

Air Power Review

Deterrence Special Edition

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Section 1: The essence and origins of the Royal Air Force's role in the UK's nuclear deterrent

Air Power and the Origins of Deterrence Theory before 1939
Professor Richard Overy

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Royal Air Force Air Power Review

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One-Day Conference held at the RAF Museum

Foreword

By Group Captain Jim Beldon
MBE MPhil MA BSc FRAeS RAF
Director of Defence Studies (RAF)

Welcome to this special edition of *Air Power Review*, in which we focus on the role of air and space power in deterrence and, in particular, the development and implementation of the Royal Air Force's role as the guardian of the UK's strategic nuclear deterrent in the 1950s and 1960s.

The first section of this volume opens with a detailed investigation into the origins of deterrence theory by the internationally renowned military historian, Professor Richard Overy. He takes us back to the origins of UK and US thinking on strategic deterrence from a distinctly *air power* perspective. It is, perhaps, easy to assume that deterrence as a strategy has been a cornerstone of military and naval thinking since time immemorial – and, indeed, deterrence has often played a part – but many would argue that its full manifestation as a lynchpin strategy only became manifest in the aftermath of Hiroshima and Nagasaki, when, heralded by the drone of the B-29's four Duplex-Cyclones, the atomic age began. Professor Overy examines the historiography of deterrence thinking in the USA and UK before and during the Second World War, at the end of which the deterrent principle of 'capability' (delivered by air power) at last matched the 'will' to employ it, thereby delivering the conceptual foundations of strategic deterrence in the Cold War.

It was an airman – Marshal of the Royal Air Force (MRAF) Sir John Slessor – who most strongly advocated a strategy of deterrence both in the UK and USA at the start of the Cold War, and we are indebted to Sir Michael Howard – perhaps the country's greatest living historian – for allowing us to reproduce the transcript of his 1998 Air League address on Slessor's role in successfully placing deterrence and the Royal Air Force at the heart of the UK's defence strategy in the 1950s and 1960s. Well-known though he may be to air power historians, Slessor's position in the pantheon of military leaders more generally has often been suppressed owing to the more famous roles played by many of his Second World War contemporaries. Sir Michael's illuminating account of Slessor's role in defining the UK's military strategy in the early 1950s not only encapsulates Slessor's clarity of vision and thought, but



also demonstrates how brilliant he was in persuading, cajoling, and outpacing all those who might have been disinclined to agree. Slessor was in very great company on the Chiefs of Staff Committee: the First Sea Lord, Admiral of the Fleet Baron Fraser of North Cape (ennobled in 1946, and First Sea Lord since 1948) and Field Marshal Viscount Slim had held more conspicuous high commands than Slessor in the Second World War, but, as Sir Michael Howard explains, he was undisputedly both the intellectual guiding light and driving force behind the Chiefs of Staff Committee in the early 1950s. In recent correspondence with me, Sir Michael described MRAF Slessor as ‘one of the truly great men of his generation’, and the transcript of his lecture gives ample proof of Slessor’s pivotal contribution in setting the foundations of success in the Cold War.

Dr David Jordan then provides an illuminating introductory overview of the development of the UK’s nuclear deterrent programme and places in a strategic context the role that the Royal Air Force fulfilled. Alan Jackson, winner of the RAF Museum Masters Prize in Air Power Studies for 2016/17, goes on to explain how Slessor’s vision was translated into reality as the ‘V-Force’ in the 1950s, and how the technological challenges, threats, budgetary pressures and co-operation with the United States all played into the varying efficacy of the V-Force during its lifetime as the nation’s principal deterrent arm, its greatest test occurring in Autumn 1962. This section concludes with a contemporaneous view of the debates in Whitehall by Peter Hudson, whose personal reminiscences as a senior Air Ministry official provide colour and detail to the arguments that surrounded the formation of the UK’s nuclear deterrent.

Section 2 of this volume focuses unerringly on the V-Force during a short period in October 1962 when the World held its breath during what would become known as the Cuban Missile Crisis. It is now generally agreed that the Crisis was the closest the world has ever come to nuclear Armageddon; the King’s College London Witness Seminar provides a vivid insight into the minds of operational aircrew, commanders and officials who were at the heart of the UK’s response to the crisis. At times, reading the transcript of personal accounts is a chilling experience for those of us who have lived through operationally demanding, but ultimately less existentially threatening times from a national – and perhaps even global – perspective. The seminar transcript is essential reading for anyone who seeks to understand not only what happened, but how it felt to those involved. We are very grateful to King’s College London for allowing us to publish the transcript of the seminar, and a final summary of the crisis by Professor Len Scott, who provides a fitting conclusion by placing the Cuban Missile Crisis in its full historical context from both a national and RAF-specific context.

Squadron Leader Stu Patton leads us into the final section of this volume by examining the utility of air power in conventional deterrence in the rapidly changing modern strategic environment, provoking some comparisons with the thoughts of the pre-war deterrence thinkers examined by Professor Overy earlier in the volume. Dr Mark Hilborne concludes this volume by taking us beyond the constraints of our own atmosphere and into space, where he examines the efficacy of Conventional Prompt Global Strike and whether the genesis of such

capabilities will either enhance or destabilise the foundations of deterrence on which post-war security has largely depended.

In producing this volume, we have brought together some of the best writing there is on the subject of deterrence and the Royal Air Force's long association with it conceptual development and practice. I would like to thank all the authors for their contributions and all those who have helped in other ways, not least King's College London and the RAF Historical Society, who have graciously permitted us to edit and re-publish some of their own documents; in so doing, they have helped us produce what I think is both a detailed and enjoyable collection of articles that knit together the story of the Royal Air Force's role in both nuclear and conventional deterrence in the post-war era.

Section 1:

The essence and origins of the Royal Air Force's role in the UK's nuclear deterrent



MRAF Sir John Slessor, pictured here in 1943.

Air Power and the Origins of Deterrence Theory before 1939

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By Professor Richard Overy

Biography: Professor Richard Overy taught at the University of Cambridge and King's College London before taking up his current appointment as Professor of History at the University of Exeter. His research interests include the history of the Hitler and Stalin dictatorships, the Second World War, air power in the twentieth century, and German history from c1900.

Abstract: A fully-fledged deterrence theory did not exist before the Second World War, but its genesis can be traced back to the immediate aftermath of the First World War. Failed attempts to outlaw aerial bombardment led to the interwar conviction that 'war was now a clash of national systems and ideologies, in which both civilian and soldier alike stood in the front line'. As British Prime Minister Harold Macmillan said in 1960, 'We thought of air warfare in 1938 rather as people think of nuclear warfare today'. Although the alignment of theory and capability did not occur until 1945, Professor Overy identifies that deterrence as a strategy was as much an evolutionary development as it was a revolutionary one.

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Introduction

The roots of the modern theory of deterrence are to be found in the evolution of strategic air power before the Second World War. The word modern is used for a purpose. Deterrence is as old as fear itself; but as a formal description of a strategic aim it dates from the 1950s superpower confrontation. Though the concept is often used loosely, deterrence is generally taken to mean a strategic ambition in which a putative aggressor is deterred from military attack by fear of the consequences, not just for his own military forces, but for his society as a whole. Expressed in this way deterrence can only work if the threat of military retaliation is credible, and if there are no doubts about the political intention to use it.

In effect deterrence works in a relationship where both parties express a clear willingness and ability to resort to violence if deterrence breaks down, creating the central paradox of 'reducing the probability of war by increasing its apparent probability'.¹ Deterrence works only where the costs of attack vastly exceed the expected yield, as is manifestly the case with nuclear weapons. Of course, it is important to grasp that deterrence only describes the *effect* produced by nuclear confrontation. The primary military strategy pursued by the two superpowers since the 1950s has been nuclear air power, exercised first through bombers, then missiles. Deterrent effect is inseparable from the superpowers' war fighting capability, from the force preparation and military doctrine of their strategic forces. Deterrence is the effect, but it is credible and devastating war capability that produces it.

In this sense it is hardly an exaggeration to see the development of air power during the twentieth century as the central feature in the emergence of a strategy of deterrence. From its inception in the First World War, air power was regarded as qualitatively different from conventional surface combat, for not only could aircraft attack the national fabric rather than the armed forces but they also did so in a rapid and annihilating way: 'The very heart of a country now lies open to a peculiarly horrible form of attack which neither science nor invention can prevent, and to which no human skill or courage can be successfully opposed.'² Long before aircraft or bombs really had the technical means to fulfil this nightmare, the Italian strategist, General Giulio Douhet (1869-1930), argued that 'the Independent Air Force is shown to be the best way to assure victory, regardless of any other circumstances whatever. . .'. The threat of the 'knock-out blow', a swift and decisive assault from the air on an enemy people, was identified with air warfare throughout the interwar period and has lived on into the nuclear age.³

While it is certainly true that nuclear weaponry has seen a radical qualitative jump in the air threat, there is a danger of exaggerating the change in 1945. Air power theory and force structure before 1939 show strong lines of continuity with the post-war world. Indeed many underlying assumptions, the categories and modes of thought which operate in deterrence theory, can be traced back to the pre-war era. Many central arguments in contemporary deterrence theory - defence/deterrence, first strike/retaliation, counter force/counter value

targets - have their source in similar 1930s arguments about first strike capability, or targeting. In fact continuity of personnel made continuity in modes of expression and strategic outlook almost inevitable. This is not to argue that a fully-fledged deterrence theory already existed before the war. The development of deterrence theory has been a slow, incremental process, bound up closely with technological change, political receptivity and combat experience. Nor in practice did air power work as a deterrent between the major powers in 1939 or 1941. Experience in the 1930s showed that neither the weapon nor the delivery system was sophisticated enough to provide the 'knock-out blow'. The theory had run ahead of the technology. After 1945 the two reached a fresh alignment.

The Framework for Deterrence

Any understanding of the threat popularly represented by air power ever since the First World War rests on two fundamental assumptions produced by that conflict. The first was that any future war was likely to be a total war again, a war of whole nations pitted against each other rather than a war simply of armed forces. Total war eradicated the distinction between combatant and civilian which had emerged under the rules of war in the nineteenth century. The second was the realisation that science held the key to military security or military success, and that the remorseless progress of scientific discovery should not be reversed or halted in a world of competing powers.

Both these factors, totalisation of warfare and the direct harnessing of science for national security, made possible not only the 1930s development of modern bombing fleets and civilian targeting, but also the threat of effective city-busting in the thermo-nuclear age. Total war, what Raymond Aron called 'universalised violence', was regarded by the First World War generation as both inevitable and repugnant.⁴ 'The very fact that this total war exists', complained the British strategist, Cyril Falls, 'in itself threatens the destruction and implies the doom of civilization.'⁵ Yet the emergence of the modern nation state, and the impact of popular mass politics on imperial rivalry destabilised the international structure and contributed to a widespread view that great states were engaged in a perennial struggle for survival. 'Modern war', wrote the German Colonel Georg Thomas in 1926, 'is no longer a clash of armies, but a struggle for the existence of the peoples involved.'⁶ The use of ideology as a political instrument made the conflict of whole societies more likely and widened the gulf between states even further. Ideological confrontation with its ingredients of irrationalism and narrow conviction increased the risks and threats of war and has continued to do so since.

The possibility of total war enormously raised the stakes in any future conflict, so much so that it was sometimes assumed after 1918 that its very prospect would deter any state contemplating it. But it also meant that in the war of the future the enemy's cities, industries, communications, even the civilian workforce were all targets for attack, a view which, despite its unhappy morality, became all too true between 1939 and 1945, and has remained enshrined in nuclear confrontation. The thresholds crossed in the First World War proved

impossible to reverse. The view of civilian populations as in some sense hostage in great power confrontation, which has been a centrepiece of 1960s and 1970s deterrence theory, depended on the ability to take effective military action against them. Though seaborne blockade continued to be regarded as an indirect and traditional form of 'total warfare', most interwar military thinkers saw air power as the way in which war could be brought home to an enemy people rapidly and decisively.

Air power was in this sense the typical instrument of total war. Aircraft were capable of attacking the industrial and administrative system, the 'vital centres', without which the enemy state could not function effectively, either as a military force or in providing the infrastructure and resources to satisfy the needs of the population as a whole. Marshal of the RAF Sir Hugh Trenchard, the British Chief of the Air Staff in 1928, argued that 'direct air attack on the centres of production, transportation and communications must succeed in paralysing the life and effort of the community and therefore in winning the war'.⁷ The US Manual of Combined Air Tactics in 1926 was even more explicit about striking civilians: 'The objective is selected with a view to undermining the enemy's morale . . . Such employment of air forces is a method of imposing will by terrorising the whole population of a belligerent country . . .'.⁸ Though such views were hotly contested at the time, on grounds both of morality and of military efficiency, it was widely assumed that major war between the powers would not only be a war of nation against nation, but also a war in which air attack would so undermine and demoralise the war willingness of enemy populations that air strikes might procure surrender on their own.

In the context of the 1920s technology this was largely conjecture, even fantasy, the realms - as one German writer put it - of 'misty illusions'.⁹ Yet at the time the perceived danger was taken very seriously. The threat of air attack lay in the eye of the beholder. In the 1920s, long before modern sensibilities were blunted by the Second World War bombing offensives, the possibilities of air power seemed horrific. Moreover the potential of air power seemed inexhaustible and its technical transformation fast and prodigious. In 1932 the British Foreign Secretary told the Cabinet: 'If civil and military aviation were in a position to do what they could do after 15 years of evolution, what were the prospects by fifty years hence?'¹⁰

The second factor that has shaped the emergence of deterrence was the unwillingness to put any constraints on the development and harnessing of science for military purposes. Of course some constraints could have been imposed: the Great Powers made considerable efforts from the Washington Conference in 1922 to the Disarmament Conference in 1932-4 to find ways of outlawing bombardment and bomber aircraft. Agreement was reached to outlaw chemical and biological weapons, though not on the application of science to produce them. But a combination of fears that air disarmament would somehow cripple civil aviation (science, this time, in the service of mankind), and a deep mutual distrust that air disarmament would be taken seriously by all the states involved, or that effective verification procedures might be established, led to repeated failure. Moreover all the powers had to take military

pressure and commercial good sense into account. The RAF campaigned vigorously against air disarmament: 'Surely', asked a Chiefs of Staff memorandum in 1928, 'it is useless to suggest that we can put the clock back ten years and get the cat back into the bag?'¹¹

The problem with aviation technology was the speed and unpredictability of change. The interwar transformation was radical: clumsy, short-range bi-planes at the beginning, experimental jet aircraft and trans-oceanic bombers at the end. No air force could afford to fall behind in the technological race. No government could risk unilateral restraint. Fear of obsolescence, and hence of increased vulnerability in the air, fuelled the scientific race. From the First World War onwards, the search was essentially for air weapons of optimum military efficiency, aircraft with long ranges and great lifting power, payloads of greater destructive effect, a super-bomber and a super-bomb. The British late 1930s development of the heavy bomber was expressed entirely in these terms; the specification was even called 'the Ideal Bomber'. The development of larger bombs, or better incendiaries, even of gas and germ bombs, all served the same end, to maximise the destructive power of aerial warfare. The subsequent development both of missiles and of atomic weapons (research which predated war in 1939) was simply an extension of the search for better weapons.

