical capability, not only for the conduct of operations, but also for routine movement of troops, the provision of 'golden hour' medical care and the re-supply of remote forward bases. Despite the high number of helicopters in country, this is a capability which is always in short supply. Consequently, ISAF rotary wing planners are currently looking at ways to improve the efficiency of rotary wing operations, including a country-wide analysis of the best way to employ contracted helicopter lift. Air delivery of supplies to remote bases from fixed wing aircraft is one very effective way to take some pressure off the helicopter assets, and this along with the development of low-cost parachutes, is why recent years have seen a huge increase in the number of air drop missions carried out – especially by the USAF. Also, as ISAF increasingly supports the Government of the Islamic Republic of Afghanistan (GIROA) as it moves through the transition of security from ISAF to Afghan forces, it is very important that Afghan ministers are seen, heard and understood by ordinary people throughout Afghanistan and this requires a significant air transport effort. Whilst the Afghan Air Force is able to support some of these needs, ISAF recognises the importance of assisting the government by flying its politicians around the country.

Turning to airspace, Afghanistan represents a complicated mix of ISAF military activity, Afghan Air Force activity, a bewildering range of contractors flying in support of the coalition and an increasing number of international and Afghan commercial airlines servicing both internal and international routes. Some of these operators have access to classified operational airspace plans and restrictions and some do not. With responsibility for airspace control falling to the air component, this makes the challenge of ensuring safe and efficient routing of aircraft a complex business, especially when it often becomes necessary to rapidly clear airspace in order to allow the delivery of weapons, either from aircraft or from artillery. The presence of a 24/7 AWACS capability is helping in this regard, as have airspace changes introduced following a major airspace study conducted in 2011. However, it is likely to be a long time before Afghanistan will be able to take responsibility for controlling its own airspace; this will remain a coalition responsibility for the foreseeable future, and certainly well beyond the 2014 date set for security transition in the land environment. However, improvements in Afghan airspace control are important because charges for international overflight of the country by airliners are a major source of revenue for the Afghan government, amounting to around \$60m in 2011.

And then, of course, there are the airfields. Afghanistan has 7 'Tier 1' airfields all of which are currently being run by military authorities: Kabul International and Kandahar are NATO run, Bagram is US run, Bastion is UK run, Herat is Italian run, Mazar-e Sharif is German run and Shindand (the Afghan Air Force Training Centre) is Afghan run with US assistance. These airfields

are not only fundamental to all ISAF operations in theatre, but are also a vital ingredient for enabling Afghanistan's future economic growth. Whilst the intention is to transition those airports with a clear commercial future to Afghan control, this is some way off at present and GIRoA will continue to need western assistance beyond 2014 if the aviation industry is to stand on its own feet. In the meantime it is highly likely that airfield operations will remain the responsibility of NATO and national western authorities as Afghan civil aviation legislation regulation and are developed and whilst the challenges of training Afghans to assume roles in airfield operations are tackled.

Future challenges for ISAF in the air environment are significant. Development of the Afghan Air Force (AAF) is progressing well, but is a major, long term undertaking. In fact, the AAF is not planned to reach maturity until at least 2016, 2 years after transition has occurred on the ground. Even then, the capability provided by the AAF will be largely one of mobility, with a limited light attack capability. It is clear therefore, given the smaller size of the AAF compared to ISAF's air presence, that the Afghan army will need to fight in a significantly different way to ISAF forces, making greater use of ground mobility and having less reliance on helicopters. Similarly, there will need to be a greater reliance on artillery than on airborne firepower, and since Afghan forces will have limited access to technological sources of intelligence, they will need to make more use of human sources of intelligence. In short, ISAF currently harnesses technology (much of it airborne) to provide an asymmetric advantage over Afghanistan's enemies, but Afghan Security forces will not have that benefit; they will fight much more symmetrically. However, given their understanding of local communities, customs and personalities, this plays to their natural strengths. It does, however, present a particular problem for ISAF as we move through transition. The challenge is to provide ISAF partner and mentor forces with the technological support which they need, whilst at the same time making sure that we train the Afghans to fight as they will fight, not as we fight.

