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AIR POWER

By Michael Graydon and Andrew Lambert

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AIR POWER – PAST, PRESENT AND FUTURE by Andrew Lambert

AIR POWERS, AIR POWER AND THE NATIONAL SECURITY STRATEGY by Michael Graydon



FOREWORD BY RODDY LIVINGSTON CHAIRMAN COMEC

These companion papers on air power were keenly received at the COMEC Defence Conference 2016 "Britain's Future Airpower", and remain apposite today.

Air Commodore Andrew Lambert's analysis of a centenary of development was distributed at the Conference. He charts the fascinating progress and rapid evolution of air power, and its strategic potency and limitations in conflicts in the latter part of the 20th century. This saw the development of interdependent forces reliant upon air superiority, but subject to disparate political pressures. He then takes an excursion through the modern era, the progress in precision air attacks and the evolution of remote aircraft. The future requires the political imperative to commit resources in order to maintain the technological edge.

Air Chief Marshal Sir Michael Graydon demonstrates that we are an industrial air power of international influence. The RAF is required to guarantee military control for security of our national air and space-based assets and for overseas operations, providing an effective rapid response across a range of situations. This, however, requires government approbation of a robust military sector to meet the technology challenges and security threats. Terrorism, state competition, cyber and the erosion of international order must be addressed by intelligence, defence and support to other operations. He concludes with future operations to protect our trade and project our influence, and the need for technological projects to be assessed on a cost-benefit basis according to the military advantage.

These papers give us much to ponder on the opportunity in the National Security Strategy to provide structures to protect our security and interests worldwide.

hoddy divingston

AIR POWER – PAST, PRESENT AND FUTURE by Andrew Lambert

Air is a curious medium; some Ancient Greek philosophers wondered if it had any substance at all. A hand moved through the air encounters little resistance yet,

as speed increases, the air seems increasingly viscous, with some aircraft designers describing high speed flight as forcing a path through soggy concrete. Yet, even at their slowest

70% of our planet is covered by water and 30% by land, but all of it is covered by air

speeds, aircraft still travel faster than vehicles or ships. And while 70% of our planet is covered by water and 30% by land, all of it is covered by air. On the surface of this planet everything is accessible from the air, and thus vulnerable, and those who seek to hide must either go below the surface, hide in the undergrowth or conceal themselves amongst other things – such as hospitals, mosques or crowds.

Use of the air medium to provide stand-off range was well appreciated by the Pharaohs. The ability to range across the battlefield at 30mph in their chariots, firing scores of flighted arrows at infantry who had no real means of reply was a war-winner, recorded on several Ancient Egyptian murals. How the Pharaohs



must have also wished that they themselves could fly, just like their arrows.

Despite man's clear yearning to fly, it is a curious fact that when powered flight did finally occur and began to be exploited, the Establishment, and in particular the existing military Services, tended to regard military flight as a parvenu, a thing of little substance, interesting maybe, but of little use and certainly no substitute for the "real" forms of war on the battlefield or on the high seas. According to these "experts" the warfare from the skies was variously "immoral", "ineffective" or "needs to be controlled by the older Services" where it could be given its proper (lower) priority. That air power has confounded all the nay-sayers is a remarkable story, and probably one that will be unbelievable to future generations who will be unable to comprehend a time before cyber warfare, before space stations and instant communications, before global air travel, before missiles, and before bombs that precisely hit their designated targets. For these generations such technology will be givens, if not "old hat"; perhaps of more interest will be the how and why of culture, competition and conflict.

But the progress of the air weapon during the 20th and early 21st Centuries is a fascinating one. It needs to be seen in the context of the evolution of warfare across the centuries. As the great land armies of Ancient Persia, Rome, Mongolia and even Napoleonic France, were slowly outflanked and overtaken by the maritime power of the Ottomans, Spain, Britain and eventually the USA, so in their turn these older forms of warfare were and are being supplemented if not supplanted by a new form of power, that from the skies. And those nations that fully exploit this medium, the new Air Powers, rely on the air and space for the success of their economies, from the influence of rapid and frequent global travel, and in place of 19th Century "gunboat diplomacy", now often lead with "air diplomacy".

First Flight

Perhaps man's first *faithful* attempt to fly was Brother Eilmer who, just before the Norman conquest, and perhaps hoping to imitate the mythical Daedalus, draped himself with a cloak wrapped around a wing-like frame, and then launched off the tower at Malmesbury Abbey. In what was probably a series of uncontrolled stalls and recoveries, he managed, so the story has it, to fly over the city wall, over the nearby river, and on to the marshy ground over a furlong beyond. That he suffered two broken legs on landing perhaps gave rise to the maxim that "a good landing is one you can walk away from"!

Of course the accolade for the first successful controlled flight goes to the Wright brothers who, as bicycle



manufacturers, understood that banking the aircraft was not something to be prevented, it was actually necessary to make the aircraft turn. After an exhaustive series of experiments they managed to fly in controlled flight for the first time in 1903.

What is truly remarkable is what then occurred. The very nature of civilised life changed. Within eight years man was using the aircraft for warfare (Libya 1911), by 1914 aircraft spotters had enabled artillery to fire at targets gunners could not see, by 1915 the first strategic air attacks had occurred, and by 1918 the world's first independent air force had been established. In the autumn of that same year aircraft had directly caused the rout of two separate Turkish corps, the VII and VIIIth, at Wadi Ziemer and Wadi el Fara.

Within 20 years of that first flight, Brigadier General Billy Mitchell destroyed the German heavy cruiser Ostfriesland from the air, heralding the fate of the battleship. Within 35 years, scheduled air services began operating across the Atlantic, and from Europe to South Africa or Australia. Trips that would have taken months by sea were now taking just a few days, if not hours.



World War II

The offensives of WWII began with that devastating onslaught of the combined thrust of tanks and aircraft in what became known as Blitzkrieg. Against such concentrated might the Allies had no effective defence. In 1945 the first atomic bombs were delivered from the air bringing WWII to a peremptory close, compelling the Emperor of Japan to surrender, thereby saving the lives of at least a million allied soldiers. At the same time the technology of flight was being put to new uses with Germany developing a range of *Vergeltungswaffen*, Reprisal or V-Weapons, rockets of increasing complexity which, eventually, allowed a man in 1969 to step foot on another body of the solar system, just 66 years after the Wright Brothers' first hesitant hops at Kittyhawk.

But progress in the air war was not unalloyed success. German attempts to destroy the morale of the British civilian population failed to persuade sufficient that surrender was better than fighting on, and in turn the Allied Strategic Bomber offensive was so inaccurate that, as one analyst calculated, to guarantee one



bomb to hit an area the size of a football pitch would require no less than 3,000 bombers. Moreover, the scale of civilian casualties from each bombing campaign was later considered both immoral and disproportionate to the gains made.

That said, against the Wehrmacht in the field the weight of air attacks proved devastating. On D-Day alone the Allies flew 14,000 attack missions across the beachheads, while the Luftwaffe flew just 750 across the whole of Europe, and most of those German flights

were dedicated to defending the homeland. Although German soldiers continued to fight hard the incessant call was "Wo ist die Luftwaffe?", and even Field Marshal Erwin Rommel, with personal experience of the power of enemy air, made the point agreed by most German generals that "...anyone who has to fight, even with the most modern weapons, against an enemy in complete control of the air, fights like a savage against modern European troops, under the same handicap, and with the same chance of success". And this has the ring of truth to it, as he wrote even to his wife, "The enemy's air superiority has a very grave effect on our movements.