If it was only after 1945 that the marriage was consummated between ideal weapon and 'universalised violence', the courtship can be traced back to the industrialisation of warfare after 1914. Without the interwar conviction that war was now a clash of national systems and ideologies, in which civilian and soldier alike stood in the front line, and without the limitless scientific pursuit of the weapons to fight total war, strategy might well have evolved along different paths. Both factors shaped the frame of mind that strategists brought to bear on questions of confrontation and deterrence after 1945.¹²

The evolution of deterrence theory

(a) The Nature of the Threat

To be plausible deterrence required a threat so substantial that the risks of going to war far outweighed possible gains. In the 1920s it was difficult to see such a threat from either sea or land power: not only was this familiar military terrain, and survivable, but the impact of either on a potential enemy was uncertain and slow, as the recent war had shown. On the other hand, the threat posed by air power was perceived in fundamentally different terms. The language used indicated this: the 'knock-out blow', air 'frightfulness', 'terror bombing'. By the 1930s apocalyptic science-fiction, which had foreseen devastation from the air for 40 years, seemed to be becoming grim reality. Some prognostications have a very contemporary ring about them: 'Both sides will be aware', wrote Air Commodore L.E.O. Charlton in 1936, 'that at the pressing of a button, instead of by a slow method of mobilization . . . war can now ensue . . .'¹³ In 1921 Will Irwin predicted that in the next war Paris would find itself 'becoming a superheated furnace - the population struggling, piling up, shrivelling with the heat . . . the survivors ranging the open fields in the condition of starving animals'.¹⁴

Views such as these helped to popularise Douhet's concept of the knockout blow. There was seldom agreement among air thinkers and air force officers about which targets were so vulnerable to attack as to produce an almost instantaneous end to hostilities. In the 1920s great emphasis was placed on the enemy will to resist and morale, on the assumption often loudly expressed in British air circles that the moral effect of bombing was 20 times greater than the material. In the 1930s the emphasis shifted to more mundane economic targets, though the purpose was the same, to render the enemy state powerless through a combination of demoralisation and crisis of supply. Throughout the interwar period populations lived with the terror that conventional bombing would be accompanied by gas attack, germ warfare and incendiary bombing. Terror is relative. Harold Macmillan later recalled that 'we thought of air warfare in 1938 rather as people think of nuclear warfare today'.¹⁵ Despite efforts by more serious military analysts to undermine the alarmist views of air power, the belief that the 'bomber will always get through' and that the experience of mass bombing would be utterly debilitating and unendurable was accepted with the same disquiet with which modern populations contemplate nuclear winter.

The threat of air power, and hence its deterrent capability, embraced several different fears. For the decision-maker the central anxiety was that populations subjected to aerial attack would lose the will to resist and force a surrender on a more warlike government. Much interwar discussion of susceptibility to attack concentrated on the impact on cities. It was generally assumed that air attack would be directed at major urban centres, partly because they were the seat of government or the administrative nerve centres, partly because they were usually the site of industry, but largely because urban populations were regarded as more rootless and anxious, likely to crack under pressure.¹⁶ In 1928 the Air Ministry presented the Chiefs of Staff with an analysis of city vulnerability:

The psychology of the crowd differs enormously from that of a disciplined military force and civilians do differ essentially from soldiers in so far as the possession and maintenance of morale is concerned. Their morale is infinitely more susceptible to collapse than that of a disciplined army.¹⁷

Air Ministry surveys of the First World War bombing made no attempt to hide the fact that widespread panic had occurred when London was attacked. German reports of Allied bombing of cities highlighted the 'general sense of nervousness' produced by the regular threat of bombing which, for a number of victims, 'ruined their nerves, in some cases for life'.¹⁸

The persistent interwar fear in Britain was of a knock-out blow directed against London, not only the Empire's heart but also the largest conurbation in Europe. Some of the more imaginative predictions - and even more sober assessments by the RAF or the British government - stressed how vulnerable London was to the kind of strategic blackmail which deterrence carries with it. In the 1920s the putative enemy was France ('we must face the fact that if we fight France, London is going to be bombed' wrote a senior RAF officer in 1928)¹⁹,

in the 1930s it was Germany. In another of Air Commodore Charlton's military fantasies, *War over England*, published in 1936, the country was brought to its knees in two days. First a small force of aircraft attacked the annual Hendon Air Show, killing two-fifths of all British pilots and all the air force leadership and 30,000 spectators; then further attacks on London disrupted electricity, water supply and the docks. The *coup de grâce* was delivered with a gas attack on London and Paris which brought immediate surrender.²⁰

Charlton also expressed another powerful fear, widely shared in 1930s Europe; the belief that the experience of bombing would produce anarchy, and the menace of communism. He argued that Britain in 1936 had a fifth column of communists outside the threatened zone who would stab the government in the back once bombing started. Stanley Baldwin when Prime Minister in 1936 conjured up a lurid vision of the consequences of air and gas attack: 'I have often uttered the truism that the next war will be the end of civilisation in Europe . . . the raging peoples of every country, torn with passion, suffering and horror, would wipe out every Government in Europe and you would have a state of anarchy from end to end.'²¹ At the time of Munich the former French prime minister, Etienne Flandin, warned the British that at the first sign of bombardment the French Communist Party would 'set up a Communist regime'.²²

The threat of bombing, even on a relatively modest scale, compounded different anxieties, but they amounted together to a general apprehension that a surprise, annihilating air attack, without prior declaration of war, might achieve an internal social and political collapse and decisive victory. Even the Committee of Imperial Defence, not generally inclined to accept the more exaggerated claims for air power, admitted in 1936 that a well-aimed attack against 'our people' from the air 'might well succeed'.²³ The Air Staff told the Committee to expect 20,000 casualties in London on the first day, 150,000 in one week. These figures were on a scale that the government could not contemplate. Senior politicians and soldiers throughout Europe were haunted by the fear that air power might, in the end, produce the short, decisive conflict denied them in the First World War. General Sir Edmund Ironside confided to his diary shortly before Munich: 'we cannot expose ourselves to a German air attack. We simply commit suicide if we do.'²⁴

(b) The Deterrent Effect

There were two possible responses to the bombing threat and both were explored in the interwar years: first of all, the search for a satisfactory framework for mutual restraint, which was generally regarded as both more moral and less dangerous than the second, the search for a mutual deterrent. Mutual restraint implied a general willingness to accept that aerial bombardment was morally wrong, and that its prohibition was generally enforceable and verifiable. There was no shortage of goodwill, since all 1920s states found the threat of air attack a sufficient deterrent to search for agreement. But there proved to be numerous stumbling blocks. France refused to accept that Germany should be given parity of treatment; there were general fears that prohibition of bombing aircraft would somehow inhibit rapid

expansion of civil aviation, which was generally approved; and Britain, though willing to disarm to an agreed level if everyone else would, refused to outlaw bombardment as such because of her commitment to empire 'air policing', which had proved a very cost-effective way of coping with imperial unrest throughout the 1920s.²⁵

Nor, in the end, was there much confidence that all states would abide by the rules, particularly the Soviet Union, which then possessed the world's largest air force, and, after January 1933, Hitler's Germany. It was proposed as a compromise that the League of Nations should become the only organisation allowed to operate bombing aircraft, as the core of a genuine international deterrent to prevent aggression, but such a suggestion, with the problems it raised of sovereignty and unanimity, produced no more satisfactory outcome than 1940s American efforts to internationalise nuclear power. Not until the SALT discussions a generation later did mutual restraint once again become an option. Instead the final failure of disarmament in 1934 heralded the onset of an aerial arms race which was linked to a crude version of mutual deterrence.

It could well be argued that the Soviet Union had already based its rearmament drive since the late 1920s on the build-up of a deterrent threat directed at the capitalist world; Hitler was attracted to air power as a 'shop window' deterrent, keeping other states at bay while the broader rearmament programmes were completed. But from the point of view of the emergence of modern deterrence theory, the most significant change after 1934 was in the attitude of the two states, Britain and America, which had pressed most forcefully for air disarmament. This was a critical change, for it marked the point in the century when the democracies realised that their safety could be secured not through international co-operation alone, but by the possession of adequate military force. Without this shift in perception, which existed right through to the 1980s, the western world might not have survived either Hitler or Stalin.

From 1934 onwards in Britain, and from 1938 in the United States, the political leadership advanced the view that the only deterrent that would work against aggressor states was the threat of massive air power. Neville Chamberlain, first as Chancellor of the Exchequer with a keen interest in rearmament and then as Prime Minister, was personally convinced that Britain's security rested on the development of air power; 'The Air Arm has emerged in recent years as a factor of first-rate, if not decisive importance.'²⁶ President Franklin D. Roosevelt, after observing what he believed to be the deterrent effect of the *Luftwaffe* at Munich in 1938, urged on large-scale rearmament in the air: 'When I write to foreign countries I must have something to back up my words.' In 1939 he suggested to army leaders that 'the only check to a world war, which would be understood in Germany would be the creation of a great French air force and a powerful force in this country'.²⁷ There was moreover a moral gloss that the democratic states could put on air rearmament. In Britain it was argued that a large air deterrent force was not necessarily an indication of aggressive intent but was designed to make war less likely. As one writer in the *RAF Quarterly* put it in 1938, air power 'is the one method in this mad world of

ours of ensuring ourselves a reasonable chance of never having to use it . . . If it is the only way we can ensure peace, we must take it and pay the price.'²⁸

(c) The Operation Of Deterrence

Deterrence was not simply politically attractive. The air forces were quick to see all the ramifications of adopting a deterrence stance. The first issue, argued out at the highest level in Britain between 1934 and 1938, revolved around the question of whether deterrence required parity of air striking power or an overwhelming advantage in striking capability. At first the government accepted the thesis of parity, a force equivalent to that of any other major air force within striking distance of London. But by 1938, when the German threat was much greater, the RAF urged the view that to argue from strength it was necessary to build 'an immense bomber force'.²⁹ An Air Staff memorandum in July pointed out that neither the Navy nor the Army was likely to pose a serious threat to Germany, and that 'In the circumstances we must regard the Air Striking Force as constituting not only a strong deterrent and insurance in peace, but also as our only way of imposing our will on the enemy in war'.³⁰ Lord Weir, the man chosen to speed up air rearmament in 1936, very much favoured this view too. A keen champion of city bombing in the First World War, Weir sought 'a striking and offensive air weapon . . . so powerful as to compel the most wholesome respect from friend or foe'.³¹ The same ambition framed American air rearmament when the go-ahead was finally given in 1939. To make the deterrent effect possible at all overwhelming force advantage was preferred to parity.

Concern with numbers reflected deeper concerns about force credibility. This meant the development of an evident war-fighting capability if deterrence failed. As the US Assistant Secretary of War pointed out to Secretary of War Harry H. Woodring in 1938: 'We realise that airplanes alone do not make an air force. We must have skilled operators, trained maintenance and combat crews, efficient accessory equipment and ample bases.'³² Though both air forces recognised the deterrent potential in large-scale air power, it had to be seen as a real deterrent, capable of bringing to the enemy high levels of damage if peaceful persuasion failed. Air power in this sense was regarded as primarily offensive, whether the intention was to deter, to defend or to act the aggressor. It was this emphasis on offensive capability that made it difficult for the US Air Corps to sell the idea of the four-engined bomber to the Army or to Congress in the mid-1930s. Moreover, the recognition of the offensive nature of modern air power raised just those questions of pre-emptive strike versus second strike capability that resurfaced again in the post-war debates on nuclear strategy.

For Britain and France the fear of a pre-emptive strike from the air hung on the belief that the potential enemy, Germany, would not hesitate to launch such an attack without even a declaration of war. The planning staff in the Air Ministry told Bomber Command in 1938:

We have reason to believe that Germany will be ruthless and indiscriminate in her endeavour to paralyse and destroy our national effort and morale and unless immediate

steps are taken to reduce the intensity of attack it is conceivable that the enemy may achieve her object.³³

There were those in the Air Ministry who urged the need to plan for a first strike against German targets, even where this would bring 'retaliation from the enemy', but the politicians were firmly against the idea of pre-emption for fear of losing the moral advantage of not striking first. 'It seems hardly possible', wrote one official shortly before Munich, 'that in a war between major air Powers it can be very long before the gloves come off. But we certainly cannot be the first to take them off.'³⁴ The result was that the RAF was forced to think in terms of a second, retaliatory strike against Germany if, and when, the knockout blow was attempted. Much planning time was devoted to estimating what the potential German bomb tonnage was that could be delivered to British cities by an all-out effort, and what kind of force equation Bomber Command should be working towards to give the retaliatory threat credibility.³⁵

More important, the emphasis on second strike placed a considerable premium on selecting the right targets. War-fighting capability was seen as a function of effective targeting, and this raised the issue that has still not been resolved in arguments about air strategy between counterforce and counter-value targets. This was peculiarly an issue for British and American forces. German air forces were directed by the German high command to concentrate on tactical air support, with medium-range bomb attacks against military targets in rear areas; French air forces, though they would have preferred a more independent role, were similarly directed to a mainly tactical objective in preventing an enemy military breakthrough on land, with bombardment aimed at the combat zone and its support organisation.³⁶ The RAF was much more sceptical of the value of attacking enemy armed forces. Once a strike force was officially sanctioned in Britain, the RAF set about deciding which targets should most profitably be attacked if deterrence failed and the 'gloves came off'.

The whole tenor of RAF 1920s thinking had been to emphasise attacks on the vital centres of the enemy with the object of paralysing his industry and demoralising his workforce. This view survived into the age of parity and deterrence. The RAF War Manual of 1935 spelt out that the air offensive should strike at the 'nerve centres, main arteries, heart and brain' of an enemy economic and administrative system, with the aim 'of weakening his resistance and his power to continue the war'.³⁷ But it also became clear that in any confrontation with another power likely to possess a large air striking force that this kind of damage could be inflicted mutually. In the British War Office Manual of Combined Operations issued three years later the commitment to attacking counter-value targets was maintained, but it was recognised that counter-force strategy was also necessary in order to limit damage:

we are also vulnerable to air attack, and a similar strategy is available to the enemy. Unless, therefore, we can be sure that our offensive will be successful before a counter-offensive can seriously affect us - and such a situation can but rarely exist - it will be

necessary to employ a proportion of our air forces on operations aimed at destroying or diminishing the power of the enemy air force.³⁸

The RAF nevertheless saw counter-force not in terms of attacking the enemy air force in being, which was popularly regarded as an unprofitable operational option, but of attacking the industries and supply systems that supported the enemy air force. 'Any industrial objective of major importance is a more vulnerable target than an aerodrome . . . ', minuted one Air Ministry official the day before the Battle of France.³⁹

Throughout the pre-war period senior airmen in Britain refused to accept that an enemy air force could be attacked decisively or effectively by bombing. Bombardment tests conducted in the late 1930s showed that airfield targets were difficult to destroy and that superficial damage could be repaired 'in hours'.⁴⁰ The chief argument, however, rested on the grounds that an air force would always be too well dispersed and camouflaged to present more than fleeting targets. To be effective air power had to be directed at targets which would hurt the enemy: 'It is of the utmost importance that, *when we do initiate air action on a serious scale, we must be allowed to do so in the most effective way and against those objectives which we consider will have the greatest effect in injuring Germany, unhampered by the inevitable fact that there is bound to be incidental loss, and possibly heavy loss of civilian life.*'⁴¹

When American airmen began to think seriously about what they would do with their striking force once they had it, they too favoured counter-value targets, and for largely the same reasons, that the enemy will-to-resist had to be broken by denying his society and economy access to vital resources. Colonel Frank M. Andrews, a 1930s champion of strategic bombardment, was even prepared to suggest that 'under certain conditions it may be necessary to carry on reprisal activities by attacking hostile population centres'.⁴² Those conditions would be met when fighting an enemy who was also prepared to attack civilians. The framework for the more sophisticated 1960s counter-value threats can be traced back here to the recognition that the air threat had to be met not just by air defence, but by the promise of massive retaliation in kind, even against civilians.