So, whilst airpower will continue to be at the heart of ISAF operations, the next few years present some significant challenges. Firstly, ISAF forces must continue to be supported across all airpower roles whilst the land component draws down; the speed and mobility of air make it a real force multiplier and coalition forces will continue to expect rapid response – especially, perhaps in the areas of close air support and medical evacuation. However, at the same time, ISAF must ensure that it does not train Afghan Security Forces to rely on capabilities which may not be available to them after 2014. There will then be a gap to be bridged between the handover of security responsibility to GIRoA on the ground and the planned maturity date of the Afghan Air Force in 2016. And finally, Afghanistan will continue to rely on external support for a number of air capabilities for the foreseeable future if it is to expand its economy; airspace and airfield management being just 2 obvious but important examples.

Book Reviews

Development, Security and Unending War. Governing the World of Peoples

By Mark Duffield

Reviewed by Squadron Leader Chantal Baker

Introduction

Duffield's analysis of the challenging domain of people centred security provides and insightful perspective on the historical context of development thinking from the post-Colonial era to the present day. He provides an interesting framework for understanding the central themes, but it is not for the uninitiated.

As DCDC and others have clearly presented, the future strategic global trends in demographics, development, personal and energy security have a significant role to play in both current and future security policy thinking and threat analysis. The characterisation of the global environment in the Future Character of Conflict as increasingly congested, cluttered, contested, connected and constrained reinforces the relevance of development themes to the security and defence sphere. Global conflict may well have declined and become less deadly in the post-Cold War era, but the threat posed by fragile, failed and failing states has made understanding the causes of instability an essential part of the security debate. In the multipolar world, instability has become a global danger, without state boundaries, intrinsically linked to poverty and underdevelopment. In our most recent international conflicts it has been well recognised by scholars and military commanders alike that winning the war may be more easily achieved than securing the peace. Therefore, consideration of the causality between security and development has an important role to play in the advancement of military thinking.

In his critique Duffield makes an interesting contribution to the very relevant debate regarding the nexus between security and development. His analysis focuses on humanitarian relief and development, drawing on the theories of biopolitics by Foucault and Agamben. He argues that development is a liberal problematic of security and questions the impact of Western humanitarianism.

His dense analysis draws on the very principle concepts of civilised life through which he seeks to challenge conventional wisdom, and in so doing his work is both complex and thought provoking. Duffield is not providing an introduction to this important and multidimensional subject. Rather, his work anticipates an existing knowledge of the development debate and draws on this to provide a valuable perspective on key trends in development thinking in the post-Cold War era. His critical and historically informed analysis is most valuable when focussed on relevant case studies, including Afghanistan. Duffield's discussion of the changing role of the state is particularly useful, especially regarding the central theme of sovereignty and the impact of the Global War of Terror and the Responsibility to Protect.

Whilst an understanding of the concept and politics of human security is of real relevance to those interested in current and future security challenges, Duffield's contribution is not the most accessible. "Security, Development and Unending War" is a valuable contribution to the rich policy and academic literature addressing this area; however, Duffield's work is best suited as a subsequent text for those who are already familiar with the core themes of the debate, rather than for those seeking an introduction to this essential subject for current military thinkers.

Book Reviews

Global Air Power

By John Andreas Olsen

Reviewed by Group Captain Tim Below

Given . . . the degree to which military innovation in peacetime is unavoidably nonlinear, contingent, and infected with serendipity, it seems best to avoid theoretical generalizations in probing for answers. . . .

. . . [However,] the sharpening of broad intuitions about the nature of war in the early twenty-first century is by no means a futile enterprise.

Barry Watts and Williamson Murray

Military Innovation in Peacetime

Introduction

Editied by John Olsen, *Global Air Power* is a collection of 9 essays by pre-eminent authors reviewing the geopolitical and sociological contexts which have shaped the development of air power as an instrument of war. Grouped into 3 sections, individual chapters present insights into how the varied yet often thematically common internal and external factors have interplayed in the evolution of air forces across the globe from the most prominent nations possessing the full spectrum of capabilities to some of the smallest players whose forces have been developed to meet unitary and tightly bounded requirements. Through this volume as a whole, Olsen seeks to illuminate universal trends as well as similarities and differences between the world's air forces of today in order to inform effective thought on the future utility and employment of air power in this the second century of manned aviation.