There's simply no answer to it." It is apocryphal that he himself was badly wounded soon after when his staff car was strafed by Canadian fighter aircraft.

"...anyone who has to fight, even with the most modern weapons, against an enemy in complete control of the air, fights like a savage against modern European troops, under the same handicap, and with the same chance of success". – Rommel

But if the Allied Strategic Bombing campaign in turn also failed to destroy the morale of the German people, it certainly destroyed the German war economy. As Hitler's armaments minister, Albert Speer, said after the devastating fire storm inflicted on Hamburg, *"Four more Hamburgs and Germany will be out of the war..."*. *"I reported for the first time orally to the Fuehrer that if these aerial attacks continued, a rapid end of the war might be the consequence"*.¹ Certainly, as the United States

¹ Speer to USSBS Survey Interrogators on the Hamburg attacks. (USSBS Summary Report). http://www.anesi.com/ussbs02.htm

Strategic Bombing survey subsequently revealed, the bombing crippled the German economy, with munitions production effectively coming to a standstill from January 1945, some 5 months before the surrender. From that moment on, it was only a question of time.

The Cold War Era

"From Stettin in the Baltic to Trieste in the Adriatic an 'Iron Curtain' has descended across the continent."

Facing each other across Churchill's 'Iron Curtain', the victorious WWII allies soon found themselves at odds. In September 1947 the USAF was formed, recognising the successes of the Allied Air offensive in WWII, the need to deter the Soviets from aggression, and the potency of the strategic air force now rapidly equipping with intercontinental bombers and strategic nuclear weapons.

In 1948 the Soviets attempted to blockade Berlin by cutting off all road and rail links to the beleaguered city. In a feat of resolve that can only be marvelled at today, the Western Allies committed themselves to supplying Berlin entirely from the air. The 2½ million West Berliners received 277,000 flights during the year the blockade lasted, totalling some 2.3 million tons at an average of 5,000 tons/day. Allied transport aircraft, protected by waves of fighters, were landing in Berlin every 3 minutes. Distribution of all the stores in the city was a civilian responsibility to which Berliners became fully committed; the record for the offloading of 10 tons of coal, for example, was just 10 minutes. The Soviets finally called a halt to the siege when they realised that air deliveries eventually exceeded pre-airlift rail deliveries, and that further blockade was therefore pointless. Such Allied commitment gave heart to the defeated Germans, drew the Allies ever closer together, and directly facilitated the formation of NATO, the bedrock of Western Defence Policy ever since.

In the two principal Cold War Era wars, Korea and Vietnam, the potency of air power seemed less assured. In both theatres the strategic unassailability of China, and the desire to keep the fight sub-nuclear, meant that neither campaign could interdict the Communist Lines of Communications (LOCs) in their heartland, so that all operations were limited to local, tactical events. Nevertheless, in Korea Air Forces substituted for ground forces to a considerable extent with the UN ground forces outnumbered almost 2:1. Helicopters were used in large numbers for the first time, providing considerable tactical mobility, and UN fixed wing aircraft, scoring kill rates of 10:1, gave an air superiority that frequently prevented the Communists from deploying military forces except at night.

Sadly, the successes of WWII and even Korea were not repeated in Vietnam. Equipped with modern fast

"No one bombs an outhouse [in Vietnam] without my approval" – LBJ

jets with impressive bomb loads, it seemed as if the Western air forces would be easy victors. However, over assessment of the potency of aircraft still armed with unguided bombs, the multiplicity of differing Command and Control centres, the inability to strike the strategic centres in China, the invulnerability of LOCs reliant only on muddy paths through jungles, the potency of Soviet air defences, and political interference, all conspired to reduce Air Power's anticipated impact. President Johnson (LBJ), applying his own moral compass and logical reasoning to his enemy, imposed frequent bombing pauses in the mistaken belief that he was signalling to Hanoi. In the event, all he signalled was his own hesitancy, his indecisiveness and lack of moral courage. Hanoi regarded his bombing pauses as a sign of weakness, all the while portraying the US as bloodthirsty imperialists.

Civilian and military leaders cannot resist micromanaging Air Power, precisely because it is so flexible. – Col. Phillip Meilinger However, the style of war changed when, in March 1972, some 30,000 North Vietnamese troops crossed the De-Militarized Zone (DMZ) in the Easter Offensive. Under the Nixon Administration the gloves

were now off, especially as the North Vietnamese regular army would need a far larger resupply than the Vietcong irregulars. Operation Linebacker I was ordered. Virtually all military targets north of the DMZ were attacked for the first time, and the mining of Haiphong harbour was allowed. First use of Laser Guided Bombs (LGBs) achieved spectacular results with bridges that had proved all but impossible as targets using unguided bombs, now falling at the first stroke. As a result, Hanoi became far more reasonable in the Peace Talks. However, as soon as Linebacker ceased, Hanoi began stalling again. In December the same year the talks collapsed entirely when Hanoi withdrew. Linebacker II was ordered, targeted against the will of the people. There then followed a succession of 100-aircraft raids by B-52s at targets in and around Hanoi & Haiphong. The aim was to cause maximum distress but few casualties. After 10 days, North Vietnam had no SAMs left; no MiGs rose to meet the bombers; and there was virtually no fire from Anti-Aircraft Artillery (AAA). B-52 losses had been sizeable (approx. 3-5%) but within the month (Jan 1973) Hanoi signed the peace accord and direct US involvement ceased.

During the same period, the Israelis had achieved some notable air successes as



US Navy National Museum of Naval Aviation photo No. 1996.253.7108.010

well. In the 1967 "Six-Day War", the Israeli Air Force achieved total air superiority, by means of a pre-emptive air attack on Arab air forces, carried out whilst the Arab pilots were having their breakfast! Destruction of virtually all Arab aircraft on the ground meant that the Arabs were unable to stop Israeli jets from ranging across the battlefield with impunity, allowing the Israeli army to achieve something of a blitzkrieg success with large slices of Palestine and Sinai falling rapidly.

Sadly, for Israel, this success was not repeated in 1973 when a combined pan-Arab offensive began with little warning at the start of the Yom Kippur holiday, a period when most Israelis were

traditionally on holiday. Now, the boot was on the other foot and the Israeli Air Force found themselves having to dogfight to achieve any measure of air control; worse, the retreating Israeli forces demanded considerable air cover to protect them against the onslaught. Although the Israelis still retained the edge in air combat, the presence of considerable Soviet air defences, especially the new SA-6 SAM, produced severe and unsustainable Israeli air losses. A significant American resupply was ordered, with 56 F-4 Phantom jets deploying directly from Continental USA, already in their war fit. On landing in Israel these aircraft were refuelled and ordered straight into combat. The tide slowly turned and Israel took the fight to the enemy, eventually crossing the Suez Canal into Egypt. The conflict lasted just 19 days and, although only 26% of US aid was sent by air, none of the 74% sent by sea arrived before the fighting stopped. And without that air resupply of more than 27,000 tons of tanks, artillery and ammunition, not to mention the 56 ready-tofight combat aircraft, Israel could well have succumbed.