These views still left the question of which targets really would have maximum damage effect on a potential enemy, and hence enhanced deterrence value. In December 1937 Bomber Command was directed to draw up detailed plans 'for attack of *all* profitable objectives in Germany'.⁴³ Over the following year Air Intelligence provided a series of air plans which highlighted in particular attack on communications, oil and electricity and the aviation industry. These remained priority targets until the end of the war, when precision attacks against them were at last technically feasible. But the Air Staff were particularly attracted to the Ruhr industrial area as a general target, not only because it was within range of western European bases, but because it was regarded as the only real equivalent to London as a major counter-value urban target. The so-called 'Ruhr Plan', sustained attack

on the industries and workforce concentrated in the major steel cities, though grudgingly approved by the Chiefs of Staff, was enthusiastically endorsed by RAF planners and was finally introduced on a modest scale towards the end of the Battle of France.

American planners were much more concerned to pinpoint economic structures - 'national *organic* systems' [italics in original] - which were particularly susceptible to interruption from the air. When Lieutenant General Henry H. Arnold, the US air forces' Chief, ordered air intelligence surveys of the optimum targets in Germany in 1941, the planning unit came up with electric power, transportation and fuel oil, with the addition of attacks on the aviation industry and air force to reduce bomber losses. A whole range of other industries was selected by both the RAF and the Air Corps as second-rank targets, to be attacked after striking successfully against primary systems.⁴⁴ The object in striking non-military targets remained the central one of reducing enemy war capability and war willingness, and creating conditions where an enemy might surrender rather than face more serious devastation.

Overwhelming force, war-fighting preparation, counter-value targeting were all central features of the 1930s strategic arguments about air power. The object of force preparation was to make it clear that the threat of force was not mere bluff. 'Because the *riposte* is certain', wrote the British air strategist J. M. Spaight in 1938, 'because it cannot be parried, a belligerent will think twice and again before he initiates a mode of warfare the final outcome of which is incalculable.'⁴⁵ Yet there remained one flaw in the strategy based on the build up of massive retaliatory threat: the growing awareness in the 1930s that despite the claims for air power's offensive capability there might be ways of defending a state against air attack once it had started, in other words that the knock-out blow might be survivable.

Such a view was widely held in German and French military circles. Military writers in both countries believed that a well-organised defence, using fighters and anti-aircraft fire, together with adequate passive precautions in evacuating populations and preparing for gas warfare, would blunt the impact of bombing.⁴⁶ The *Luftwaffe* was reasonably confident that the huge anti-aircraft preparations undertaken from 1937 onwards would deter an enemy even from attempting air attack. In Britain the RAF accepted the development of defensive capability with an ill grace. It was the government's realisation that defence preparations were a technical and organisational possibility, and that the dangers of popular revolt and demoralisation after air attacks might be mitigated by their active efforts, which prompted a switch of emphasis from 1937 to defensive rather than offensive aviation. Sir Thomas Inskip, Minister for the Co-ordination of Defence, claimed that 'The role of our Air Force is not an early knock-out blow . . . but to prevent the Germans from knocking us out.'⁴⁷ The chief of Fighter Command, Air Chief Marshal Hugh Dowding, was among those who took the view that the best form of counter-force activity was an active air defence. In February 1939 he wrote to the Chief of Air Staff: 'It is my considered opinion that a bomber attack from Germany on this country would be brought to a standstill in a month or less, owing to the moral effect of the terrific casualties which they would suffer whenever they are intercepted.'⁴⁸

Though this largely undermined the strategic arguments for deterrent air power, the RAF was forced to accept the shift in priority. From 1938 onwards (and confirmed spectacularly in autumn 1940) British political and military leaders gambled on the ability to survive air attack, combined with a limited counter-strike against enemy targets to discourage further attacks. The evident contradiction this involved - the assumption that the enemy would not survive to the same extent - was glossed over by superficial arguments about the fragile nature of the 'German personality'. British air power rested on the apparent compatibility of enhanced defence capability and enhanced striking power. This was hardly an American problem, since no enemy state could yet reach the continental USA with any effective payload. The Air Corps was free to concentrate its efforts on developing a credible deterrent force, and massive air retaliation should deterrence fail, a strategic profile that emerged in an almost identical form after 1945.

For the air power deterrent to work at all it was necessary for the potential enemy to know what the threat was, and to be convinced that its possible use was seriously meant. It was recognised at the time that this placed the democracies at something of a disadvantage, since the high moral ground occupied by the western states confronting fascism would clearly be lost if they declared themselves openly prepared to inflict massive aerial destruction on an enemy. In an appeal for American air co-operation, Spaight argued that the democracies would have to adopt a new posture internationally: 'there is no security except armed strength. The golden rule has gone by the board. If the democracies are to survive they must be war-minded, almost bloody-minded - for the time being.'⁴⁹ This the British never succeeded in being until the war was under way. Though Chamberlain held out hopes for air power's deterrent effect and made public Britain's commitment to large-scale air rearmament, he eschewed the kind of declaratory policy which spelt out what the nature of the deterrent threat was. German leaders had no such qualms, even though the *Luftwaffe* had not been built up to deliver the knock-out blow.

Roosevelt was much more inclined to issue threats, and the contrast between his public statements and those of his predecessor, Herbert Hoover, who had called for abolition of bombing planes and bombardment altogether in 1932, make clear that the USA was drawing by the end of the 1930s towards a declaratory stance. Treasury Secretary, Henry Morgenthau, told Roosevelt in January 1939 that 'for your international speeches to be effective, you must be backed up with the best air fleet in the world'.⁵⁰ But Roosevelt, too, was not in a position, with a large isolationist component in public opinion, to make overt threats of aggression or retaliation, and attempts to make clear to Japan before Pearl Harbor through covert means that American air power was a real threat to further expansion proved woefully inadequate. Nevertheless the unhappy 1939-41 experience, when deterrent threats went unperceived or ignored, paved the way for a public posture much more declaratory in character. The United States emerged in 1945 much more willing to be 'bloody-minded'. The President's Air Policy Commission reporting in 1948 stressed the importance of making it clear that America was serious about war: 'the hope is that by

serving notice that war with the United States would be a most unprofitable business we may persuade nations to work for peace instead of war'.⁵¹

Limitations on Deterrence

(a) Technical Credibility

The central weakness in any strategy that relies on deterrent effect is the need for credibility. This must be secured in two ways: a belief that the threat is capable of technical operation, and is sufficiently great to deter, must be present if the aggressor is to face unacceptable risk; second, the aggressor must be sure beyond all reasonable doubt that the potential enemy will actually use the forces he is threatening with. A failure to secure either belief will render deterrence inoperable.

Of the two aspects of credibility the technical one imposed severe limits on practical interwar deterrence. During the 1920s, on the basis of First World War experience, the air weapon's technical capabilities were greatly exaggerated. The numbers of aircraft and the weight of bombs which it was suggested would produce war-winning effects were tiny by Second World War standards. Charlton's picture of British defeat at the hand of German airmen began with a knock-out blow by only 18 aircraft. Even the RAF's more sober assessments tended to overstate the damage and injury expected from a conventional attack. In 1938 the head of Bomber Command asserted from operational research that 300 medium bombers needed only two weeks and 1,500 sorties to paralyse the Ruhr's heavy industry.⁵² In truth no major state could undertake an effective bombing campaign in the 1930s. The aircraft lacked sufficient range - not until 1939 did the *Luftwaffe* have medium bombers capable of reaching northern England, and British bombers could penetrate little farther than north-west Germany from British bases. The bomb carrying capacity was small in proportion to the industrial and operational effort for each bombing sortie, and until the war's early stages navigation and bomb aiming were in their infancy.

Of course it is important to remember that the perceived threat was relative. Medical and psychological reports suggested that the damage inflicted by even a modest air attack, particularly if accompanied by gas or germ warfare, would have effects on urban populations more devastating than anything ever experienced. Though there were clear technical limitations to air attack which had not been transcended by 1939, politicians in the pre-Hiroshima years had no other benchmarks to measure atrocity and devastation than science fiction and gloomy military prognosis. Evidence from the wars in Spain, Ethiopia and China proved ambiguous; moreover British military chiefs regarded these as minor conflicts between unequal adversaries. In any future war they expected Germany to turn the full weight of her forbidding air effort on Britain.

In fact it was in Germany that air power's real limitations were most keenly felt. German military theorists saw what Britain was aiming for, but perceived a doctrine they regarded as muddled and incomplete.⁵³ The view that wars could be won by air power in its current

technical state was considered simply illusory. The attack on cities for the purpose of demoralisation or terror was specifically forbidden in the *Luftwaffe* war manual.⁵⁴ The main emphasis was put on what aircraft could technically do to best effect: to combine their defensive capabilities and firepower with the surface forces in tactical support operations. This view made it highly unlikely that German forces, or politicians, would be susceptible to any deterrent threat. Even with the world's best quality bombers in 1939, operational surveys showed the *Luftwaffe* incapable of mounting a serious strategic campaign against Britain. German leaders could not bring themselves to believe that RAF capability was any better.

By contrast the RAF never ignored the threat posed by the *Luftwaffe* and assumed right up to the outbreak of war and beyond that the German air arm's central purpose was to mount massive strategic attacks from the outset of hostilities. Yet when the RAF was forced to think operationally about what it could do to strike back at Germany, a wide range of debilitating limitations was unearthed at once. There were too few bombers of any range or significant payload; there was a woeful lack of bombardment training and experience; navigation was rudimentary; and not until the end of 1938 was there any agreement on what targets such an exiguous force should attack. Measured by the technical capability of its 1939 force there simply was no serious deterrent threat that the RAF could offer.

Both sides were well aware that technical conditions changed rapidly and substantially. The late 1930s strategic weakness of both forces was not designed to last. In Germany scientists were working on missiles of great range and were beginning to think about atomic weapons. German engineers had produced the jet engine and were designing the first inter-continental bombers.⁵⁵ The rough technological balance restored by British and French rearmament would have been overturned, if war had not intervened, within two or three years. These were the weapons systems that later supported the 1950s confrontation. In Britain the technical gap was to be made good not with jets and missiles, but with a conventional bombing force of great size and lifting power. The RAF Expansion Scheme 'M' launched after Munich called for a large force of multi-engined bombers with a range that would reach right across Germany, or deep into the Soviet Union from Middle Eastern bases, and with the maximum bomb load possible.⁵⁶

The technical standards set for the new generation of heavy bombers both in Britain and the United States represented a radical leap in strategic technology of a kind that would make strategic deterrence at least a technical possibility. In the USA the search for a new strategic weapon went back to 1934 when the Air Corps recognised that within the foreseeable future aircraft would be able to attack the continental United States across the ocean. Though the Army obstructed research and development of very long-range aviation, the Air Force stuck to its guns and by 1930s' end the United States had in the pipeline the best range of heavy bombers then available, and were already looking at aircraft that would provide the core of the strategic air forces after 1945.⁵⁷

(b) Political Credibility

If Britain's deterrent lacked technical credibility, there was no real evidence for any potential enemy that Britain possessed the political will to use the weapons she was threatening with. For much of the interwar period Britain was at the forefront of those states arguing for disarmament. While permitting the build up of an air striking force, Chamberlain repeatedly called for policies of mutual restraint in use of the air weapon. Publicly he was committed to the April 1939 statement he made in the House of Commons that 'it is against international law to bomb civilians as such and to make deliberate attacks on civilian populations'.⁵⁸

Bomber Command operated under this constraint until the German attack on Rotterdam in May 1940, even though the RAF had satisfied itself years before that there was no legal impediment to bombing nonmilitary objectives as long as there existed some 'indirect' connection with the enemy war effort.⁵⁹ RAF planning throughout the 1930s was predicated on the assumption that civilian casualties were unavoidable even when attacking military targets, and that the incidental effect on morale would be a strategic bonus. But Chamberlain faced pressures that were political as much as ethical. During the 1930s pacifism and public dread of war were factors that had to be taken into account. It was thought unlikely in the 1935 General Election that the electorate would accept increases in rearmament, let alone a commitment to strategic bombing, even as a deterrent.⁶⁰ British spokesmen had the difficult task of appearing to be high-minded at home and threatening abroad. A major study of air strategy, published in 1936, illustrated the British dilemma: 'inhuman and brutal use of the air weapon does not appeal to the average Briton, whose moral and cultural level is considerably above Continental standards. Ideas of "wholesale destruction" strategy can be entertained in peacetime only by the less-civilized or morally inferior nations.'⁶¹ The feeling that it was hypocritical for democratic nations to threaten large-scale damage in peacetime died hard. Even during the war Bomber Command was inhibited more than it would have liked by the exercise of public scruple.

The commitment to morally defensible positions internationally and domestically made the practice of deterrence almost impossible. Another imponderable made British strategy unstable. If the British government felt sure of its own moral credentials, this was far from the case when it came to potential enemies. The Foreign Office was never certain that the dictator states would not commit some 'mad dog act'. It was impossible to assume rationality in other leaders.⁶² This problem of the perception of rationality was central to the deterrence argument both before and after the war. The central paradox - that you deter someone through rational pressure from behaving irrationally - was clear in British approaches to Hitler. The temptation to produce mirror image calculations was overwhelming in this case, as it was later with the Soviet Union. If Britain feared the impact of strategic air power, then Germany, it was argued, should fear it too, however irrational Hitler's ambitions might be. Chamberlain hoped up to the outbreak of war that Hitler would see sense, that he would recognise that he could not win a war against the West, even if he might not lose it either.

But British intelligence before 1939 was simply not up to the task of discovering whether or not Hitler was deterred, and instead produced what was regarded as powerful evidence of German economic and moral weaknesses to suggest that even mad dictators would see the futility of risking war.⁶³ In practice the failure to deter Hitler by the air threat, or for that matter by any other threat, rested not on his fundamental *irrationality*, but on a rational calculation of acceptable risks. Hitler knew that the British lacked an effective bombing capability, and was sceptical of all claims for independent air power, but he did think that the Western states had an exaggerated fear of the German air threat and that this, combined with his alliance with Soviet Russia, would be sufficient to deter them.