Citing their extensive accumulated combat experience, Section 1 reviews the development of the British, American, and Israeli air forces, with Tony Mason opening Olsen's exposition with a canter through 100 years of UK air operations. After presenting a history of the formation of the Royal Air Force, and Lord Trenchard's key role in its creation as an independent entity in the face of opposition from the Army and Navy, Mason reflects on the importance of strategic bombing in shaping the RAF during the Second World War, before reciting an extensive list of UK air operations, including those conducted by other UK Services, since 1945. During his review of the post-Cold War era, he pulls out as his dominant theme the conflicting balance between economic contraction and an expansion in global commitments. Richard Hallion's outstanding review of the history of US air operations easily relates to Olsen's objective. Setting out from the early days of 'pursuit' and 'attack' aviation roles, Hallion reflects on the Cold War years of nuclear mission obsession, before turning to the evolution of the modern environment of space-dependent precision ordnance-enabled air power heralded by the success of Operation Desert Storm in the 1991 Gulf War. Majoring on inter-Service rivalry, budget allocations, and powerful articulation of the air power message, he draws out the importance of the human element, notably demonstrating the (positive and negative) personal contributions of individual Chiefs of Staff and Secretaries of Defence in the Service's development. Clearly articulating the defining rationale at each evolutionary step, Itai Brun charts the development of Israeli Air Force doctrine since the nation's creation. Employed primarily to assure air superiority in support of ground force manoeuvre during the War of Independence, Brun explains how Israel's peculiar security situation in the midst of the Arab world resulted in the subsequent doctrine of pre-emptive offensive air strike. He goes on to highlight how the reactive catastrophe of the Yom Kippur War directly led to the air force refocusing on the role of territorial air superiority until this philosophy was itself rendered inadequate by the Iraqi scud attacks of the Gulf War which in turn required the adoption of today's offensive/defensive posture.

The second section addresses the Russian, Indian, and Chinese air forces, as 3 examples of Services which have undergone (or in India's case, which need to undergo) significant conceptual change in the last 20 years. In reviewing Russian (*née* Soviet) air power, Sanu Kainikara majors on 2 axes: the dominance of political ideology in defining [Soviet] military doctrine, and the concept of employment of Soviet air power as a supporting element to land forces. Together, these factors contributed to doctrine fundamentally at odds with that of NATO, espousing the importance of superiority in numbers rather than in technology, and rebutting the Western ideal of centralised control decentralised execution with scant regard for air superiority in the nuclear age. Kainikara asserts that it was only the confluence of the evidence of the Gulf War and the change in ideology from Soviet to Russian which enabled the Russian military to recognise the dominant role of air power in the technological age. Jasjit Singh provides an informative and concise history of the emergence of the Indian Air Force from colonialism, and browses its relevant conflicts of the twentieth century. Observing that India's air force of today remains the tactical force which was established by the British, he offers opinions on 2 continuing debates in Indian circles: whether the Indian Air

Force should develop into a strategic component of national power, and whether it should be offensively or defensively postured. Reflecting on the individual and potentially combined threats posed by China and Pakistan, he concludes that strategic transformation is imperative, but that despite the cultural readiness of the air force leadership, realisation of such a change will be dependent on considerably improved resourcing. As presented by Xiaoming Zhang, mirroring and sometimes copying the Soviet model of a primarily defensive air force supporting land forces, the development of any healthy or objective air power theories in China was inhibited by the enduring Maoist 'people's war' theory until the wake-up call which was the Gulf War. However, although China now has both a 30-year strategy and the resources necessary to rejuvenate its air force as a strategic Service, Xiaoming contends that the greatest challenge facing the People's Liberation Army Air Force today is the institutionalisation of a culture which embraces both offensive and defensive capabilities, and the organisation and employment of the Service as an independent and strategic force.

In the final section of the book before an afterword by David Deptula, Alan Stephens addresses the air forces of the Asia Pacific region, James Corum covers those of Latin America, and Christian Anrig's final chapter reviews the key issues in the air power debate since the Gulf War. Situating them within the strategic construct of shape-deter-respond, Stephens examines the development of several Asia Pacific nations' air power models in turn. He illustrates how, despite the common factors of vast maritime distances and recovery from wars of national liberation, socio-political evolutionary variances have predominated, resulting in extremes of effects, from the total stifling of air power development in Indonesia, to the emergence of Singapore as one of the world's leading air powers. Moreover, he observes how air power can be either effective or thwarted according to a nation's peculiar circumstances, respectively citing the highly advanced surveillance capabilities of Australia, and Vietnam's use of 'guerrilla air power' tactics to defeat first the French then the Americans. Reviewing the numerous Latin American conflicts of the last 100 years, Corum observes the responsiveness of air power at a micro level, with small, focussed air 'forces' being created swiftly in response to specific threats, generally in counter-insurgency and counter-narcotics roles. He demonstrates that despite the relatively small scale of many of these operations, and the rudimentary nature of the air forces involved, the fundamental air power tenets of mobility (albeit tactical), surveillance, and firepower (generally in quasi-CAS-type roles, although not always in support of ground forces) have proved as pervasive and decisive as in any larger-scale conventional conflict. Anrig's European analysis of the aftermath of the Gulf War finds that this watershed conflict heralded a new era in strategic air power employment, elevating air forces to being the primary Service in future Western operations while brutally exposing the pressing need for the modernisation of European air forces. Although now largely re-armed with precision weapons, Anrig highlights fears over sovereignty issues in the non-federal continent of Europe, which have resulted in various capability pooling programmes rather than national role specialisation. He also notes that although many European nations were willing coalition partners in Operation Desert Storm, the cultural environment of continental Europe nevertheless favours strategies of gradualism over the more dramatic shock and awe-style campaigns espoused by their American allies.