Of interest particularly to British readers are the air aspects of the small Falklands conflict of 1982. Although not a major air campaign in its own right, the RAF's bombing missions over 6,800nm were the longest then seen, and involved 2 Vulcan bombers (a primary and a spare) and 11 Victor Tankers. Though the damage to the airfield at Stanley was relatively light, the attacks prevented the Argentines from using the islands as a base for fast-jets and persuaded the Junta to retain 2 Mirage squadrons for the defence of Buenos Aires. However, it was at sea that Air Power demonstrated its effectiveness against surface warships. Just 90 relatively

unsophisticated Argentine attack aircraft damaged or sank 7 major warships; hit and damaged 9 others, leaving just 7 undamaged. According to Argentina, a further 10 bombs hit their ship targets but failed to explode. Although Sea Harriers on visual air patrols managed to shoot down some 19 Argentine aircraft, the lack of any effective airborne early warning (AEW) was almost catastrophic for the British task force. The lesson was clear – naval forces without effective air cover would be sitting ducks.

Gulf War Era

Gulf War I

The first Gulf War, beginning with Saddam's invasion and occupation of Kuwait in 1990, followed by the UN Coalition's defeat of Iraqi forces in 1991, has been described by some as the *apotheosis* of air power. Bringing together NATO forces trained during the height of the Cold War with 4th generation weapons systems armed with precision ordinance proved overwhelming. Combined with the remarkable invisibility of stealth, and orchestrated in a highly demoralising psychological campaign, the Coalition was able to inflict defeat on Iraq, with the World's 4th largest army and 6th largest air force. All coalition air assets (12 nations provided air support) were tasked under one command (CENTAF) – this was the first time that the USN in particular (but also the USMC) had worked fully under one air umbrella. During a 6 weeks' precursor air campaign, the Coalition destroyed Iraq's Command and Control (C2) capability with the result that Saddam lost almost all contact with his forces in Kuwait, and was at times forced to exercise his command from a Winnebago SUV. The campaign achieved total air supremacy across the whole of Iraq, such that F-15s patrolled the skies over Baghdad at will, and shot down Iraqi aircraft that attempted to take off, especially after most had already fled to their erstwhile enemy, Iran. The air campaign targeted all Iraqi ground forces in theatre, destroying 35% of Saddam's tanks, 31% of his other armour, 44% of his artillery, and reducing front line forces to below 50% of their fighting strength.² In a period when the computer game Space Invaders had just come out, F-111s carried out nightly attacks on individual tanks using laser guided weapons, an activity that became known as "tank plinking".

2

Gen Norman Schwarzkopf, It Doesn't Take a Hero, Bantam Press 1992, p439.



http://www.defenselink.mil/multimedia

In addition, Iraqi forces were subjected to a radio, loudspeaker and leaflet campaign that told them when and where they would be attacked from the air, with the result that although fewer than 10,000 out of the 545,000 Iraqi soldiers in theatre were killed, some 87,000 surrendered at the first opportunity and as many as 150,000 left their posts and desert-

ed, just to escape the bombing. Many Iraqi soldiers even contemplated suicide rather than face air attack. Quite apart from the B-52 carpet bombing of army Divisions in the field, Iraqis found that their tanks seemed to have the strange propensity to just blow up in the middle of the night. As one prisoner said ruefully, "In the Iran/ Iraq war the tank was my friend; in the Gulf war it was my enemy".³

The Iraqi order to abandon Kuwait was given at the start of the 100-hour coalition ground offensive, and although the elite Republican Guard continued to fight on, most soldiers just gave up, allowing the Allies to destroy much of the remaining Iraqi armour before the ceasefire.

"We have already informed you of our promise to bomb the 16th Infantry Division. We kept our promise and bombed them yesterday. Beware. We will repeat this bombing tomorrow.... Now the choice is yours. Either stay and face death or accept the invitation of the Joint Forces to protect your lives." – Coalition leaflet dropped on Iraqi Forces

Modern Western air power had unarguably established its credibility as a powerful, if not invincible, weapon of war. Two aspects did, however, give cause for concern as they suggested a bleak future. The first was the Iraqi attacks by SCUD surface-to-surface missiles against not just military targets, but also indiscriminately against civilians in Riyadh as well as Israel. And the second was the restraint resulting from an air attack on the AI Firdos military bunker in Baghdad which, unbeknown to the allies, was also being used as a shelter for politicians' and military families. Because of the media coverage of this unfortunate attack, President Bush prevented all

³ Reported in ibid.

further attacks in and around Baghdad. Civilians were now firmly a factor in air war, either as targets for extremists or as constraints for the West.

With the capitulation of Iraqi forces, the fall of the Berlin Wall, the collapse of the Soviet Union, and the demonstration of Allied (mostly US) might, many believed a period of international stability would prevail. However, without the dead hand of the USSR, many nationalities began to reclaim perceived rights and petty divisions re-emerged. Iran and Arab nations flexed their muscles, the Balkans regressed to petty squabbles, and China began to re-assert herself. In such relatively small squabbles one might have thought the emphasis would be on land operations, with air in supporting roles only. However, sensitivity over casualties, a reluctance to commit troops on the ground and a desire to reduce costs put Air Power very much centre stage.

Balkans

In the Balkans, in answer to the ethnic cleansing being carried out by all sides, the UN established a No Fly Zone (NFZ), with NATO as the provider of assets. However, apart from reading a litany of warnings to errant troop-carrying helicopters, no authorisation was given to use any force to implement the Zone. NATO was powerless to intervene, not only when Dutch troops were threatened, but also when massacres of thousands of civilians took place at Srebrenica, Zepa and Gorazde. Insurgents just chose to ignore the air presence and concentrated on attacking defenceless civilians, hence provoking Western sensitivities. Asymmetric warfare was born. The situation was, however, quickly brought to a close in 1995 when the US and other allies, carried out Operation Deliberate Force. This, an intense air offensive targeted against Serbian forces, brought Serbian President Milosevic to the negotiating table and coerced him into signing the Dayton Accords after, incidentally, he was invited to dine sitting under the wing of a USAF U-2 spy plane.

Five years later, still doubting Western resolve, and believing Russia would now intervene on his side, Milosevic began to use regular Serbian forces in a vicious campaign both against the insurgent Kosovo Liberation Army and to cleanse Kosovo of its ethnic Kosovars. Although Madeleine Albright, the US Secretary of State, thought that a swift air shock would return Milosevic to the negotiating table, the air campaign took some 3 months, involved 1,000 aircraft and required some 38,000 combat missions to convince the Serbs that they could not continue. The lesson was clear. Against those fully committed to their cause, an air coercion campaign will take considerable effort and cannot quickly be accomplished by a short sharp shock.

But the Kosovo air war also highlighted a number of other features, principally over the politics of war. In the first instance, belief that Milosevic would fold after just 48hrs revealed a lack of NATO planning because of a lack of NATO consensus. As military staffs had to go back to the drawing board a number of questions arose. At the military level, was Air Power to destroy the Serbian forces in the field thereby preventing further ethnic cleansing, or was the aim to coerce the Serbian leadership directly by inflicting costs, especially through the destruction of key infrastructure targets inside Serbia, especially those mostly owned by Milosevic's friends? At the political level, was Air Power to be used decisively, or would political consensus only be maintained by a more gradualist approach? Would targets be selected and prioritised for their military or coercive effect, or would they only be selected if all agreed – "the horse designed by committee" approach? And, finally, would the West countenance land force operations or would a possible long-term commitment and the concomitant risk of casualties rule this out?

These issues seemingly presented Milosevic with an easy option: ride the storm, accept the costs, and just wait for NATO to collapse in squabbles and infighting as civilian casualties mounted and with little achieved. Militarily, a parallel option was attractive: either come out and fight – which would certainly be required if NATO invaded (in which case the forces would become a lucrative NATO air target); or just hide and endure. In which case, amongst the mountains and forests, NATO would have to spend many days and many missions searching with few successful attacks. This would allow the Serbian army to maintain its covert position, with the occasional foray for ethnic cleansing.