The simple truth was that in the absence of very top-level political intelligence it was impossible to tell whether the deterrent strategy would work, a problem that American strategists have faced throughout the post-war period. But so poor was western intelligence on the *Luftwaffe* that neither Britain nor France succeeded before the outbreak of war in realising that it was a tactical, not a strategic force. This misperception left the RAF overcommitted to a defence and counter-strike strategy for the German attack in 1939 which never came, and greatly inhibited what help it could give to French forces in 1940 when the German military finally did with its air force what it had intended. Failing better information on the enemy, all the British could do was build up a force which they hoped would be strong enough to act strategically if the deterrent effect proved ineffectual and an 'irrational' attack was launched against them. In practice very much the same position was taken by 1950s and 1960s American strategy. In both periods the margin between deterrence and willingness to fight rested not on any intrinsic virtues in the deterrent posture but on the potential enemy's self-restraint.

(c) Deterrence versus War-Fighting

The final limitation lay in the hostility of much of the military establishment both to claims for independent or strategic air power and to the idea that war-fighting could in some sense be substituted by the strategic aim of deterrence. There were plenty of officers who would have echoed the sentiments expressed in 1939 by the French general, Maxime Weygand: 'There is something in these bombardments of defenceless people behind the front that smacks of cowardice which is repugnant to the soldier.'⁶⁴ American soldiers were strongly critical of 1930s claims for air power. Brigadier General Stanley D. Embick of the War Plans Division described military aviation in 1935 as essentially 'auxiliary in character'. Colonel Walter Krueger, in a memorandum penned the same year, agreed that 'Aircraft are admittedly powerful agents of destruction, but their power is curtailed by their inherent limitations'. He preferred a fleet of naval vessels to a 'decisively inferior air fleet'.⁶⁵ In Britain the Chiefs of Staff acted throughout the late 1930s to impose much more modest tasks on the bomber force than air theorists wanted, insisting on the tactical use of aviation and limited counter-force operations as the most effective use of aircraft under current technical conditions.

This was not mere conservatism for its own sake. There is no doubt that the claims for air power, and the nature of the air threat were greatly exaggerated and were increasingly seen to be so

with the advent of more technically sophisticated defence systems based on radar and fast interceptor fighters. But such attitudes highlighted internal political conflict and professional jealousy between the three services over their future strategic role and allocation of military resources.⁶⁶ There was never any question that the German or French armies would abandon large-scale surface fighting in favour of massive aerial striking power, if only because even with a massive air deterrent the risk of being exposed to conventional army attack was still considerable. Britain was more geographically secure, but even here the Navy was able to win the lion's share of military spending for much of the interwar period because of British strategic obligations overseas. In the USA army hostility to air power claims might well have killed strategic aviation in its cradle had it not been for Roosevelt's personal enthusiasm for air power.

Most significant, however, was that up to the early 1940s no weapon or delivery system existed of sufficient and assured destructive power to pose as a plausible substitute for the other services. Hence the assumption accepted in all states that in any future war surface forces would not only take the bulk of the actual fighting, but could act as a deterrent threat every bit as effective as air power.⁶⁷ It is arguable whether the French were more afraid of the German Army or the German Air Force, or the British more afraid of Italian seapower than air power. Certainly Hitler, to the extent that he was affected by foreign military power at all, was more aware of Western naval strength and the French and Soviet armies than he was of air power. Though the British tried to develop a credible striking force once war had begun, following Churchill's view that 'our aim is to win the war by building up a crushing measure of air superiority . . .',⁶⁸ the key to deterrence credibility lay in German research into missile technology, and the Anglo-American decision to develop the atomic bomb.

The Coming of Deterrence

It would be wrong to argue that no deterrent effect could be found before 1939, but its application was limited, and it was difficult to separate air power from other military and political components which produced deterrence. It was certainly possible, as the RAF did, to deter colonial peoples from violent opposition by the threat of direct punishment, but this was a crude weapon, picking on tribal societies' vulnerability, their inability to oppose air power and deep awe for its technical novelty. Major states could certainly bring pressure to bear on minor powers by the threat of air attack, as Germany did with rump Czechoslovakia in March 1939. It was even possible to wield the air threat in relations between major states as Germany did, not entirely intentionally, during the Munich crisis. Fear of bomb attack did influence both Chamberlain and French Prime Minister Edouard Daladier in their approach to the Czech crisis, but it must be remembered that, despite this threat, on 28 September 1938 both powers would have gone to war with Germany if Czech territory were seized by force.⁶⁹

The deterrent effect that developed after the Second World War with the rise of nuclear-armed superpowers was understood before the war but was still technically inoperable. The one area in which it was possible to see the effect actually working, the mutual restraint in using chemical and biological weapons, rested on just the criteria that would govern postwar

deterrence - that the weapon would produce unacceptably high levels of damage, and that the damage could be mutually inflicted. By 1939 Germany had a substantial lead in chemical warfare, both in conventional chemicals used in the First World War, and in pioneering new 'nerve' gases, but German intelligence was unaware of the lead, and assumed that the Western states had been stockpiling and experimenting to an extent greater than Germany, and had the capability to deliver gas bombs over Germany. Hitler accepted that these weapons should not be used after approaches from Britain at the beginning of the war, and although there were times when both sides contemplated using the materials (and every major state built up enormous stockpiles of chemical and biological weapons) the deterrent effect was sufficient to maintain restraint.⁷⁰ Of course the threat did not inhibit conventional warfare, nor did it avert atrocity in wartime. But the restraint shown by both sides was a classic result of deterrence, where both sides knew the other possessed the weapon, could deliver it and would, if attacked, retaliate.

It was some time after 1945 that anything like this situation was achieved with nuclear weapons. By 1948 America had only seven atomic bombs, each of which took a team of 24 men two days to assemble. It is all too often forgotten that for years after 1945 air power deterrence rested on the conventional as well as the nuclear bombing threat.⁷¹ That is not to say that the threat of attack with even a handful of atomic bombs was ever taken lightly, though it was clearly survivable in the way that modern nuclear war is not, but the horrible damage inflicted by conventional strategic bombardment during the war was a constant reminder that the feeble 1930s air threat had become an operational reality at last. In that sense Dresden was as exemplary as Hiroshima. There were thus some very obvious continuities between the pre- and post-war situations, not only in the lessons learned from the experience of pre-war diplomacy and wartime strategy, but also in the gradual adoption in the USA of a strategy whose shape and components were developed first in the interwar arguments about air power. Perhaps most important of all, wartime strategic bombing, and the fire-bombing of Japan in particular, pushed the Western states across psychological and ethical thresholds that made possible a strategy of mass destruction of civilians from the air, which would never have been countenanced in the 1930s.

For Americans the harshest lesson of all was that despite all their efforts for peace after 1918 war was still an ever-present threat in the international system. Moreover, Japanese aggression in 1941 showed that even rich, militarily powerful states were not immune to surprise attack. They blamed much of this situation on the Anglo-French failure to face up to Hitler in the 1930s with sufficient force to deter him. Ambassador William C. Bullitt remarked to Roosevelt after Munich: 'If you have enough airplanes you don't have to go to Berchtesgaden.'⁷² The unpleasant consequence for Americans was that they would have to shoulder the responsibility after 1945 for defending the West by remaining a massively armed power, where all their traditions were of isolation and retrenchment. The report of the Air Policy Commission in 1948 took as its starting point that 'disarmament is out of the question'. It went on to ask: 'Where does relative security lie in a world in which all nations are free

to arm and in which war is the final resort for the settlement of international disputes?' The Commission recommended that the USA should rely on air power as the basis of her military security. The strategy suggested formed the basis of American military policy in the nuclear age.⁷³

security is to be found only in a policy of arming the United States so strongly (1) that other nations will hesitate to attack us or our vital national interests because of the violence of the counterattack they would have to face, and (2) that if we are attacked we will be able to smash the assault at the earliest possible moment.

Post-war strategy, like 1930s air power strategy, saw the deterrent effect as a desirable strategic consequence, but it was clear that the effect depended on willingness and ability to fight. In the charged atmosphere of early Cold War politics it did not seem out of the question that America might suffer what one commentator called an 'atomic Pearl Harbor'.⁷⁴ An earlier report highlighted the fact that with the atomic bomb had been created a 'weapon so ideally suited to sudden unannounced attack that a country's major cities might be destroyed overnight . . .'.⁷⁵ The nightmare of the knock-out blow spurred on American military preparations after 1945 as it had done British 1930s rearmament. The difference lay in the fact that atomic weapons raised the thresholds of damage and fear well beyond what they had been ten years before.

The US response was to continue nuclear research, to stockpile atomic weapons, and to think hard about how they might be used. The targeting debate about the relative merits of counter-force and countervalue objectives was revived. The American decision to opt for city attacks against the Soviet industrial heartlands not only reflected the fact that as yet US cities faced no comparable threat, but also the conviction that the surest way to convince an enemy to give way was to attack the vital centres and demoralise the population as the Army Air Forces had done in 1944-45. Nor was there much doubt in the early years of atomic weapons that America would use the weapons at her disposal if it became necessary. In 1947 the Joint Chiefs of Staff asked the Atomic Energy Corporation to supply 400 atomic bombs by 1953 capable of 'killing a nation'.⁷⁶ The deterrent effect rested entirely on the existence of a credible military strategy of conventional and atomic bombardment.

Until Mutual Assured Destruction it could even be argued that the deterrent effect was largely secondary to the active preparation for exercising strategic air power. Indeed there were writers who argued that atomic warfare could be fought against, using the same weapons produced to combat the 1930s bomber threat, fighter interception and well-organised passive defence.⁷⁷ The real breakthrough came later, with the hydrogen bomb, the growth of modern missile systems and weapons stockpiles, and the acquisition of nuclear weapons by other major states. The mid-1950s is a more critical turning point in many ways than 1945. American strategy, with its support for Western Europe, rested on a determination not to return to the abortive aims of disarmament and world co-operation which internationalists

had sought after 1918. The alternative, already adopted by all major states in 1935-41, was to build up massive armed force, to harness science and industry to refining the weapons systems, and to assume the posture of counter-threat. The outcome was not only the Second World War, but the structure and nature of great power strategy ever since. In their hostility to aggression and war-mongering, the two major Western states, Britain and America, opted for a strategy of deterring or containing the threat from Germany and Japan and, after 1945, the Soviet Union. This required the build up of large military forces and a specific threat, of air power retaliation, in order to keep the peace. It was a policy that locked the Western states into an upward spiral of military commitment until a weapon so devastating and unthinkable could be found which would stop all aggressors, rational or irrational, opportunistic or ideologically motivated, from risking all-out war.

This position was achieved not by 1939, nor by 1941, but was finally achieved after 1945 when the air threat had been fully revealed in war. Modern deterrence theory grew out of the strategic and moral dilemmas facing the Western states; its necessity first became apparent in response to the political and military revolution set in motion by Hitler and the Japanese armed forces. Deterrent credibility stemmed not from fear of the unknown, but from the evidence of what liberal democracies had done to Hamburg, Dresden and Hiroshima. This has been the central paradox in Western strategy, that in order to keep the peace Western states must be seen to be fully prepared to unleash the most unimaginably destructive of wars.

Writing of the Manhattan Project in 1945, the official report spoke of a new weapon available to the West 'that is potentially destructive beyond the wildest nightmares of the imagination'. Yet it was a weapon, the report went on, not produced by a warped genius inspired by the devil, 'but by the arduous labor of thousands of normal men and women working for the safety of their country'.⁷⁸ Just as the deterrent effect sought in the 1930s was based on the experience of bombing in the First World War, in Spain and China and Ethiopia, so the deterrent effect after 1945 was rooted in the material catastrophe that overcame the Axis states, and the evident willingness of democracies to use any weapon in defence of their freedom.

Notes

¹ R.B. Byers, 'Deterrence under attack: crisis and dilemma' in Byers (ed.), *Deterrence in the 1980s: Crisis and Dilemma* (London, 1985), p.18; see too G. Quester, 'The Strategy of Deterrence: Is the concept credible?' in *ibid.* pp.60-95; P. Morgan, *Deterrence: A Conceptual Analysis* (Beverly Hills, CA: London: Sage, 1977/83), esp.pp.16-24, 205-15; G. Snyder, *Deterrence and Defense: Toward a Theory of National Security* (Princeton UP, 1961).

² L.E.O. Charlton, *The Menace of the Clouds* (London, 1937), p.25.

³ C. Messenger, *The Art of Blitzkrieg* (London, 1976) p.31. On the origins of strategic air power, see N. Jones, *The Beginnings of Strategic Air Power: A History of the British Bomber Force 1923-1939* (London: Frank Cass 1987); B. Brodie, *Strategy in the Missile Age* (Princeton UP, 1959) chs. 3-5; G. Quester, *Deterrence before Hiroshima* (NY, 1960).

⁴ R. Aron, *The Century of Total War* (London, 1954), p.41.

⁵ C. Falls, *The Nature of Modern Warfare* (London, 1941) pp.18-19. Falls regarded the bomber as the central weapon in total war: 'one might almost say that it is based upon indiscriminate attack, especially from the air, directed against the civilian population' (p.6).

⁶ B.A. Carroll, *Design for Total War: Arms and Economics in the Third Reich* (The Hague, 1968) p.40.

⁷ Public Record Office, London (PRO), AIR 9/8 COS 156, note by the First Sea Lord, 21 May 1928, p.2.

⁸ PRO AIR 9/8, notes on a Memo, by the CIGS, 23 May 1928, p.2. The author quotes similar views from French and German sources, including the following from one German writer:

'In wars of the future the initial hostile attack will be directed against the great nerve and communication centres of the enemy's territory . . . in fact against every life artery of the country . . . the war will frequently have the appearance of a destruction en masse of the entire civil population rather than a combat of armed men.'

⁹ H. Klotz, *Militärische Lehren des Bürgerkrieges in Spanien* (self-published, 1937), p.53.

¹⁰ U. Bialer, *The Shadow of the Bomber: the Fear of Air Attack and British Bombing 1932-1939* (London: R. Hist. S. 1980) p.21. See also Klotz, p.50, who gives the following figures to indicate the development of air technology. The ratio of 1918 performance to that of 1937 was as follows: speed 1:3.8; rate of climb 1:5.8; bomb load 1:6.0; range 1:8.0.

¹¹ PRO AIR 9/8, COS 76th Meeting, 'The War Object of an Air Force', May 1928, p.1.

¹² On the 'Ideal Bomber' see M. Smith, *British Air Strategy between the Wars* (Oxford: Clarendon Press, 1984) pp.240-7. For a general discussion of the issues involved in mobilising science see S.J. Deitchman, *Military Power and the Advance of Technology* (Boulder, CO: Westview Press, 1983).

¹³ Charlton, *Menace*, p.22.

¹⁴ M.S. Sherry, *The Rise of American Air Power: The Creation of Armageddon* (New Haven: Yale UP, 1987), p.32.

¹⁵ H. Macmillan, *Winds of Change* (London: Macmillan 1960) p.522.

¹⁶ J. Konvitz, 'Représentations urbaines et bombardements stratégiques 1914-1945' *Annales* No. 4 (1989), pp.824-8.

¹⁷ PRO AIR 9/8, Air Ministry, note by planning dept., 17 May 1928, p.3.

¹⁸ PRO AIR 9/39, 'Air Policy and Strategy', 23 Mar. 1936, Appendix L, pp.3-6. See too AIR 9/8, Air Ministry note 26 May 1938, p.6: 'There is ample evidence to prove that our industrial population is most susceptible to panic and loss of morale . . . German attacks on England greatly affected public opinion.'