Having introduced the elucidation of universal trends, similarities, and differences in the development of the world's air forces as his objective, Olsen leaves the reader to deduce them for himself. Targeting his book at the full spectrum of readers as he does, this may be no bad thing, allowing the professional air power theorist to situate the presented evidence perhaps in a different context to that appropriate to his more casual audience. Four interwoven themes pervade the contributory chapters however, which are reviewed here.

The first is the recurrent idea that institutional culture and ideology, along with the personal influence of strong leadership, has shaped (including in some cases to the detriment of their efficacy) the development of the world's air forces through the twentieth century. With the notable exception of Israel, the majority of leading air forces are today independent Services, whose battle to win independence from their sister Services has been hard won in the face of concerted inter-Service opposition. *Global Air Power* illustrates how, from the very days of Trenchard, it has taken men of powerful vision and strong argument to liberate their air arms in every enlightened nation, while those whose culture, whether Soviet, Maoist, post-colonial, or dictatorial, prohibited such a move have seen their national air power constrained to tactical roles in support of notional Clausewitzian ground force encounters, failing to exploit the strategic advantage which technology has conferred upon more modern air forces. Especially among the nuclear capable nations, cultural resistance to the strategic employment of air power for fear of escalation of limited conflicts artificially constrained the employment of air power as evinced by the Chinese from the Korean War to today's standoff over the Taiwan straits. Meanwhile, reticence to employ defensively envisaged forces offensively resulted in the near defeat of Israel in 1973 and the effective total collapse of the previously mighty Japanese Naval Air Force by 1945. Conversely, *Global Air Power* identifies a post-1945 global trend to employ offensive action in support of defensive ideals as part of a wider move to better integrate offensive and defensive strategies, and an associated trend at the operational level among those air forces sufficiently technologically advanced to be capable of it, to reverse the salient of historical air power dominance through platform role specialisation which has characterised the first century of manned aviation in favour of integrating classical characteristics and functions of legacy air platforms into single unified systems which can be employed as a cohesive, networked, survivable whole.

The second theme develops the idea of the strategic capacity conferred upon air power by modern technology to be employed as an independent political tool. The paradigm of the importance of 'boots on the ground' is significantly Clausewitzian, and while by no means irrelevant in the twenty-first century, Anrig perfectly articulates the advent of a new air/land concept which surfaced in Operation Desert Storm in 1991 and which was again witnessed in Operation Allied Force in 1999, whereby air forces were no longer employed in support of land forces, either subserviently or in an integrated concept, but air power was instead invoked to deny territory to enemy ground forces, thereby rendering the air force the primary Service, relegating the land component to follow-on occupation of ground and mopping-up roles. No longer is a modern integrated air force constrained to precursor 'softening up' activities

and combat operations in support of the land component, but air power is today capable of achieving the desired decisive effect, at range, and, in the uncontested aerial environments which have characterised warfare in the second half of the twentieth century warfare at least, with minimal casualties, be they enemy combatants, civilian collateral, or own force body count. Irrespective of primacy, an enduring sub-theme here is the importance of effective interaction between the various arms of a nation's military forces if air power is to be employed to its maximum effect. Attributing its cause to a misplaced fear of escalation, Xiaoming identifies the Chinese failure to approve the employment of air power even when sorely needed by embattled ground forces during the 1979 invasion of Vietnam as a fundamental misunderstanding by the Chinese leadership of the critical role of air power in modern warfare. Meanwhile Stephens cites the failure of the Japanese Naval and Army Air Forces to cooperate as inhibiting Japan from becoming a first rate air power during the Second World War, and the abysmal lack of coordination between the US Navy and Air Force as directly contributing to America's defeat in Vietnam.