Meanwhile, if this campaign demonstrated anything it showed the bizarre impact of disparate pressure groups on a modern military campaign. The entire conflict was carried out in the full glare of the Media spotlight, both at home and even on social media in theatre. Battle damage reports were available to the general public before they became available to military analysts. National politicians were under continuous scrutiny, often invited by public and media alike to adopt positions they might afterwards regret, and all this was reflected in the disparate attitudes to targeting. As one analyst reported "...zero non-combatant casualties became not only the goal of strategy but also the international expectation" as well.⁴

4

Benjamin J Lambeth, NATO's Air War for Kosovo, Rand Corp, 2002, p xvii.

At the end of the first month, after a period of considerable incoherence in the air campaign, Milosevic must have been convinced that he could ride out the NATO attacks as the campaign seemed to be heading for a repeat of Rolling Thunder, the initial air campaign over Vietnam. If LBJ's "bomb-pause-bomb" strategy was taken as a sign of weakness by Hanoi, the sheer cacophony of NATO nations must have seemed a predictor that the campaign would soon collapse. Fortunately, individual nations realised that what was at stake was not merely the fate of the Kosovars, but actually the future of NATO itself, and the air and political campaign slowly began to become coherent, with a number of coercive pressures being brought to bear on Milosevic. First was the realisation, spelled out to him by Martti Ahtisaari and Viktor Chernomyrdin that Russia would not (and could not) intervene, and that he and Serbia were alone; second was his indictment by the UN Tribunal in the Hague for his alleged war crimes; third was the possibility, increasingly advanced by a number of European nations, that NATO would be forced to invade; and finally, and probably the most persuasive was the realisation that the bombing campaign would continue until the battle was finally won, and there was now no chance that NATO would collapse in disagreement.

In the event Milosevic and his cronies finally realised that the costs, physical, psychological and political, were not worth it and after 78 days he agreed to a ceasefire.

What is remarkable is that, despite the fractious nature of the Alliance, the military frustration about political whimsy and interference, and the lack of any clear direction, Air Power still managed to be effective in acting as the dominant element of the coercion panoply. Of course, the military is the servant of politics and well is it said "War is politics by other means", but bad politics make bad war, and directionless politics probably spell defeat.

Modern Era

9/11 and the Aftermath

Realisation of the strategic potency of Air Power is nowhere more vividly illustrated than by the iconic pictures of the air attacks of 9/11. For the first time the power of air attack had been exploited by an elusive group of unsophisticated extremists intent on changing the whole strategic landscape through the



discomfiture of the greatest nation on earth. The Al Qaeda group led by Osama bin Laden clearly had no argument with the individuals who died in the World Trade Center; Osama's real and effective psychological target was the people of the USA, and hence their President. It was a coercive strategy writ large and although the stated aim of this coercion (the removal of infidels from the Holy Places) has yet to be achieved, the attack achieved international notoriety and sparked a whole spate of subsequent intervention operations, which Osama no doubt hoped would ultimately cripple Arab-American relations in the hope of achieving a pan-Islamic Ummah, a world of Islam.

Since the 9/11 attacks nations have adopted stringent policies for preventing further similar outrages, but terrorists have now realised the potential for mischief possible from using the air weapon.

Afghanistan & Gulf War II

The immediate reaction to 9/11 was to demand the immediate handover of Osama bin Laden and, when that was refused, to attack Al Qaeda in its heartland, Afghanistan. This attack, combined with the subsequent invasion, brought out a number of illustrative lessons regarding the use of air power in the modern era.

First was the potency of aircraft armed with Precision Guided Munitions (PGM) operating with Special Forces (SF) and Air Force Combat Control Teams. These SF teams, sometimes even mounted on horses, and integrated with local militia from the Northern Alliance, directed precision air attacks from aircraft circling overhead. The Taleban had no counter to such attacks and for the most part retreated or just melted away. Cities were abandoned; the Taleban government retreated to the mountains of Bora Bora and, it seemed, the conflict was over.

In an effort to "win hearts and minds" and to train the new Afghan National Army, considerable Western ground forces were deployed into theatre. However, with aircraft rapidly retasked for the impending invasion of Iraq and with force levels scaled down, aircraft could only be used in limited localised support of ground units – defending small remote garrisons through offensive air support and using attack helicopters, and for providing tactical Air Transport (AT) and CASEVAC. Though individually effective, the scale of the air operation lacked the pervasiveness necessary to convince insurgents that there was nowhere to hide. Many beleaguered garrisons soon found themselves with little or no air support and had to fight it out. The psychological dominance achieved during the invasion slowly dissipated and the Taleban took the opportunity of characterising air strikes as

attacks on Islam itself, particularly when a number of collateral damage events took place. A wedding party was attacked on one occasion, and a hospital on another. These high profile catastrophes caught the attention of the world's press and underscored the vital role of accurate air analysis and air intelligence in preventing strategic disasters.

In the 2003 invasion of Iraq, there was no precursor Air Campaign. COMCENTCOM's aim was to preserve the element of surprise for land ops and deny Saddam the opportunity to take pre-emptive action such as burning oil wells. Nevertheless, Gen Franks intended the "Shock and Awe" of his campaign, using high technology air and ground assets, would persuade the Iraqi forces to give up. Air power was therefore largely limited to the support of land forces.



MSgt Bart Decker from the 23rd STS, on horseback in the Balkh valley, during the initial days of the US invasion of Afghanistan in 2001.

After a reasonably successful first week, coalition forces were confronted by huge sandstorms. In this period, "wobble weekend" the land offensive slowed to a halt while the Iraqis took shelter where they could, including under bridges. Despite these sandstorms, Air Power, using precision satellite-guided munitions of the JDAM-type targeted armour and infantry in known locations. As COMCENTCOM himself recorded, "When individual tanks and artillery pieces suffered direct hits from JDAMs during the height of the three-day sandstorm, Iraqi morale plummeted".⁵

"This affected the morale of the soldiers, because they were hiding and thought nobody could find them."⁶ Coalition Air Power proved devastating not only to military equipment, but to the will to fight of soldiers and officers alike. Most Iraqis, appreciating that the overthrow of Saddam was a foregone conclusion, deserted. "I asked Petraeus about enemy prisoners of war. We don't have a whole lot, Sir. Most of them took off their uniforms and just walked home."⁷

⁵ General Tommy Franks, *American Soldier*, Regan Books 1st Ed, 2004, p559. Joint Direct Attack Munition (JDAM)

⁶ Enemy POW report.

⁷ Franks, ibid, p522.



Of course there were ground battles, and some of them severe, especially when the Coalition encountered elite units, but in many cases progress was uninterrupted except by localised skirmishes or ambushes. Demonstrative of the capability of air power was the recovery of Pfc Jessica Lynch and her co-captives when a sizeable SF air operation was mounted to extract her from her hospital bed some way inside enemy controlled Iraq.

Typical was the comment by a Marine lance corporal. After leaving Kuwait, L/Cpl Edward Shirley's M1A1 Abrams tank... travelled through Basra, up the Euphrates and Tigris rivers, and into Baghdad. "At some point we

At some point we expected there to be an armored battle but it never happened... the air force had taken out most of their tanks and others were abandoned. We saw a lot of burned out Iraqi armor...

expected there to be an armored battle but it never happened... the air force had taken out most of their tanks and others were abandoned. We saw a lot of burned out Iraqi armor..."