¹⁹ PRO AIR 9/8, AVM P.B. Joubert de la Ferté to Air Ministry, 2 May 1929.

²⁰ L.E.O. Charlton, *War over England* (London, 1936), pp.158-81, 218-25.

²¹ New Fabian Research Bureau, *The Road to War, Being an Analysis of the National Government's Foreign Policy* (London, 1937), pp.177-8.

²² Quester, *Deterrence*, p.97.

²³ Bialer, *Shadow of Bomber*, pp.129-30.

²⁴ R. Macleod (ed.), *The Ironside Diaries 1937-1940* (London: Cassell, 1962), p.62, entry for 22 Sept. 1938.

²⁵ R.A. Chaput, *Disarmament in British Foreign Policy* (London, 1935), pp.335-59.

²⁶ N. Gibbs, *Grand Strategy, Vol.1: Rearmament Policy* (London: HMSO, 1976), p.534; see too U. Bialer, 'Elite Opinion and Defence Policy: Air Power Advocacy and British Rearmament during the 1930s', *British Journal of International Studies* 6/1 (1980), pp.32-51.

²⁷ Sherry, *American Air Power*, pp.79-80; H. Ickes, *The Secret Diary of Harold L. Ickes* (London: 1955), Vol.11, pp.468-9.

²⁸ E.W. Sheppard, 'Hep! Hep!' *RAF Quarterly*, Vol.9 (1938), p.40; see also Charlton, *Menace*, p.13: '[Air power] can be treated as a threat, the mere hint of which may suffice to coerce a country which lies peculiarly open to attack . . . air forces may in course of time produce an equilibrium which could be the forerunner of universal peace . . .'; J.M. Spaight, *Can America Prevent Frightfulness from the Air?* (London, Sept. 1939), p.42: 'in air power one finds the answer to those who believe that because war has become so terrible it will not be lightly engaged. What does prevent it from being lightly engaged in the world as it is at present, is the possession by the intended victim, as well as the intending aggressor, of adequate force: that, and nothing else.'

²⁹ PRO AIR 8/258, Bombing Policy file, 'Fighters or Bombers' n.d. [1938], p.8.

³⁰ PRO AIR 8/244, Air Staff, 'The Role of the Air Force in National Defence', 5 July 1938, p.9.

³¹ W. J. Reader, *Architect of Air Power. The Life of the First Viscount Weir of Eastwood 1877-1959* (London: 1968), p.231; see also M. Smith, 'Rearmament and Deterrence in Britain in the Thirties', *Journal of Strategic Studies* (hereafter JSS) 1/3 (Dec. 1978) pp.313-37.

³² National Archives, Washington DC, (NA), RG 94/508, Memo, for the Secretary of War, 16 Feb. 1938. 'Air Corps Program', p.7.

³³ PRO AIR 14/381, Plan W1 'Appreciation of the Employment of the British Air Striking Force against the German Air Striking Force', April 1938, p.1.

³⁴ PRO AIR 8/251, Air Ministry (Plans) to Chief of Air Staff (CAS hereafter), 9 Sept. 1938, p.2; AIR 14/194, Bomber Command, 'Note on the question of relaxing the bombardment instructions and initiating extended air action', 7 Sept. 1939, p.8.

³⁵ PRO CAB 64/15, COS 603, 'Estimated Scale of air attack on England in the event of war with Germany', 20 July 1937. It was estimated that Germany could deliver 1,000 tons daily against Britain by April 1939, or 644 a day if France were also attacked. Even by 1940 Bomber Command could still only promise to deliver 100 tons a day in retaliation in the first week, dropping to 30 tons a day thereafter (AIR 14/194, record of a conference with CAS, 28 Apr. 1940). Scheme 'L' in spring 1939 planned a British bombing capacity of 3,795 tons by 1941 (total of all operational squadrons). See AIR 8/250, Cabinet Paper 218(38), 'Striking Power of the Metropolitan Bomber Force, 15 April 1939', p.2.

³⁶ R.J. Young, 'The Strategic Dream: French Air Doctrine in the Inter-war period 1919-39' *Journal of Contemporary History* 9/1 (1974), pp.63-76; K-H. Völker, *Die deutsche Luftwaffe, 1933-1939: Aufbau, Führung und Rüstung der Luftwaffe sowie die Entwicklung der deutschen Luftkriegstheorie* (Stuttgart, 1967), pp.86-9, 195-201.

³⁷ NA RG18/223 Box 1, RAF War Manual, Part I, Operations (May 1935), p.57.

³⁸ PRO AIR 2/1830, Manual of Combined Operations, 1938, para. 22.

³⁹ PRO AIR 9/99, Note, the attack of air forces on the ground, 9 May 1940, p.2.

⁴⁰ PRO AIR 9/8, CAS 'note upon the Memo, of the Chief of the Naval Staff, May 1928, p.3: 'One Air Force cannot destroy the organisation of another Air Force by bombing': AIR 9/98, 'Reports on trials to determine the effect of air attack against aircraft dispersed about an aerodrome site', July 1938. See also M. Smith, 'The RAF and Counter-force Strategy before World War II', *RUSI Journal* 121/1 (Spring 1976), pp.68-72.

⁴¹ PRO AIR 14/194, Bomber Command, Note, 7 Sept. 1939, (italics in original).

⁴² NA RG18/231, Andrews Paper, 'The Airplane in National Defense' n.d. [1932]. See too Library of Congress, Washington D.C., Andrews Papers, Box 11, Lecture by Maj. Harold George, 'An Inquiry into the Subject War', 1936, for a clear summary of counter-value strategy: 'the very make up of modern industrial nations are much more vulnerable because of the existence of the economic structure, which our present civilisation has created than were the nations of a century ago . . . It appears that nations are susceptible to defeat by interruption of this economic web. It is possible that the moral collapse brought by the breaking of this closely knit web will be sufficient, but, closely connected therewith, is the industrial fabric which is absolutely essential for modern war.'

⁴³ PRO AIR 14/225, Air Ministry Directive to Bomber Command, 13 Dec. 1937, p.2 (italics in original).

⁴⁴ H.S. Hansell, *The Strategic Air War against Germany and Japan* (Washington D.C., Office of AF Hist., 1986), pp.10-19; idem, *The Air Plan that Defeated Hitler* (Atlanta, GA: Higgins-McArthur/Loginoand Porter, 1972), pp.50-63; R. Futrell, *Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force 1907-1964* (Maxwell AFB, AL: Air University, Aerospace Studies Inst., 1972) pp.59-62.

⁴⁵ Quester, *Deterrence*, p.102 (italics in original). See also Spaight, *Frightfulness*, p.43; 'Make air attack less possible by making the defence stronger and readier, make the riposte to it certain to be more prompt and powerful if it does occur, and you go far to make war unlikely.'

⁴⁶ On France, P. Le Goyet, 'Evolution de la doctrine d'emploi de l'aviation française entre 1919 et 1939', *Revue d'histoire de la Deuxième Guerre Mondiale*, Vol.19 (1969).

⁴⁷ C. Messenger, 'Bomber' Harris and the Strategic Bombing Offensive 1939-1945 (London, 1984), p.23.

⁴⁸ PRO AIR 16/261, ACM Dowding to ACM Newall, 24 Feb. 1939, pp.1-2; see also AIR 9/99, HQ Bomber Command to Air Ministry, Dec. 1937, in which it was argued that the best counter-force strategy lay with fighter aircraft 'destroying enemy bombers in flight'.

⁴⁹ Spaight, *Frightfulness*, p.43.

⁵⁰ Sherry, *American Air Power*, p.82.

⁵¹ *Survival in the Air Age: A Report of the President's Air Policy Commission* (Washington, DC: US GPO, 1 Jan. 1948), p.12.

⁵² PRO AIR 14/225, Draft of letter from ACM Sir Edgar Ludlow-Hewitt to Air Ministry, n.d. [early 1938]. These figures were rightly regarded as an exaggeration by the Air Staff.

⁵³ O.E. Schüddekopf, *Britische Gedanken über den Einsatz des Luftheeres* (Berlin, 1939) pp.42-55.

⁵⁴ K-H. Völker (ed.), *Dokumente und Dokumentarfotos zur Geschichte der deutsche Luftwaffe* (Stuttgart, 1968), doc. 200, 'Luftkriegführung', 1936, p.82: 'Attack on cities for the purpose of

terrorisation of the population is fundamentally rejected'. See too K. A. Maier, 'Total War and German Air Doctrine before the Second World War' in W. Deist (ed.) *The German Military in the Age of Total War* (Leamington Spa: Berg 1985), pp.213-18.

⁵⁵ M. Walker, *German National Socialism and the Quest for Nuclear Power 1933-1949* (Cambridge, 1989), pp.13-41; W. Dornberger, V2 (London, 1954); R.J. Overy, 'From "Uralbomber" to "Amerikabomber": the *Luftwaffe* and Strategic Bombing', *JSS* 1/2 (Sept. 1978), pp.154-75.

⁵⁶ PRO AIR 8/250, RAF Expansion Scheme 'M', Memo, by the Secretary of State for Air, 'Relative Air Strength and Proposals for the Improvement of the Country's Position', 25 Oct. 1938.

⁵⁷ R.W. Krauskopf, 'The Army and the Strategic Bomber 1930-1939', Part I, *Military Affairs*, Vol.22 (1958/9).

⁵⁸ PRO AIR 9/105, Anglo-French Staff Conversations, 'Preparation of Joint Plans of Action for Franco-British Air Force', 19 Apr. 1939, pp.2-3.

⁵⁹ PRO AIR 9/8, 69th COS, 'The War Object of an Air Force', 22 May 1928, pp.1-3: 'It is clear, therefore, that in the late war, military works, military establishments, workshops or plant, and also transportation systems and centres of communications which could be used directly or indirectly for the needs of the enemy army, navy or air force, were regarded as legitimate objectives of air bombardment, whether situated within or without the actual zone of military land operations.'

⁶⁰ For a general discussion of British pacifism and public opinion see M. Ceadel, *Pacifism in Britain 1914-1945* (Oxford, 1981).

⁶¹ Gen. N.N. Golovine, 'Air Strategy', Part III, *RAF Quarterly* Vol.7, (1936) p.429.

⁶² It is interesting to look at 1930s Air Ministry planning with this perception. There was much discussion of totalitarian states, of dictatorship, of populations whose leaders 'enslaved' them and disregarded their fate. See especially PRO AIR 9/8, Air Staff Memorandum. 'The Potential Dangers to the Security of the British Empire and our Consequent Defence Requirements', 15 Jan. 1936: 'In Russia', ran the report, 'the Soviet system provides an inexhaustible mass of slave labour and permits a disregard of the interests and welfare of the individual which would not be tolerated in the British Empire . . . We are therefore faced not only with the necessity of providing the forces essential for our security, but of providing them in competition with systems which tend to simplify the tasks of our potential enemies . . . '.

⁶³ R.J. Overy, 'Germany, "Domestic Crisis" and War in 1939' *Past & Present*, No. 116 (1987), pp.141-7; W. Wark, *The Ultimate Enemy: British Intelligence and Nazi Germany* (OUP, 1986), Ch. 7.

⁶⁴ Gen. M. Weygand, 'How France is Defended', *International Affairs*, Vol.18 (1939) pp.471-1.

⁶⁵ NA RG 165/888.96, Memo, by Brig. Gen. Embick, 'Aviation versus Coastal Fortifications', p.2; Memo, by Col. W. Krueger, 'Air Defense as a Factor in National Defense', Dec. 1935, p.2, 4.

⁶⁶ This point has been made convincingly by H. Strachan. 'Deterrence Theory: The Problem of Continuity', *JSS* 7/4 (Dec. 1984) pp.395-401.

⁶⁷ See J. Mearsheimer, *Conventional Deterrence* (Ithaca, NY: Cornell UP, 1983), esp.Chs. 2-3.

This is one of the few studies of deterrence before 1945. The argument developed here that deterrence is a direct function of military strategies rather than a function of existing weapons

systems suffers from the almost complete absence of any discussion on air power and air forces before 1940.

⁶⁸ PRO AIR 8/258, 'Draft Air Programme' n.d. [1941], p.1.

⁶⁹ On 'political' deterrence see H.S. Dinerstein, 'The Impact of Air Power on the International Scene 1930-1939', *Military Affairs*, Vol.19 (1955) pp.65-70; E.M. Emme, 'Emergence of Nazi Luftpolitik as a Weapon in International Affairs', *Aerospace Historian* Vol. 7 (1960); M.S. Smith, 'The RAF, Air Power and British Foreign Policy', *Journal of Contemporary History* Vol. 12 (1977).

⁷⁰ E.M. Spiers, *Chemical Warfare* (Urbana: Univ. of Illinois P. London." Macmillan 1986), esp.pp.58-64; R. Harris and J. Paxman, *A Higher Form of Killing: the Secret Story of Gas and Germ Warfare* (London: Paladin, 1982) pp.53-67, 107-36.

⁷¹ N. Polmar, *Strategic Weapons: An Introduction* (NY: 1982), pp.3-4; Quester, 'Strategy of Deterrence', pp.71-3; Strachan, 'Deterrence', pp.396-7; A.L. Friedberg, 'A History of US Strategic "Doctrine" 1945 to 1980', in A. Perlmutter and J. Gooch (ed.), *Strategy and the Social Sciences: Issues in defense policy* (London: Frank Cass, 1981), pp.40-1, 45-7; D.A. Rosenberg, 'American Atomic Strategy and the Hydrogen Bomb Decision', *Journal of American History* 66/1 (1979), pp.62-76. A strong sense of the continuities in air power from the 1930s to the 1950s can be found by reading the collected speeches and articles of Marshal of the RAF John Slessor, which he published in 1957 under the title *The Great Deterrent* (London, 1957).

⁷² Sherry, *American Air Force*, p.76.

⁷³ *Survival in the Air Age*, pp.6-7.

⁷⁴ D.O. Smith, 'The Role of Airpower since World War II', *Military Affairs* Vol.19 (1955), p.72.

⁷⁵ H.D. Smyth, *A General Account of the Development of Methods of Using Atomic Energy for Military Purposes under the Auspices of the United States Government 1940-1945* (London: HMSO, 1945) p.134.

⁷⁶ Rosenberg 'Atomic Strategy', p.68. By 1950 the USA still lacked this atomic capability. The Harmon Committee set up in 1949 to evaluate impact of atomic attack on the Soviet Union estimated that the attack would produce 2.7 million dead, 4 million casualties, and would reduce Soviet industrial output by 30-40 per cent. This was substantially lower than Soviet losses in World War II. See Friedberg, 'Strategic Doctrine', p.46.

⁷⁷ See, e.g., Gen. L.M. Chassin, *Stratégie et bombe atomique* (Paris, 1948), p.260 ff.

⁷⁸ Smyth, *General Account*, p.134.