The third theme permeating the entirety of Olsen's collection is the worldwide paradigm shift in air power thinking which resulted from the Gulf War in 1991. The contributory authors collectively leave no room for questioning the enormity of the shift in strategic thinking which the success of Operation Desert Storm precipitated around the globe. Although this is the core thrust of Anrig's discourse on European air power, the impact of the US-led 1991 air campaign pervades every chapter of the work to some degree. Moreover, the shift was truly global, its effect not being restricted to coalition participants. For the US it marked the validation of technology-enabled parallel warfare, taking the ability to accelerate Boyd's OODA loop to the extreme on multiple concurrent fronts to create strategic paralysis in the Iraqi military. For British and continental European air forces who several authors assert had become over-comfortable with their Cold War military postures, it exposed their inability to conduct aerial warfare in the dawning paradigm of the post-Cold War era. For the embryonic Russian Air Force, while Hallion challenges Western conventional wisdom that the Cold War advantage was held by the more technologically advanced NATO forces, it nevertheless forced the replacement of entrenched Soviet doctrine of combat superiority through numerical mass to recognise the strategic effect achievable through air power. Even China, which did not participate in combat operations in the Gulf War, was forced to recognise from both the Gulf War and the Balkans experiences that modernisation meant not the establishment of merely defensive forces of overwhelming mass, but the acquisition of high-tech offensive forces and the adoption of a more balanced offensive/defensive posture. Indeed, as Stephens observes, even for the powers of the Asia Pacific region, and the same is true for Latin America, those nations which will be best placed in the modern air power era will be those which promote quality over quantity, eschew complexity, and focus on their specific security circumstances. Yet the US strategy was not the only changing force in the Gulf War. For Israel, the Iraqi scud attacks precipitated doctrinal adaptation to focus on the dual missions of homeland defence and offensive deep strike in response to the ability of modern protagonists to wage war from beyond a nation's immediate borders.

The final theme is the challenge of resourcing modern air forces. Singh is alone among the authors to proffer personal opinions ahead of recanting objective observations, and is explicit in his assertion that India should modernise its air force, and that this must be supported by a substantial increase in resources. As Anrig observes, no nation is immune from the challenge of the seemingly never-ending cost spiral of modern air power. Even the United States' acquisition programme, whose often politically-driven cost control failures are validly critiqued by Hallion, is currently facing harsh cutbacks. Similar budgetary reductions are widespread across European air forces, and Anrig rightly laments the present trend of *ad hoc* role specialisation which is arising piecemeal across Europe according to resource limitations, protesting the case instead for a deliberate and focussed pan-European policy. He also notes with disdain the present and continuing trend for larger and smaller powers alike to prioritise combat firepower ahead of enabling capabilities, a phenomenon mismatched with NATO's strategy of increased global engagement in UN-mandated interventions. Further afield, in Latin America, Corum notes that although many of the forces concerned are several orders of magnitude smaller, the funding difficulties are nevertheless equally challenging for these nations, and while he observes that their forces have historically been funded either largely or at least in some part by wealthier nations engaging in third party or proxy wars, this may prove not be a sustainable funding stream in the future. As part of its 30-year strategy, China is alone among the major air powers, at least at present, to be increasing its defence expenditure according to Xiaoming, and the balanced array of high-tech forces it is developing through this programme is set to provide a genuine challenge to the world's current leading air powers within the coming decade.

Through *Global Air Power*, Olsen's authors demonstrate how technology maturation has enabled the evolution of air power from a tactical supporting element of Clausewitzian warfare as politics by other means into an independent tool of twenty-first century politics. Although in his afterword David Deptula introduces some new ideas, notably that twenty-first century air power engagement will be characterised by contested, if not denied, air environments, he supports the assertion that leading air power nations today perceive the future to be in the employment of this tool to strategic effect through high-tech, network enabled, information aware forces. However, in an uncertain world, our adversaries of the future will include non-air power nations as well as non-state actors, and Olsen is right to caution that the past can not be directly extrapolated to predict the future. The ever-evolving strategic environment continues to demand as strong and visionary leadership as ever, underpinned by an institutionalised adaptive and innovative culture. Olsen's *Global Air Power* provides a balanced and comprehensive insight into historical air power evolutionary trends, and is essential reading for any serious disciple of air power; but especially in an age of fiscal austerity, we should be cautious not to overlook Stephens' lesson from Vietnam whereby even a non-air power nation was able to defeat the might of the French then American militaries without any investment in the air at all.



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