With most of the Iraqi army having deserted, and with the remainder rapidly disbanded, the seeds were then sown for a resentful insurgency, especially as power had now passed from the Sunni Ba'ath party to Shia irregulars. The ensuing anarchy and widespread insurgency required Air Power to be used in a similar modus operandi to Afghanistan, but again without force levels sufficient to dominate the ground and control events. General Eric Shinseki, US Army Chief of Staff, recommended "several hundred thousand" troops be used to maintain post-war order, but then Secretary of Defense Donald Rumsfeld – and especially his deputy, Paul Wolfowitz – strongly disagreed.

A final and evolving factor in both the Afghanistan and Iraq theatres was the evolving use of UAV/Remotely Piloted Aircraft (RPA). Initially used solely for visual reconnaissance, the RPAs slowly began to use a wider range of sensors and to be equipped with short range missiles. Such systems have the advantage of a low detectability and, in clear weather, the ability to monitor activity on the ground with great discrimination. When armed with weapons such as Hellfire they cut down the detection to shooter time to a matter of seconds. However, the decision to use the weapon was and is heavily dependent on political will and robust Rules of Engagement, so well-illustrated in the 2016 film "*Eye in the Sky*".

Libya

In February 2011, civilian unrest and protests against Colonel Gaddafi's regime began. On 24 February the Royal Navy and Royal Air Force began evacuating UK nationals. Over 800 British and 1,000 others were evacuated using a combination of HMS Cumberland and HMS York, and by using C-130 and SAS to rescue them from hostile sites deep inside Libya.⁸

It soon became clear that a massacre of rebels, and their families, would be likely in and around Benghazi. Gaddafi's forces had been detected marching on the city with armour, while the Rebels were armed with small arms and truck-mounted guns.

There was a cry for help to prevent a humanitarian crisis and President Sarkozy (with French colonial and other interests) persuaded Britain and the US to support. France unilaterally began an air interdiction campaign.

On 17 March, the United Nations Security Council adopted Resolution 1973 which reinforced and tightened the arms embargo against Gaddafi, established a no-fly zone in Libyan airspace and authorised *"all necessary measures … to protect civilians and civilian populated areas under threat of attack in the Libyan Arab Jamahiriya, including Benghazi, while excluding a foreign occupation force of any form on any part of Libyan territory"*.⁹

The West then responded quickly using the inherent flexibility of their air forces. On 19-20 Mar US, UK and France begin establishing a No Fly Zone (NFZ) over Libya, and this was followed by a sizeable air attack against C2, Air Defence (AD) and support forces. The same night 112 Tomahawk missiles were launched from US/UK ships against AD sites. UK-based Tornado attacked bunkers with Storm Shadow missiles, before returning all the way back to the UK (3,000nm). On the 2nd night 2 x B-2s attacked and destroyed 45 Hardened Aircraft Shelters (HAS) at the airbase near Sirte. By Day 3, all Libyan SAMs had been destroyed.

Once air superiority had been achieved Libyan armour was attacked and progressively destroyed outside Benghazi. Rebels were thus encouraged and empowered to protect themselves and then take the fight to Tripoli.

Despite the initial US reluctance to become involved, NATO was however heavily

HCDC Report – Operations in Libya, p13.

⁸ http://www.raf.mod.uk/news/archive.cfm?storyid=A4A68A2F-5056-A318-A8DEE3EE8FDF6F11.

reliant on the USA. Despite Europe providing most of the air firepower, over 70% of all support sorties were provided by US assets.

Operations concluded on 31 Oct after the capture and death of Col Gaddafi. Gaddafi's attempt to escape had been thwarted by air reconnaissance, with information passed to rebels to enable them to intercept (and kill) him.

Air Power – the Future

So what threads can we see permeating Air Power's first century? Clearly, from its early and somewhat hesitant beginnings the air weapon has evolved from a means of spotting from the air to becoming a dominant if not the predominant weapon of war at all levels. No one doubts that space platforms provide instantaneous communications, or that they can use their optical and other sensors to detect much of what happens of the surface of the earth. These sensors, coupled with RPA, provide long-duration almost undetectable reconnaissance with a discrimination that allows individuals to be identified, and for selected targets to be destroyed within seconds. As ever, the problem is that in a period of peace there are just too few of them for widespread effective coverage. Moreover, although we gain access to high quality imagery, it is often in the understanding of what that imagery means that we fall down.

However, given the capability of Western aircraft – from fighters to recce aircraft, to bombers, to air defence sup-

"Our problem was we always made it look too easy." – Gen Carl Spaatz, USAF

pressors, not to mention the AWACS, ISTAR and AAR – the West's air forces can currently range across a battlefield with impunity, attacking whatever target we desire with great accuracy. That it seems so easy belies the huge investment of time, resources and energy that goes into making such precision attack seem so effortless and, at the same time, valuable. However, if the 1973 Yom Kippur war teaches anything, that luxury may not always be there, and the shifting balance between offence and defence is never-ending. The effectiveness of newer Russian SAMs and radars may mean that even today's stealthy aircraft may one day become detectable and hence vulnerable. In particular, the RPAs upon which we now place such reliance may, in war, as one US General noted, "fall from the skies like rain".¹⁰

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Lt Gen Dave Deptula, conversation with author.

So, if we want our Air Power to maintain its technical edge, we must keep up our guard, and that means money and political commitment. Again, if we want to use it successfully it means air power must be sufficient to be pervasive, leaving an enemy nowhere to hide. The penny packets we have seen deployed in recent years may be excellent in providing political reassurance, but they provide little succour for beleaguered ground troops, and often serve to demonstrate a lack of resolve and political weakness, and in doing so, far from overawing an enemy, actually encourage him.

In an era of extreme weapon accuracy, we also have increasingly to ask how we can use that precise destruction to best effect. Destroy, or threaten? Destroy to deny, or destroy to induce? In whichever way we use Air Power we need to fully comprehend the range of effects and outcomes: physical, as well as psychological and political.

A lesson from both Vietnam and Kosovo is the deleterious effect of political interference. While military forces are necessarily the servant of the executive, neverthe-

A good politician, like a good general needs to say <u>what</u> he wants to be achieved, not <u>how</u> to do it.

less, politicians must appreciate that naïve interventions or cacophonous direction makes an operation less than decisive, often extends the conflict, increases costs and casualties and achieves the very result they sought to avoid. A good politician, like a good general, needs to say what he wants to be achieved, not how to do it.

A final thought, now that high technology, such as mobile phones, computers, and even drones are increasingly available throughout the entire world, is to ask by how much have we unwittingly empowered the underdog? We have already seen the effectiveness in 9/11 of turning the West's high technology against us. What will they think of next?

And now, with Cyber warfare also being added to the panoply of weapons, one wonders if war, not peace, will become the new norm, and escalation up the ladder of violenece more, rather than less, likely. If so, Air Power with its inherent flexibility and speed of reaction is likely to be called on more often, and the challenge of the future will be to exploit the new (nano) technologies and Air Power's inherent charateristics to prepare the West for whatever the opposition has to throw at us.

AIR POWERS, AIR POWER AND THE NATIONAL SECURITY STRATEGY by Michael Graydon

I am unashamedly going to latch on to the clear success of the 2015 COMEC Conference at which Professor Andrew Lambert and Vice-Admiral Sir Jeremy Blackham, an old friend, spoke so well on the subject of Britain's Maritime Future, avoiding single minded advocacy for the maritime cause and posing questions which I am sure invited a good session afterwards. Accordingly with this good example, I will do my best to avoid a single service focus on air power; indeed I have strenuously avoided doing so for a long time – looking back I last spoke on the subject at the Sheppard Conference in 2004 – and have preferred since to take part in joint service discussions and with the assumption that today's armed forces should know the benefits of joint operations, know the strength and weaknesses of naval, land and air forces, and are trained wisely together to know that these components, like the elements of a good orchestra, will have their solo moments but combined are greater, much greater, than the sum of their parts.