Marshal of the Royal Air Force Sir John Slessor and the Prevention of War

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Biography: Professor Sir Michael Howard, educated at Wellington College and Christ Church Oxford, served with the British Army 1943-45 during which time he was awarded the Military Cross. Now retired, his career as a military historian began at King's College London where he established the War Studies Department and helped to found the International Institute for Strategic Studies. Subsequently he was appointed Chichele Professor of the History of War and Regius Professor of Modern History at Oxford University and later appointed Robert A Lovett Professor of Military and Naval History at Yale University.

Abstract: This article examines the substantial contribution of Marshal of the Royal Air Force Sir John Slessor to strategic thinking during the early stages of the Cold War. Sir Michael maps out Slessor's conceptual journey and the consequent realignment of the RAF towards a deterrent posture.

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Introduction

In November 1959, addressing the United States Air Force Academy, Marshal of the Royal Air Force Sir John Slessor informed his audience that... 'The aim to which the existence of the Royal Air Force is dedicated is the prevention of war.'¹ By that time nobody would have been surprised by that definition. It had already become the conventional wisdom. But ten years earlier it would certainly have raised eyebrows, not least within the Royal Air Force itself.

In 1949, and for several years thereafter, the assumption had been that the RAF must be prepared to fight a war against the Soviet Union that would be a re-run of World War II on an enormous scale, with the addition of nuclear weapons. Some idea of the conventional wisdom of that day can be found in a work published in 1949 by a senior American defence scientist Dr Vannevar Bush, entitled *Modern Arms and Free Men*:

'Great fleets of bombers would be in action at once, but this would be the opening phase only . . . They could undoubtedly devastate the cities and the war-potential of the enemy and its satellites, but it is highly doubtful if they could at once stop the march of great land armies. To overcome them would require a great national effort, and the marshalling of all our strength. The effort to keep the seas open would be particularly hazardous, because of modern submarines, and severe efforts would be required to stop them at the source. *Such a war would be a contest of the old form, with variations and new techniques of one sort or another. But, except for greater use of the atomic bomb, it would not differ much from the last struggle.*'²

These were the common assumptions when Slessor became Chief of the Air Staff in 1950. Such a war was seen as being, if not inevitable, at least very likely, and this continued to be so during the two years when he held that office. After his retirement global tension ebbed. For one thing the death of Stalin brought into power as leaders of the Soviet Union men who, if equally dedicated to the ideology of Marxism-Leninism, were at least more rational and approachable than that increasingly paranoid dictator. For another, the development of thermonuclear weapons had forced even the most conservative of strategists to revise all their assumptions about the nature of future war. None the less, even before he left office, and even before the development of thermonuclear weapons was known to be feasible, Slessor had thought through, and had persuaded many (though by no means all) of his service colleagues and political masters to accept, a doctrine of nuclear deterrence that was to provide the basis for all our strategic thinking until the end of the Cold War.

The concept of deterrence through Air Power came naturally to Slessor, but he was no narrow-minded protagonist of the traditional doctrines of the Royal Air Force, let alone of the Bomber Command in which he had served with distinction. His career had given him wide experience both of inter-Service co-operation and of the interface between political and military decision-making. He had attended the Army Staff College, and written a book,

Air Power and Armies, that was for long to be a leading text on the subject of army-air co-operation. He had been able to put many of his principles into practice while serving on the North West Frontier in India in the 1930s. During the Second World War he had co-operated closely with the Royal Navy when he commanded Coastal Command at the height of the Battle of the Atlantic, and then, as Deputy Commander-in-Chief of Allied Air Forces in the Mediterranean, he learned much of the potentiality, and even more the limitations, of air power, especially in the conduct of the Italian campaign. Finally, he spent two post-war years as Commandant of the Imperial Defence College before becoming Chief of the Air Staff in 1950; a year in which, with the invasion of South Korea, the Cold War reached its depths and, to many, global war appeared imminent.

By that time Slessor had already formulated the views about strategy that were to remain the basis for his thinking throughout the rest of his life. He had set them out in an address to the United States National War College in April 1948.³ It was a bad time. The communist *coup d'état* had just taken place in Prague; there was deadlock between the Soviet Union and the Western powers in Germany, and the political situation in Italy made civil war in that country seem by no means unlikely. Slessor's proposals for dealing with the situation were simple. Western policy should be 'to prevent war with Russia . . . and if war cannot be prevented, to win it as effectively as possible.' First priority should therefore be given to 'that form of force which affords the most obvious *deterrent* to attack by Russia': and that, without any doubt, was Air Power.

If war did break out, Slessor's expectations were much the same as those of Vannevar Bush. 'We may', he warned, 'have to undertake the mass evacuation of young and old people and invalids on an unprecedented scale . . . leaving the United Kingdom stripped and at action-stations with every able-bodied citizen of either sex that remains organised as part of the defence system, so that Britain can serve . . . as an unsinkable aircraft carrier for the striking forces of the United Nations.' The Navy would be fully stretched to keep the sea-lanes open, but the primary task of the Army would be civil defence. Yet, Slessor went on to suggest, such a major war 'holds out such appalling prospects that neither side would take it on . . . and we might find ourselves back in a sort of Crimean war . . . a Communist coup in Italy might result in Italian troops with US and British support fighting Yugoslav troops with Russian and Bulgarian support at the head of the Adriatic, with the Quadripartite Commission (the inter-allied body responsible for the administration of occupied Germany) still sitting in Berlin . . . We should not reject the idea of a local trial of strength . . . a localised testing of how much we or they mean business.'

Now note three things about what Slessor had to say. First, we find here, already clearly formulated, the concept of deterrence – and implicitly, bilateral deterrence, even though the Soviet Union had yet to test their atomic bomb. *Neither side*, he frankly admitted, might be prepared 'to take it on'; and that raised problems of mutual deterrence which he did not at that time explore and which he never really solved. Second, Slessor saw the primary instrument of

deterrence as lying in Air Power. And third, two years before the invasion of South Korea, he already visualised the contingency of 'limited war'. Other thinkers were working along similar lines. About the use of air power as a deterrent there was of course nothing new. It was a concept familiar within the Royal Air Force, whose expansion had been given priority by Neville Chamberlain in the 1930s precisely in the hope that it would deter Hitler from further aggression. The American political scientist, Bernard Brodie, had indeed taken this thinking to its extreme in a work, *The Absolute Weapon*, published in 1946, in which he made the startling pronouncement 'Thus far the chief purpose of our military establishment has been to win wars. From now on its chief purpose must be to avert them. It can have no other useful purpose'.⁴ It was not a view that made him popular with the United States Chiefs of Staff, and it is doubtful whether at that time Slessor had ever heard of him. At the same time the British military writer Basil Liddell Hart, whom Slessor knew well, was thinking about 'limited wars'. 'Fear of atomic war,' he wrote, 'might lead to indirect methods of aggression, infiltration taking civil forms as well as military, to which nuclear retaliation would be irrelevant. Armed forces would still be required to fight 'sub-atomic war'.⁵ But neither Brodie nor Liddell Hart, nor indeed any other strategic thinker, was in a position to translate their ideas directly into policy, as could Slessor during those vital years 1950-52.

As we have seen, Slessor became CAS just as the invasion of South Korea convinced the American leadership, if no one else, that the Cold War with the Soviet Union was about to turn hot, and resulted in a crash programme of re-armament in which the British loyally joined. This programme specified for the defence of Western Europe a force of 96 divisions and 9,000 aircraft, of which the United Kingdom was to find 9 divisions and 1,550 aircraft; targets established at a NATO conference in Lisbon in 1952, and known thereafter as 'the Lisbon Goals'. These were described by Slessor himself at the time as 'an economic impossibility, a logistical nightmare, and a strategic nonsense'.⁶ This re-armament programme, promoting as it did a huge rise in world commodity prices at a time when the United Kingdom was already struggling with a desperate balance of payments problem, resulted in an economic crisis that the second Churchill administration inherited when it came to power in 1951. The following year the urgency of the military crisis ebbed with the stabilisation of the situation in Korea and continuing Soviet quiescence in Europe, so the government ordered the Chiefs of Staff to make drastic reductions in military appropriations. By now Slessor was Chairman of the Chiefs of Staff Committee; and it is no disrespect to his immensely distinguished colleagues, Admiral Sir Rhoderic McGregor and Field Marshal Sir William Slim, to say that it was largely due to his leadership that the British military was able to come forward with clear and agreed proposals based on a comprehensive strategic theory that enabled their political masters to tailor their armed forces to meet the political challenges facing them at an acceptable economic cost. It was certainly the first time they had done so in the twentieth century, and I doubt whether they have done anything comparable since.

You will all know the story of the gestation and birth of the famous report on Defence Policy and Global Strategy of 1952; how Slessor took his colleagues on their own, without their staffs,

for a week-end to Greenwich. There the three of them hammered out a paper that was to remain the framework of British defence policy for a further decade and lay down principles which were to guide Western strategy until the end of the Cold War forty years later.⁷ Slessor's phraseology ran all through it. The principal objects of Allied strategy, it stated, 'are to prevent Russia and China from gaining their ends by infiltrating and disintegrating the Free World, *and to prevent war*' (emphasis added). 'The first essential of Allied policy must therefore be to establish and maintain for as long as possible a *really effective deterrent against war*'; so priority should be given to air-strike forces. 'We conclude' the paper continued, 'that war is unlikely provided that the Cold War is conducted by the Allies in a patient, level-headed and determined manner . . . Provided that *the great deterrent* of atomic attack is kept in being . . . the likelihood of war is more remote than it was thought two years ago.'⁸ This phrase, 'The Great Deterrent' was one that Slessor made his own, and he continued to use it for the rest of his life.

War of course might happen, the appreciation continued, and for that eventuality strong conventional forces, especially naval forces, must be kept in being. Even if the homeland of both belligerents were to be devastated by atomic attack, the conflict might go on, in what became known as a 'broken-backed' manner. Slessor himself was sceptical about this, and only his desire to avoid a total breach with the Royal Navy made him lend his signature to the idea of 'broken-backed' war. The development of thermonuclear weapons was to make him more sceptical still.

Shortly after his retirement Slessor published a book, *Strategy for the West*, in which he set out his views at some length.⁹ It was a seminal work. In it he laid out a strategy for the conduct of the Cold War that was to be followed, and followed successfully, for the next thirty-five years. During those years so many hundreds of books and thousands of articles were published about nuclear strategy (most of them quite useless and some of them, I have to admit, by me) that it is immensely refreshing to re-read that book and remind ourselves of Slessor's sterling common sense, which was as evident in his political judgements as in his military. It was not the task of the West, he insisted, to eliminate Communism; it was 'to drive it back behind its frontiers and keep it there.'¹⁰ He had no time for the kind of crusade that was at the time being preached in the United States. 'We have' he wrote, 'no God-given mission to destroy Communism'. Rather 'our policy must accept that our opponents have their own rights, hopes and fears . . . [and] must be a reciprocal programme of Live and Let Live.'¹¹ It required great patience and self-restraint in order to prove 'that the Western way of life is better than the Communist way of life', and it meant accepting, perhaps for many years, 'a heavy burden of armaments.'¹² But this would provide time and opportunity 'for the forces of sanity that are at work in the world to assert themselves.'¹³ It did, and they have. Few policies, either political or military, have ever been so triumphantly vindicated.

Slessor made it clear that the main 'burden of armaments', would be made up of those weapons whose task was to *prevent* war. Economies could then be made in all the others. Freed from the constraints imposed by his colleagues in the senior Services, Slessor was now

able to state categorically his view that the day of 'balanced forces' was over. 'We can no longer afford the attempt to superimpose the new atomic air strategy on top of the old conventional strategy' he stated, 'so we . . . must, and fortunately can, make a virtue of necessity. We must maintain atomic air power to prevent war, and we must supplement and support it by conventional forces . . . of a size and cost that the free nations can afford to maintain without breaking themselves.'¹⁴ These would still be needed to deal with limited wars of the Korean type, and it would be the function of strategic air power to keep them limited; 'to hold the ring and prevent them from spreading, by the threat of the Big Stick in the background.'¹⁵

But what if nuclear war did break out? The Russians might be effectively deterred from using 'all-out war' as an instrument of policy, but what about the West? Slessor frankly accepted the possibility that the West might itself have to initiate nuclear war in defence of its vital interests and 'not even shrink from striking the first blow as an alternative to bloodless defeat.'¹⁶ But would we not be ourselves deterred from striking the first blow by fear of Soviet nuclear retaliation? Here Slessor was less than convincing. He admitted that defence of the United Kingdom against enemy nuclear attack was impossible, except for certain key installations. As for everybody else, he suggested, they must just grin and bear it. 'There are worse things' he argued, 'than physical extinction.'¹⁷ The British people would simply have to 'steel themselves to risks, and take what comes to them, knowing that thereby they are playing as essential a part in the country's defences as the pilot in the fighter and the man behind the gun.'¹⁸ Here it must be said that Slessor lost touch with reality. There could be no comparison between the aftermath of a nuclear, let alone a thermonuclear, strike and the German blitz of 1940. The problem of 'self-deterrence' as it came to be called, was not to be solved by this kind of exhortation, and he must have known it.

So what was the answer to the problem of 'self-deterrence'? Slessor never found it, but neither, I think, did anyone else. He countered the proposed solution of the CND with their cry for the abolition of nuclear weapons by declaring that 'it never has made and never will make any sense trying to abolish any particular weapon of war. What we have to abolish is war.' Nuclear weapons had done just that, so 'the greatest disservice that anyone could possibly do to the cause of peace would be to abolish nuclear armaments *on either side*'¹⁹ (emphasis added). But the logical inconsistency remained. If the Soviets retained their own nuclear weapons, as Slessor recognised as being not only inevitable but even desirable, would not the West be deterred from using theirs even under the most extreme circumstances? This problem was to obsess strategic thinkers for the next thirty years, and so far as I know they never came up with an answer.

Slessor and the Air Staff had hoped, at least initially, that by pre-emptive strikes against Soviet air bases they might keep the damage to acceptable proportions – at least so they thought, until the Soviets developed thermonuclear weapons. The true strategic rationale for the initial development of the independent British nuclear deterrent was the fear that the United States' air forces could not be relied upon to give such targets the necessary immediate priority.²⁰

Before the development of thermonuclear weapons and ballistic missiles, this reasoning made a certain amount of sense, but it was not thought politic to make it public and Slessor, so far as I know, never used it in his public statements. His own arguments were more emotional and, it must be said, less convincing. Britain needed her own deterrent force, he maintained, for one overriding reason; to preserve her status as a Great Power. 'The fact is' he told an Oxford audience in 1954, 'that today a bomber force equipped with the most effective modern weapons is the battle-fleet of the twentieth century and, if we want to remain a Great Power, we must face up to the cost.'²¹ In *Strategy for the West* he was even more insistent; 'This thing is so much a matter of life and death to all of us that no British family of the requisite quality should rest content until they have at least one son serving his country in the air.'²² British pretensions to such Great Power status did not survive the Suez affair of 1956, and thereafter the defenders of Britain's independent nuclear status had to fall back on more practical arguments. Within a few years, in any case, Britain's nuclear status was no longer the concern of the Royal Air Force alone.

One of the last missions that Slessor had to undertake as Chairman of the Chiefs of Staffs Committee was to visit Washington and explain the new British policy to his American colleagues. They gave him a rough ride. In the aftermath of the invasion of South Korea the United States' armed forces had expanded enormously, and they intended to keep it that way. They did not agree that the Soviets were the cautious, calculating adversary depicted by Slessor, as alarmed by the prospect of a nuclear war as we were ourselves. Instead they expected them to launch an all-out attack on the West as soon as their nuclear weapons were operative, which was expected to be within two years, and the West must be ready to meet them at all points. With NATO pledged to expand on the scale laid out by the Lisbon Goals, the last message they wanted to hear was that their principal ally intended to cut back the forces needed to fight a war and instead rely on nuclear deterrence to prevent one.²³

Two years later they had changed their minds. Stalin was dead; his successors appeared more accommodating; the war in Korea had been successfully contained and was increasingly unpopular; and Dwight D Eisenhower had been elected President on a policy, not of rolling back the forces of communism, but of restoring peace in Korea and balancing the budget at home. Suddenly the Americans discovered the concept of nuclear deterrence as a solution to their strategic and economic problems over what they called 'the long haul'. This policy, termed 'the New Look' after the latest developments in Parisian *haute couture* was expounded by Eisenhower's Secretary of State, John Foster Dulles, first to his allies in the NATO Council in April 1953, and then to the general public in a famous article in *Foreign Affairs* in January 1954. The object, he there explained, would be to place its military dependence 'primarily on a great capacity to retaliate, instantly, by means and at places of our own choosing, [thereby gaining] . . . more security at less cost.'

In an article that he himself contributed to *Foreign Affairs* a little later in the year Slessor gently pointed out that this was 'not altogether a new concept . . . The so-called 'New Look' is in fact

merely a rationalisation of tendencies, themselves originating in economic factors, which it had been increasingly obvious since 1952 would have to be faced sooner or later.' But Dulles was an embarrassing ally. Slessor himself had argued (and was to argue with increasing conviction) that 'The Great Deterrent' had only a limited effectiveness. It had abolished, not war in general, but only 'total war' as it had been waged in the twentieth century. It would deter the Russians, and indeed anyone else, from initiating a major war as an instrument of policy, as Hitler had in 1939, or taking the risk of provoking a major war as the Austrians had in 1914.²⁴ To that extent, and to that extent only, war had 'abolished itself'. But that only made it more likely that there would be limited wars of the Korean type, and in dealing with those massive retaliatory nuclear power was irrelevant, if not counter-productive. 'If we place too much reliance on the atomic deterrent for purposes for which it is unsuitable' he told the RUSI in 1954, 'the effect may be exactly the reverse.'²⁵ 'The Great Deterrent' he told an Oxford audience a year later 'will not absolve us from the unpleasant obligation to be ready to meet limited aggression with appropriate limited force.'²⁶

Meanwhile the unveiling of 'the New Look' had set off in the United States a debate that was to continue for decades and drown out the more modest discussions that were carried on in London in such venues as Chatham House, the Military Commentators' Circle, and the newly-founded Institute for Strategic Studies. Increasingly the stage was to be occupied by such prima donnas as Henry Kissinger, Tom Schelling, Bernard Brodie and Albert Wohlstetter, who discussed at an ever more abstruse level the nature of deterrence and the problem of maintaining its credibility in an age of rapid technological change – questions to which British thinkers, including Slessor himself, were to make little further contribution. As the decade wore on, Slessor became increasingly concerned over the nature of those 'limited wars' whose continuance he had always foreseen. How could they be kept limited, and prevented from escalating into the major wars that had, in principal, abolished themselves?

The leading British thinker on this question was a sailor, Rear-Admiral Sir Anthony Buzzard, who had resigned his post as Director of Naval Intelligence largely in order to campaign in public for the views that he had been unable to persuade his superiors to accept when he was in the Admiralty. Buzzard was a rigorous thinker and a committed Christian who regarded the idea of all-out nuclear war as both immoral and counter-productive. While accepting that the West had to prepare for major war in the last resort, he was reluctant to accept, either that we should initiate the use of nuclear weapons or, if they were used, that they should target civilian objectives. He therefore pressed, not only for precise restrictions to be set on the use of force in limited wars of the Korea type, (what Liddell Hart had called 'sub-atomic wars') but that these restraints should be extended even to major hostilities. The use of nuclear weapons, if they had to be used at all, should be initially and explicitly confined to military targets in the battle zone itself. If their use had to be extended, they should still be confined to military targets, but the capacity for such escalation should be kept in reserve to deter the adversary from raising the stakes. If a formal agreement could be reached along these lines, so much the better; but in any case the West should make its own intentions quite clear in advance.

This doctrine Buzzard termed 'graduated deterrence', and later became known to strategic pundits as 'Intra-war deterrence'. Slessor disagreed, and made his own views clear in a notable debate with Buzzard at Chatham House in November 1955.²⁷ For one thing, if the Soviets invaded Western Europe, to confine nuclear weapons to the battlefield would be to punish our friends and leave our adversaries scot-free. But more generally, he could not believe 'that, if it comes to major war the hydrogen bomb will not be used sooner or later; and my own feeling is that, ghastly though it would be, it would be less awful for us in the long run if it were used sooner than if it were used later.' In the case of 'limited wars' fought outside Europe, however, he agreed with much of what Buzzard had to say. Unwritten limitations had operated in Korea, where the United Nations refrained from attacking targets north of the Yalu River, and this might work again. He suggested, echoing the thinking of Liddell Hart on the subject, that 'It might suit both sides in a war of this nature to revert to the classical theory and concentrate on the defeat of the enemy's armed forces while limiting, if not entirely excluding, military action against centres of population.'²⁸ A possible model, he suggested, might indeed be the old RAF doctrine of 'Air Control' used in policing the Empire, when ample notice had been given before bombing to enable non-combatants to get away, and 'prescribed areas' had been designated in which any movement was liable to attack without further warning.

That proved in fact to be a pretty disastrous policy when the United States adopted it in Vietnam with their 'free-fire zones', but another point made by Slessor about limited wars was to be highly relevant to that conflict. One reason why he agreed that it might be unwise to use nuclear weapons in 'Korea-type' conflicts was that the dependence of Western armed forces on ports and bases would make them highly vulnerable to retaliation. In any case, he emphasised, what would be needed for such wars was not sophisticated weaponry but good fighting troops prepared to live as rough as their adversaries. The real weakness of Western armies, he warned, lay in the huge logistical infrastructure made necessary by their heavy weaponry and their high standard of living. 'The organisation of armies', he wrote a shade nostalgically in 1957, 'should be more akin to that of the old Punjab frontier force . . . who went cheerfully to war on foot with a rifle, a couple of bandoliers, a bag of raisins and a chupatti or two, and a water bottle.'²⁹ The American forces did not go to war in Vietnam equipped like that. Their adversaries did.

In his later years Slessor became increasingly interested in questions of arms control and disarmament, including a possible disengagement of military forces from Germany – a heretical idea he had first floated as early as 1954 and never wholly abandoned. He observed with some concern the enormous build-up of United States military strength, both nuclear and conventional, introduced by Robert McNamara in the early 1960s in order to provide both forces to fight 'limited wars' and to maintain a nuclear 'second-strike' capability. Like most of his countrymen he remained until the end of his life a strong believer in what became known as 'minimal deterrence'. In a note he wrote in 1963, referring to the McNamara re-armament programme, he accepted that 'We must allow a most generous margin for misjudgement in a situation that has no precedents to guide us. But margin piled up on margins can add up

to political, economic and military lunacy. We should never forget in this connection that the primary aim of Western policy is to work towards general comprehensive disarmament which alone can give the world security in the long term.³⁰ Nuclear deterrence might prevent war but it could not by itself create peace.

Slessor would probably not have expressed himself in these terms ten years earlier when he relinquished the office of Chief of the Air Staff, but not the least admirable of his qualities was his willingness to re-examine and where necessary readjust his ideas with changing circumstances. He was in the habit of describing himself as 'one who is no longer in a position of responsibility but who has had some time to think about these things.'³¹ and think he did, hard and long, in a fashion unusual among senior retired officers. Indeed it is hard to think of anyone else who reached his rank and exercised comparable responsibilities, in the British or any other Armed Forces, who made so substantial a contribution to the strategic thinking of his time. There had been brilliant mavericks like Herbert Richmond and J F C Fuller, whose originality had set them at odds with their Services throughout their careers. There had of course been Trenchard, but his grand vision had to be refined and expounded by more articulate acolytes – not the least of whom was Slessor himself. But the very idea of 'Boom' Trenchard engaging, as did Slessor, in long, subtle, good-humoured arguments with his Service colleagues, with his American allies, and, later, with upstart young academics like myself who had never dropped a bomb in anger, boggles the imagination.

I must not conclude this lecture without paying my own personal homage to Jack Slessor. In the mid-fifties some of us founded what was to become the International Institute for Strategic Studies to provide an informed and critical forum to debate the whole issue of deterrence and arms control, and Jack became one of our earliest Council members. He was a regular attendee at our seminars, discussions and conferences, and never for a moment tried to pull rank. He always expressed himself with force and precision, but listened courteously to dissenting views, made thoughtful interventions in discussions and, without ever abandoning his principles, allowed himself to be moved along by the arguments. He never made you feel a fool, but if you disagreed with him it was wise first to think through exactly what you were going to say. His was always the voice of experience, realism and sanity, and he kept us all on track. Although he would himself have hotly denied it, he was indeed a truly great man. His contribution to the winning of the war had been outstanding. No less was his contribution to the subsequent keeping of the peace.

Notes

¹ Text in Slessor Papers held by Air Historical Branch.

² Vannevar Bush, *Modern Arms and Free Men* (New York, Simon and Schuster 1949) pp.115-116. Emphasis added.

³ Reprinted in Sir John Slessor, *The Great Deterrent* (London, Cassell 1957) p.72. (hereafter GD).

⁴ Bernard Brodie, *The Absolute Weapon* (New York, Harcourt Brace, 1946) p.89.

⁵ B H Liddell Hart, *The Revolution in Warfare* (London, Faber 1946) p.87.

⁶ Notes for discussion with US Joint Chiefs of Staff 29/30 July 1952, in Slessor Papers, AHB, Air 75/20.

⁷ An account of the Greenwich meeting and its significance is to be found in John Baylis *Ambiguity and Deterrence: British Nuclear Strategy 1945-54* (Oxford, Clarendon Press 1995) pp.126 ff.

⁸ Text in Slessor Papers, AHB, AIR 75/20.

⁹ Sir John Slessor, *Strategy for the West* (London, Cassell 1954). Hereafter SW.

¹⁰ SW p.2.

¹¹ SW p.27.

¹² SW p.5.

¹³ SW p.21.

¹⁴ SW p.49.

¹⁵ SW p.64.

¹⁶ SW p.7.

¹⁷ SW *ibid.*

¹⁸ SW p.108.

¹⁹ SW p.5.

²⁰ On this see Ian Clark & Nicholas J Wheeler, *The British Origins of Nuclear Strategy, 1945-1955* (Oxford, Clarendon Press 1989) *passim*.

²¹ GD p.89.

²² SW p.105.

²³ See n.6 above.

²⁴ GD p.181.

²⁵ GD p.144.

²⁶ GD p.182.

²⁷ International Affairs, April 1956, pp.148 ff.

²⁸ GD p.246.

²⁹ GD p.310.

³⁰ 'NATO Nuclear Strategy: some lessons from History' in Slessor Papers, AHB.

³¹ GD p.217.

The Royal Air Force and the Strategic Nuclear Deterrent: An Introduction

By Dr David Jordan

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Introduction

On the afternoon of Friday 25 October 1946, a cabinet committee known as GEN75, chaired by the Prime Minister Clement Attlee, was in the process of discussing Britain's future in terms of atomic energy. One chair was empty, that of the Foreign Secretary, Ernest Bevin. The committee, established to discuss nuclear matters, was in the middle of a discussion about whether to build a gaseous diffusion plant which would permit the production of uranium 235, a vital component in an atomic bomb.

The Chancellor of the Exchequer, Hugh Dalton, and Sir Stafford Cripps (President of the Board of Trade) were carrying the argument. The serious financial situation in which Britain found itself after the Second World War simply did not allow for the high costs involved, they contended: Britain would have to do without. At this point, Bevin walked in. He apologised for his late arrival, explaining that he had fallen asleep 'after a good lunch', and listened to the debate. After a few moments, he interjected:

That won't do at all, we've got to have this... I don't mind for myself, but I don't want any other Foreign Secretary of this country to be talked to or at by a Secretary of State in the United States as I have just had in my discussions with Mr Byrnes. We've got to have this thing over here, whatever it costs. We've got to have the bloody Union Jack flying on top of it.¹

This intervention was both dramatic and decisive. Attlee was, almost certainly in agreement with his Foreign Secretary, well aware of the fact that Britain would have to embark upon production of its own atomic weapons if the country were to have any hope of influencing the United States at a time when it appeared that America might once again adopt a rather hands-off approach to Europe in the aftermath of a major war.² He saw the atomic bomb, despite the enormous cost, as being something that the United Kingdom must seek to possess. Cooperation with the United States was ruled out as a result of the McMahon Act, passed into law in July 1946, and which prohibited the transmission or dissemination of nuclear-related data even to allies.³ This was the source of considerable resentment in Britain and Canada, given the important part played by scientists from those two nations in the development of the atom bomb, but American concern for close control over information trumped wartime alliances. Thus, Britain was set on course for developing its own weapons and becoming an atomic power. The detonation of an atomic bomb by the Soviet Union in 1949 simply added impetus to Britain's pursuit of similar weapons.

In 1952, the first British device was ready for testing. Under the auspices of Operation HURRICANE, an atomic weapon was loaded into the frigate HMS *Plym*, and sailed to the Monte Bello islands off Australia. On 3 October, the device in the *Plym* was detonated, making Britain the third nuclear power.⁴

Developing the bomb was one thing; the means of delivery another. The Air Staff duly issued requirements and specifications for bomber aircraft capable of carrying and delivering an

atomic bomb. As a result of Britain's financial difficulties, RAF Bomber Command was equipped with aircraft ideally suited to fighting a continuation of the air offensive against Germany in the form of the Avro Lincoln, the immediate descendant of the famous Lancaster, and was in the process of ordering the aircraft which would become the English Electric Canberra, a most versatile aircraft which would go on to carry nuclear weapons as cooperation between the UK and US resumed in the 1950s. Yet the Canberra – a twin-engined aircraft which did not have the range to reach targets deep in the USSR, which was clearly by then the major strategic threat to Britain – was not the answer to the nation's requirement. Nor was the interim step of obtaining surplus Boeing B-29 Superfortresses from the United States (known in RAF service as the Boeing Washington) sufficient, since, as had been displayed in the Korean War, the type was increasingly vulnerable to the Soviets' rapidly advancing air defence systems. The solution came in the form of not one, but three aircraft: the Vickers Valiant, the Avro Vulcan and the Handley Page Victor. As a result of their names, inspired by the decision of the then-Chief of the Air Staff (CAS), Sir John Slessor, that the bombers would be the 'V-class bombers', the nation's initial deterrent capability would be provided by the so-called V-Force until its phased replacement by the Royal Navy's Polaris-armed Continuous At Sea Deterrent (CASD) carried by *Resolution*-class submarines from 1969.