So let me take another leaf out of last year's book and float some general thoughts before focusing on air power as it is generally understood today. Air

'The ability to project power from the air and space to influence the behaviour of people or the course of events.'

Power has been defined in a number of ways. Currently the Air Force describes it as 'The ability to project power from the air and space to influence the behaviour of people or the course of events.' This works pretty well if you are focussed on the military aspect. But, one might ask, should the military aspect totally dominate the definition. It certainly has a large part to play in the matter but there is more to it I believe, and the light shone so effectively by Professor Lambert last year on maritime power bears a focus on the air too. He submitted that maritime power was not primarily a military calculation but was a measure of total national engagement with the sea and the capacity to operate there. States that choose to pursue a seacentral approach to trade, security and identity are he concluded seapowers.

Can a Nation be an Air Power?

I submit that air power should not just be a military calculation either. Whilst new on the block, relative to land and sea warfare, British air-mindedness has foreseen

the importance of the air environment: whether opening up the world, and the pioneering flights of Britons such as Alcock and Brown sparking the introduction of airlines carrying post, passengers and time-sensitive material. Whether establishing a world leading aviation industry with not only a reputation for R&D in such engineering feats as the jet engine, the Comet jet airliner, Concorde, but also our innovative thinking towards such things as low cost airlines which have democratised travel, driven down costs and in turn enhanced the prosperity of all. If this were not enough, it was, of course, Britain that established the first independent air force, formed on the back of concerns over national air defence flowing from the Zeppelin and Gotha attacks on London from 1915 to 1917. The security of these islands has ever since been underwritten by our control of the national airspace. And the RAF's involvement overseas from the days of Empire right up to coalition operations of today has rightly demonstrated across the world the key role played by air in the wider security spectrum. And it is our deep involvement in air matters, in common procedures and task sharing that leads to our easy integration with other nations, and hence markedly increases our influence on the world stage.

Our economy also is heavily reliant on air travel, witness the disruption and problems that arose when Icelandic volcanic ash blanketed Northern Europe, when French Air Traffic Controllers go on strike, or when US flights were barred following the 9/11 disaster. London already has 3 separate airports and Heathrow itself is a major world hub with tourism bringing great benefit to the whole country. Now,

at the beginning of the 21st Century almost every city and major town in the UK is served served by its own airport. by its own airport. People

...almost every city and major town in the UK is

think nothing of going to Rome for the weekend and expect to be able to travel by air on holiday or business. But our air reliance is not just on the air medium in the lower atmosphere; we must see air and space as one. There is no artificial boundary between the two and we rely equally, though differently, on both. For example, for a nation such as ours relying so heavily on the financial sector, imagine trying to operate without satellite communication. Our ability to punch above our weight as a member of the Security Council, and other august bodies, our diplomatic influence, and our regular coalition military activities all place great reliance on space-based assets.

In this light and perhaps without realising it, I believe we can conclude that our widespread engagement across this environment, our dependence on the air and space for our security, for vital aspects of trade and key elements of our financial wellbeing, and for the influence and identity this brings us around the world, make us de facto a true 'Air Power' nation, fully complementing our existing identity as a sea power.

Of course this does not detract from the importance of maritime power, both military and civilian, nor does it alter the importance of military land operations which are likely to engage us around the world and continue to be a dominant feature in the 21st century for some time to come. But we must recognise that control and exploitation of the air and space environment will remain as it has done for decades the vital first order activity for the maintenance of our civilian economy and for all major military activity.

So, if we are a nation which relies significantly on the provision of air and space capabilities, an 'Air Power,'

Nation as 'Air Power'...the consequences of this characteristic?

what must we bear in mind as we address the consequences of this characteristic?

1. Public support for investment in the aviation sector rests less on the visibility of the military and its role in security than perhaps on the accessibility of airports and cheap flights and on business interest in retaining a viable industry. Government should perhaps be rather more persuasive as to the merits of robust military as well as civilian aviation sectors and may have to rely on media assistance to make the case.

2. The use of air and space which provides the hidden wiring for so much of our industry and provides the high tech lifestyle assumed as a right by the population, presents those responsible for its security and reliability with massive challenges in the era of cyber crime and cyber warfare. Sadly though, the proliferation of high technology world wide offers new security challenges by extending the number of threats from extremist and radicalised individuals. Our vulnerability and that of all western nations in both the commercial and military arenas is a weakness which one day could, and probably will mercilessly be exploited.

3. Aircraft are expensive; military aircraft increasingly so. The cost of an F-35 Lightning is expected to be in the region of \$130m and this I assume is based on a considerable production run. In these circumstances you very quickly come up against the quality versus quantity question. Do we have the right balance between those assets vital to defeat whatever a peer-group enemy may field versus what we need for more routine operations?

4. In parallel, manpower costs – training costs in particular - rise as technology improves capability. The more you can do with an aircraft, the greater is likely to be the training bill. And this tends to drive down manpower numbers to compensate, reducing both flexibility and resilience. Moreover, the investment needed for an F-35 pilot- over £4m – demands a return on service of a minimum of 12 years. At a time when pilots are in demand for the commercial sector this can be very difficult and expensive to achieve, as the Army have found in retaining Apache pilots.

5. The support costs of hi tech equipment are always underestimated. To support a capability through the probable 25-30 years in service – a figure regularly achieved in practice – a spares regime which works in peace and war must be provided and training ensured throughout. I have yet to see this working properly in the military sphere. Industry working with the Service promises much, but for one reason or another, inadequate governmental up-front funding, Service savings measures or exaggerated claims by industry, the last 20 years has not met requirements nor provided levels of assurance on which to plan with confidence over an extended period. In contrast the commercial aviation sector would appear to have achieved high aircraft reliability and a spares regime which works. As an aside, the RAF's Voyager, a modified A330-200 is demonstrating a huge improvement in reliability and thus spares provision.

The RAF contribution to the Nation

If I have made a case as to why this nation should be considered an 'Air Power', I am conscious that I must spend some more time on how the RAF stands up to providing an air capability which supports this proposition. An air force must be able to react quickly to a variety of situations, and I mean quickly; not weeks, not days but hours

and minutes. In the case of Air Defence – 10 minutes, day or night, throughout the year. Maritime Air needs to react to

An air force must be able to react quickly to a variety of situations.

fleeting reports, again in minutes, and for the transport of Special Forces our Air Transport fleet needs to respond in very short order. Because of the continuous nature of their task, even when the combined Air Transport (AT) and Air to Air Refuelling (AAR) fleets are not at higher alert states, they can be re-roled far faster than most other military capabilities.

But timeliness is not the only factor; we need a range of effective capabilities that

match the threat or situation we face. An RAF Expeditionary Air Group can deploy a full range of assets very rapidly and a typical package might include Offensive Support and reconnaissance aircraft, Intelligence gathering assets, RAF Regt personnel and, depending on the threat environment and deployment base chosen, Air Defence assets might have to be in the van. Helicopters too may be required to provide vital ground force mobility in theatre and for the essential CASEVAC. UAVs will most likely also be included, both for the surveillance they offer as well as the low-risk strike capability. Any forward deployment must necessarily also be fully supported by the strategic assets including both tactical and long range air transport, air to air refuelling, maritime patrol to maintain the sea lines of communication and, of course, space-based assets and cyber warfare systems.

Such assets provide politicians with both our day-to day security and the rapid and effective response they desire in an emergency. The thirst for information gathering and Intelligence assessment is insatiable; the RAF has today a range of assets which in this field places it in the top end of air forces around the world. Sentinel, Rivet Joint, UAVs, fixed wing Reconnaissance, AWACS, and Shadow are a formidable collection and RAF crews are highly skilled in their exploitation. In this respect, we are still of much use to the Americans.

AT and AAR are provided by the A400M, C-130J, C-17 and Voyager and these are all state of the art aircraft, albeit numbers are marginal. Almost certainly any sizeable operation involving significant ground forces would thus require commercial freight and passenger carrying augmentation, with extended operations progressively dependent on sea supply.

Our Air Defence (AD) capability with Typhoon is equally world class. The multi-role variant also offers a flexibility which is essential for today's range of challenges. But despite the welcome increase in Typhoon aircraft numbers heralded in SDSR 15, fast-jet numbers remain low and are a real weakness. At one stage, in late 2014 with operations against ISIL in Iraq gearing up, the RAF had just 7 squadrons of fast-jet aircraft (3 Tornado and 4 Typhoon) with only 2 of the Typhoon squadrons having a very limited ground attack capability. If this were not bad enough, one of the Tornado Squadrons was actually due for disbandment in early 2015. All this was against the background of existing Air Defence commitments in UK and the Falkland Islands, ongoing tasking in Iraq and Afghanistan, together with emerging pressure points from Russia in both the Crimea and the Baltics. Thankfully, common sense prevailed and a reprieve for one Tornado Squadron was swift, maintaining the Tornado fleet at 3 squadrons, just sufficient to serve the anti-ISIL tasking

from RAF Akrotiri. Although this has meant that we retain 7 fast-jet squadrons pro tem, we should recall that in Gulf War I we had some 30 fast-jet Squadrons available. In recognition, SDSR 2015 planned to run on 2 Squadrons of an earlier mark of Typhoon for air defence allowing the remainder to become multi-role; but this upgrading and training will take some time. Meanwhile the Tornado, doing excellent work over Iraq and Syria, is still planned to be phased out. As yet there is no clear picture as to how and when the F-35 Lightning will replace this loss as the numbers ordered thus far, and the completion of Full Operating Capability, appear incompatible with Tornado Out of Service dates.

Moreover, the government's statement in SDSR 2015 that it will still proceed with the full 138 F-35 aircraft procurement may be on shaky ground in the light of the fall in the pound following BREXIT. There will be real risks in deploying our new carriers without sufficient defences, let alone any realistic offensive capability. The loss of the Harrier Force from SDSR 10 leaves a major gap in Carrier borne air.

The RAF helicopter fleet has been much in demand by the Army and is a well equipped and expert force. Its long association with Special Forces(SF) means that it remains a priceless national asset.

But finally, let's consider the Elephant in the Room for the last 6 years – the absence of any Maritime Patrol Aircraft. The so called capability holiday envisaged in the SDSR of 2010 was quickly exposed for its naivety in the decision to scrap the new Nimrod Maritime Patrol Aircraft. Without them our nuclear deterrent became more vulnerable in transit with as yet unknowable consequences, and an operation, similar to that mounted by Australia to search for the missing Malaysian airlines MH370, could not have been carried out by us in the Atlantic. This and the steady pressure from a variety of informed sources has thankfully resulted in the recent order post SDSR 15 of 9 P-8 Poseidon aircraft from America.

The story then for a nation which aspires to be an 'Air Power' is that industrially for now at least, and in both the commercial and military aviation sector, there is a strong foundation to underpin this ambition. Yes, there are concerns over the long-term health of the aviation industry, and the increasing presence of US

Yes, there are concerns over the long-term health of the aviation industry, and the increasing presence of US manufacturers in the UK suggest they sense gaps and opportunities.

manufacturers in the UK suggest they sense gaps and opportunities. Yes, militarily, aircraft numbers are at the low end of credibility for independent or sustained operations but, measured against most other nations, the UK can indeed pursue a strategic track as an 'Air Power' for trade, security, and as a means of influence.

But let me now turn to air power operations over the next 10 years or so.

Air Power in Future Operations

Following publication of SDSR 15, along with Jeremy Blackham, Air Commodore Andy Lambert and other colleagues writing for the UKNDA, we published a commentary on that important Paper, examining both the National Security Strategy and the Review of Security and Defence.

We said: 'This Review has come a long way from its 'horizon scanning' predecessor intent on savings, and confronts the need to face both state based threats and those that come from terrorism that recognises no borders. The Review identifies four particular challenges that will drive UK security priorities:

1. The increasing threat posed by terrorism, extremism and instability.

2. The resurgence of state-based threats; and intensifying wider state competition.

3. The impact of technological developments, especially cyber threats.

4. The erosion of the rules-based international order, making it harder to tackle global threats.

These threats neatly cover the functional spectrum, though the review significantly omits the military growth of China, the opening of the Arctic Ocean and the issue of Article V obligations with Russian threats to the Baltics.'

Let us take each of these in turn and see what air power per se can offer in support with the occasional reference to what an 'Air Power' nation can do as well.

Since November 2015 when the Review was launched, Prime Minister Cameron's comment in the Foreword:

'...the threats to our country are growing'. Prime Minister

"...that the threats to our country are growing' has surely been borne out.

Terrorism, extremism and instability in one way or another continue to dominate Western headlines. At one extreme we have a nuclear-armed peer-group competitor elbowing its way across Eastern Europe and threatening those NATO Baltic nations which house significant Russian diasporas. At the other we have seen a plethora of terrorist attacks against our continental allies, and must be in no doubt that we are targeted as well. In between, we face the chaos of Syria that not only floods Europe with refugees but threatens the security of the entire Middle East, potentially drawing in Saudi Arabia and Iran on opposite sides, and which encourages extremist quasi-religious regimes such as ISIS. There is little sign as yet that we have any real solution to this disorder certainly in the short term.

So where does Air Power fit in, and what must Air Powers do?

On a continuous basis, air power will be providing a range of functions. Intelligence from air platforms is being delivered to a full range of Government agencies involved in the security of the nation, and indeed to allies as well. Air Defence aircraft will remain at high alert, ready to be scrambled for intruders and possible hijacked airliners. Airborne support to maritime operations attempting to intercept the illegal immigration trade continues. Special Forces and their helicopter lift will continue their operations far and wide and remain on alert for further tasking.

Hopefully on a less permanent basis, it is nevertheless probable that our involvement in operations in the Middle East will also continue with C4 ISTAR, offensive support to friendly ground forces, attacks on terrorist vital assets, transport and supply of SF. Given our sensitivity to casualties, and our reluctance to be more fully involved on the ground, it is hard to see that this model of an air heavy contribution to coalition operations will change much for some time yet. While our air commitment to such operations is only part of the panoply of options, it allows the UK as one of the world's 'Air Powers' to be fully involved, exercising its responsibilities as a member of the UNSC, and using its air power to mitigate the worst effects of a conflict, to provide support for friendly forces, and to buy time for diplomatic and other measures. For a lasting solution, of course, instability must be tackled at root and I will return to one air aspect of this when looking at the erosion of the rules based international order challenge.

Though the Cold War is thankfully a thing of the past, state-based threats sadly remain. These will require the full range of air power capabilities. For nuclear

deterrence to be credible, conventional forces must represent serious obstacles to adventurism by providing credible rungs up any escalation ladder. Hybrid or ambiguous warfare thrives on weak conventional forces and uncertain leadership. Forward basing as in the Baltics of Typhoon and ground forces on rotation plus a maritime presence is an important part of this form of credible deterrence. In addition, any nation contemplating aggression against us would have to take into account national and international ability to reinforce rapidly; capable AT and AAR fleets and a potent Expeditionary Air Group have a great contribution to make to this element of their calculation. A further factor here is the credibility of existing Defence Agreements- an example being the Five Power Defence Agreement (FPDA) involving UK, Australia, New Zealand, Malaysia and Singapore. In recent years there has been more regular exercising of air forces in support of such arrangements, thereby sending out important signals of commitment in this part of the world. The Gulf region too has seen a quite regular presence of RAF fast jets for cooperative exercises.

And behind all of this are the unseen battlegrounds, only apparent to the public when something goes wrong. The Cyber threat, in particular, has seen increased efforts involving GCHQ and MOD with the RAF as the lead service in this field; the Service experience in Electronic Warfare has been a useful stepping stone here.

The National Security Strategy

Let me turn to a final air opportunity. Projecting our Global Influence, which the SDSR identifies is the most far reaching of NSS objectives, carries with it a recognition that our security can be advanced in the future by a greater engagement in those areas where instability - so often the breeding ground for terrorism - is rife. The benefits that can be achieved from soft power uses of air power, offer a welcome vision of the future. Quite apart from our humanitarian activities over many years, there is one soft power option that is so easily overlooked. In the past we have gained enormous security benefit from training overseas personnel from a range of nations at either UK establishments or through Military Training Teams overseas. Foolishly we let most of this lapse for short sighted Treasury reasons. For minimal savings we lost huge influence. I know from my personal experience the lasting goodwill that flows from UK trainees, many of whom reach the higher levels in their Service, if not their country. If we are serious about this engagement policy, and I believe strongly in its long term benefit, then let us do it properly and try to recover those lost when our charging regime and the reduction in our own training capabilities had been so

foolishly applied, as well as adding new nations to the fold. This added to the many benefits that could flow from educational initiatives, and the whole range of soft power training and engagement, will do far more in educating future leaders and thereby avoiding the erosion of rules based international order than any short-term military operation ever could.

Mounted already on one hobby horse, forgive me for attempting to mount one more at the end of my talk: numbers and cost. At what stage do we as airmen – and I suggest that it

...how valuable is just one more high-tech weapon compared with several lower tech ones?

might apply to our colleagues in the Navy and possibly the Army as well – at what stage do we recognise that we are so far advanced technologically over the most likely challenges to our security, that we should refocus away from the relentless quest for even greater technical superiority and look at what we already do pretty well to make it more reliable, better and simpler, and let it be said, cheaper. This is not to say that we can allow ourselves to be outpaced by a peer-group competitor, but the issue is one of balance. Beyond a certain point how valuable is just one more high-tech weapon compared with several lower tech ones?

Nowhere is this more relevant than close air support for land forces. Whilst the stealth capabilities and weapons delivery accuracy of say the F-35 are remarkable, for the sort of operations that we are seeing year on year in Syria, and Iraq and previously in Libya, the use of an F-35 seems seriously over the top. Compare some relative costings and weapon carrying capability with the A-10 Warthog. Cost of one F-35 is \$130M plus; Warthog \$18.8M. Cost per hour to operate; \$45k versus \$15k. Weapons for A-10 up to 8 tons of bombs and missiles, 30mm seven-barrel Gatling gun delivering 3,900 depleted uranium rounds per minute. In contrast, the F-35B, the one we are buying, will have an externally mounted 25mm 4 barrelled gun, air to air missiles plus 2 x 1000 lbs internal bomb load, and a variety of external stores which may appear impressive but will limit hot climate operations off the carrier and at a stroke also remove the stealth advantage. Might there not be benefit in a different balance of numbers which allowed a lower cost capability to be available for just those operations which appear to be most likely for guite some time. At the very least, we should be debating the issue with an open mind, and not hide behind arguments we deployed in the Cold War period.

The 21st century is unlikely to be a comfortable one if its start is anything to go by. Sadly, I can make a number of predictions with which few would disagree: population increase will

...an 'Air Power' too, we are well placed.

continue with further pressure on diminishing resources; the flight from poverty, corruption and religious persecution will be unrelenting in its pressure on free world society and security. Russia and China will continue to stand in the naughty corner with many matters unresolved if not unresolvable in Eastern Europe and the South China Sea respectively. This continuing nationalism cannot but place uncertainty on future relationships with the West. The UK has now added BREXIT to these challenges; and the financial and strategic outcome will not be clear for some time. It may indeed be the spur to the engagement strategy already highlighted; if so then we already as a seapower, and I submit an 'Air Power' too, are well placed to pursue it. And the armed forces will play a key role here. I hope we have the common sense and the staying power to see it through.



"Projecting our Global influence". Squadrons of Stealth F-35 Lightning Mk II, will soon form the backbone of the UK's strategic offensive capability. They will operate from land and sea – off the new aircraft carriers, *HMS Queen Elizabeth* and *HMS Prince of Wales* – piloted by officers drawn from both the Royal Navy and the Royal Air Force.

Air Chief Marshal Sir Michael Graydon GCB CBE FRAeS

Air Chief Marshal Sir Michael Graydon retired as Chief of the Air Staff after 40 years in the Royal Air Force in 1997. In that time he flew as a fighter pilot and as an instructor in a number of appointments at home and overseas. He served on four staff tours in 11Gp RAF, MOD Joint Warfare, and with NATO in Holland and Belgium. He was successively Commander-in-Chief of RAF Support Command and RAF Strike Command, before becoming Chief of the Air Staff.



A non-executive director of Thales 2000-2010, adviser and Consultant to Cassidain, he was Chairman of Symbiotics and United Schools Learning Trust until 2015. Currently he is Vice-Patron of the Air Cadet Organisation, Vice-President RNLI, Chairman of Sutton's Hospital in Charterhouse. President of the Battle of Britain Memorial Trust, and has held appointments with The English Speaking Union and The Air Squadron. He writes of Defence for the UK National Defence Association and the media.

Air Commodore Andrew Lambert

Air Commodore Andrew Lambert flew Phantoms and went on to run the RAF's 'Top Gun' School. A Planner for the 1991 Gulf War, he then commanded a Tornado fighter Squadron on operations over Bosnia. After a Master course at Cambridge, Andrew served successively as Director of Defence Studies RAF, Air Commander in the Falklands and British Commander



for the Iraqi Northern No Fly Zone, based in Incirlik, Turkey. As an Air Commodore he served as Deputy Commander for Norwegian Air Operations, and the Assistant Commandant (Air) at the UK Joint Services Command and Staff College, Shrivenham.

A military historian, he has published a number of papers on the Psychological Impact of Air Power and Coercion. He is a recent Director of the UK National Defence Association, A Director of the European Rim Policy and Investment Council and has published several papers on British Defence Policy. Andrew lectures widely on military and Classical history, Psychological Warfare, Air Power and contemporary Defence subjects.

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- Front cover: RAF Typhoon, Europe's most advanced swing-role combat aircraft providing both air-to-air and air-to-surface capabilities.
- Inside back cover: Predator, Unmanned Aerial Vehicle (UAV)/Remotely Piloted Aircraft (RPA).
- Back cover, top: RAF Tornados, GR4, two-seater, all-weather day/night attack and reconnaissance aircraft.
- Back cover, lower: RAF Chinook, heavy-lift and troop-carrying helicopter.