The provision of not one but three V-bombers for the RAF sometimes creates mystification when placed in the context of the nation's financial difficulties. This is more readily understood when it is appreciated that the Valiant (arguably the forgotten bomber of the trio) was meant to be a relatively straightforward aircraft which could thus be brought into service swiftly, while the Victor and Vulcan were more advanced designs which might prove technically challenging and thus be prone to delay and, indeed, possible failure. Although there was an intention to choose between one or other of the pair, this never happened, and the RAF was to fly three nuclear-capable medium bombers. The Valiant is best remembered for being the vehicle for the first airborne delivery of a British nuclear weapon. This was conducted as the third test of a series carried out during Operation BUFFALO (which also saw testing of weapons mounted on towers) in September and October 1956; the tests helped to build confidence in the United States that collaboration on nuclear matters could be resumed. A month after BUFFALO, Valiant squadrons were put to use with conventional weapons, attacking targets in Egypt as part of Operation MUSKETEER during the Suez crisis.

The effects of the Suez crisis were profound. If Britain had harboured any desires to be considered a great power, they were dashed after the crisis, as the unfavourable reaction from Washington helped illustrate the limitations of British power. British reflection upon the events of late 1956 led in turn to a major defence review, forever associated with the Minister for Defence, Duncan Sandys.⁵ Sandys' review infamously declared that the future of manned aircraft was limited and that missiles would become the order of the day for the RAF. Conscription was ended, and the UK was to place the bulk of its defence effort into the provision of an effective deterrent. This would, for the time being, continue to be delivered

by the RAF and the V-Force, which at the time of Sandys' review was still building up to its full strength (although it never reached the target of 240 aircraft originally envisaged).

This presented a number of challenges. First, the (fission) atomic bomb had been superseded by the successful testing of a much more powerful (fusion) hydrogen bomb by the United States. The USSR soon followed. Concerned that the recently gained nuclear capability would be rendered obsolete in the 'race for megatonnage' and that a proposed nuclear test ban would deny Britain the opportunity to enter the H-bomb 'club', a series of tests of a British H-bomb were rapidly planned and undertaken under the codename Operation GRAPPLE. Although the tests were not quite as successful as portrayed at the time, Britain had become a member of the club just in time, and its credibility as a nuclear weapons state at the leading edge of technology was retained.⁶

The Valiant, as the least sophisticated of the V-bombers, was not planned for long service, particularly as its ability to penetrate growing Soviet defences reduced. Consequently, while three squadrons would remain in the pure bomber role, the type was used also for developing air-to-air refuelling and long-range reconnaissance. Unfortunately, the aircraft had been constructed using a new alloy, DTD 683. By the late 1950s, it had already been demonstrated that the alloy was prone to cracking, and it proved ill-suited to the rigours of the task to which the Valiant would be dedicated. The decision to move the bomber force to low-level operations to improve survivability against the Soviet integrated air defence system (IADS) exposed the aircraft to a harsher flying environment, inducing a higher rate of structural fatigue which added further to the Valiant's troubles. Following two significant structural failures (by some miracle, neither of which brought the aircraft down despite causing major damage), the decision to withdraw the Valiant was taken in 1964.⁷

The Victor and Vulcan arrived in time to address the capability gap, but questions regarding their survivability and, thus, their efficacy were raised even as they were coming into service. It became clear to the Air Staff that a stand-off weapon was desirable, enabling the attacking bombers to launch their weapons outside the range of the Soviet defences, even though there were grounds for confidence that a significant proportion of bombers with their potent payloads would get through to their targets if ever called upon to do so. The British stand-off weapon, the Blue Steel, proved to be a disappointment, and the move to low-level operations to enhance the bombers' survivability impacted significantly on the missile's range. The solution to the ongoing concerns with Blue Steel lay in the procurement of the Douglas GAM-87 Skybolt missile then under development for the USAF's Strategic Air Command (SAC). Unfortunately for the UK, the Skybolt was not well-regarded by the incoming Kennedy administration and was promptly cancelled following a number of failed tests (ironically, on the day the cancellation was announced, a test missile functioned perfectly). The reaction of the UK to the cancellation was one of profound irritation, much to the surprise of the Kennedy administration, which had not appreciated that, while SAC did not require Skybolt to remain viable, Bomber Command did. Relations were patched up at the Nassau conference

in December 1962 - but with serious consequences for the V-Force, since the replacement for Skybolt was to be the Polaris submarine-launched ballistic missile (SLBM).⁸ The V-force would continue in the strategic role until 1969, shortly after the first Royal Navy Polaris submarine became operational. Although Duncan Sandys had seen an era when the RAF would use missiles with nuclear warheads as part of the deterrent, this had been just a brief period between 1959-1963 when a number of RAF squadrons based at various locations in the east of England were equipped with the Douglas Thor Intermediate Range Ballistic Missile (IRBM).⁹ Although a highly reliable system, the Thor was significantly limited by its vulnerability to a first strike against its positions, and its withdrawal was therefore not met with widespread lamentation, apart from amongst those who had operated it and thought that its contribution to the deterrent had never been properly appreciated.

By 1969, the grounding of the Valiant had brought about a re-roling of the Victor B1 bombers, which were converted to assume the air-to-air refuelling duties that the Valiants had hitherto undertaken. The Victor B2 was employed by two squadrons at RAF Wittering (100 and 139), making use of the Blue Steel, but once the V-Force deterrent era was at an end, the Victors were converted into tankers, going on to serve until the mid-1990s. The Vulcan, meanwhile, continued in the nuclear strike role, albeit switching to tactical operations using the WE177 freefall tactical nuclear bomb. Conventional weapons delivery was also assigned to the aircraft in the early 1970s, but further financial constraints saw the deletion of training on conventional weapons delivery in 1975 (with some interesting consequences in 1982, when the Vulcan was called upon to bomb the airfield at Port Stanley as part of Operation BLACK BUCK). Although air-delivered weapons remained in the RAF's arsenal until after the end of the Cold War, the height of the RAF's nuclear era had been in the 1960s. Key to this had been the principle of deterrence; only once did it appear to have come close to the brink of failing, with the Cuban Missile Crisis of 1962.

The concept of aerial deterrence was not new (as Professor Richard Overy and Professor Sir Michael Howard's contributions elsewhere in this edition demonstrate), but the horrifying consequences of a nuclear exchange weighed heavy upon the world. Given that the main contention over Cuba was between the United States and the USSR, it is not surprising that the bulk of literature about the Cuban crisis deals with the US and, to a lesser extent, the USSR - but Bomber Command's place should not be ignored. Although the British approach was rather low-key, the V-Force was at the heart of the Government's response to the crisis. It is often said that the only time that the efficacy of deterrence can be measured accurately is when it fails; it did not fail in 1962, and understanding how Britain's contribution to the machinations over the basing of Soviet missiles in Cuba was a prime driver in the decision to hold an ICBH witness seminar, reproduced later in this edition of Air Power Review. The story told by the participants is both enlightening and sobering (despite the passage of time between the events of 1962 and the seminar in 2009), and helps aid our understanding of Bomber Command's vital role in defending the UK through deterrence during the late 1950s and early 1960s.

Notes

¹ Alan Bullock, *Ernest Bevin: Foreign Secretary* (London: W Norton and Company, 1983), 352.

² Ian Clark and Nicholas J Wheeler, *The British Origins of Nuclear Strategy 1945-1955* (Oxford: Clarendon Press, 1989), 51.

³ The Act was formally titled the Atomic Energy Act, but the Bill bringing it forward was presented by Senator Brien McMahon, whose name has been associated with the Act ever since.

⁴ Richard Moore, *The Royal Navy and Nuclear Weapons* (Abingdon: Frank Cass, 2001), 68.

⁵ Despite the title, the Minister of Defence was a cabinet rank position, above that of the Secretaries of State for the respective single services and with responsibility for the coordination of defence policy. It was retitled following the creation of the unified Ministry of Defence and the abolition of the posts of Secretaries of State for War and Air and the First Lord of the Admiralty.

⁶ Group Captain Kenneth Hubbard, *Dropping Britain's H-Bomb: Story of Operation Grapple* (Barnsley: Pen & Sword, 2008); AVM Wilfred Oulton, *Christmas Island Cracker* (London: Thomas Harmsworth, 1987).

⁷ Tony Blackman, *Valiant Boys: True Stories from the Operators of the RAF's First Four Jet Bomber* (London: Grub Street, 2014) 167-176.

⁸ Richard E Neustadt, *Report to JFK: The Skybolt Crisis in Perspective* (Ithaca: Cornell University Press, 1999).

⁹ John Boyes, *Project Emily: Thor IRBM and the RAF* (Stroud: History Press, 2008); John Boyes, *Thor Ballistic Missile: The United States and the United Kingdom in Partnership* (Stroud: Fonthill Media, 2015); Geoff Goodchild, *Thor: Anatomy of a Weapon System* (Stroud: Fonthill Media, 2016).

UK governments and the British bomber-borne nuclear deterrent, 1945-1955

By Mr Alan Jackson

Biography: Alan Jackson completed an MA in air power at the University of Birmingham in 2016, under the tutelage of Air Commodore (Retd) Dr Peter Gray and Dr James Pugh. Alan's career was spent in industrial management. His interest in the history of air power, and in its current and future application, was sparked by early Cold War experiences. His article looks at British government decisions on the bomber-borne nuclear deterrent in those early Cold War years; it is based on his MA dissertation, for which he was awarded the Royal Air Force Museum Masters Prize in Air Power Studies for 2016/17.

Abstract: Decisions made by British governments in the period from 1945 to 1955 led to the creation of an advanced strategic bombing force to deliver a British independent nuclear deterrent. During the same period, proposals were made to extend the life of the 'V-Force' and find its eventual replacement. The reasoning behind those decisions, and the extent to which they can be explained and justified in terms of political objectives, economic capacity, and technical advance, are the subject of this article. The author identifies that, whilst the creation of the V-Force was a very significant achievement, by 1955 serious questions had already arisen as to its potential operational effectiveness.

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Introduction

The grand strategic decision to create an independent British nuclear deterrent, the decision which was fundamental to the creation of the British V-bomber force, has often been characterised as flowing from the desire to maintain Britain's great power status.¹ Kenneth Morgan pointed to the readiness of Labour to support a foreign policy which was in many areas 'virtually indistinguishable from those of Conservative or imperialist administrations in the past'; he remarked how little disagreement there was in the parliamentary Labour Party.² Alan Bullock emphasised that Labour ministers who had been in the wartime coalition, and particularly Attlee and Bevin, had been significant contributors to what was genuinely a shared policy for the 'post-war international settlement'; their experience had been gained in government, 'with all the resources of government, including a mass of secret information, and with their minds focused on the national interest in a world dominated by power politics'.³ Peter Hennessy commented that indeed 'Britain was a superpower in 1945, as it had been in the nineteenth century, for a single simple reason: its possession of a global Empire'.⁴ Bevin, he said, 'was not one to relinquish voluntarily one ounce of British power'.⁵ Morgan pointed also to the long shadow of 1930s appeasement; 'a powerful factor throughout the post-1945 period was the belief that Labour must not lapse again into the quasi-pacifist illusions of the 'appeasement' era'.⁶ Thus defence, and how to afford it, was an important policy issue for



RAF V-bombers in flight – Avro Vulcan, Vickers Valiant and Handley-Page Victor © IWM GOV 9361

the incoming government, which faced all the problems of giving effect to its social and industrial aims while converting from a war to a peace economy.

With the passing in 1946 in the United States of the Atomic Energy Act (the McMahon Act), and the consequent ending of co-operation on development of nuclear weapons, the British government had to decide whether to embark independently on the creation of a nuclear deterrent. Richard Rosecrance wrote that 'there was absolutely no question at the end of the war that Britain would go ahead with the atomic bomb'.⁷ Hennessy said that 'Attlee never agonised over atomic matters'.⁸ In his official biography of Attlee, Kenneth Harris commented that the international situation faced by the British government early in 1947 saw to the east the Soviets 'strongly entrenched in Europe', and to the west the forthcoming 1948 American presidential election which might have seen the election of 'an isolationist Republican'; 'Britain could not have resisted the Russian advance [across Europe] with conventional weapons'.⁹ As John Bew said, the fear was that if America failed to defend Europe, and Russia got the bomb first, Britain could be left alone.¹⁰ In this context, the decision to proceed with a British bomb, and consequently with a delivery system for it, was unsurprising.

The desire to create a British nuclear deterrent had to be reconciled with Britain's economic position at the end of the Second World War. The state of Britain's economy then, and the scale of her defence commitments, has perhaps not been better and more succinctly described than by Margaret Gowing in the official history of the British atomic energy project:

Britain had, in winning the war, sold a substantial proportion of her foreign investments, run down her gold and dollar reserves and incurred a mountain of debt, while a third of her merchant fleet lay at the bottom of the sea, and exports were a third of the pre-war level... Yet defence commitments in a war-torn world were still very heavy.¹¹

Much of what has been written about the economics of the period focuses on the impact of defence expenditure on the British economy overall; the literature has little to say about the decision to proceed with an independent deterrent in the context of governments' other priorities.¹²

In terms of the translation of policy to hardware, Wynn observed that the only foreseeable delivery system for the atomic bomb to inland targets over any distance in 1945 was the aeroplane, and that this was expected to be true for the next ten years.¹³ That expectation was to prove approximately correct.¹⁴ By 1955, supersonic flight by military aircraft was a reality. In Britain the English Electric P1 had its first flight in July 1954, and exceeded Mach 1 in level flight for the first time less than a month later.¹⁵ Work began in 1955 on a 100-mile range Mach 2 stand-off nuclear weapon, to be carried by the V-bombers, as a counter to expected developments in Soviet air defences.¹⁶ Research was already ongoing into the feasibility of a supersonic bomber to succeed the V-force.¹⁷ Significantly, but ultimately abortively, work had

also begun on the proposed medium-range ballistic missile, Blue Streak.¹⁸ The period was one of high technological ambition.

The political and economic context

Labour's victory in the general election of July 1945 with a large majority provided Clement Attlee's government with a strong mandate to carry its policies through.¹⁹ These policies were focused on measures intended to 'win the peace':

'The Labour Party makes no baseless promises. The future will not be easy. But this time the peace must be won. The Labour Party offers the nation a plan which will win the Peace for the People.'²⁰

This offered the voter a deliberate contrast with what Labour saw as the failure after the First World War to produce a better life for the people of Britain. In 1919, 'the "hard-faced men who had done so well out of the war" were able to get the kind of peace that suited themselves'. The peace now must be prosperous for all. The Labour programme set out to achieve this by proposing measures in six areas: 'jobs for all'; 'industry in the service of the nation'; 'housing and the building programme'; 'education and recreation'; 'health of the nation and its children'; and 'social insurance against the rainy day'. These measures defined the objectives of the Attlee government; but Labour did not ignore defence. In a newsreel election address, Attlee began with the words: 'Labour puts first things first: security from war...'²¹

The economic situation faced by the government in August 1945 was dire. Attlee summarised it in his 1954 memoir:

Our whole economy had been geared to the war effort. We had allowed our export trade to decline. We were closely integrated with the United States economy through the operation of Lend/Lease and this had meant that we had not had to worry about our supplies of food and raw materials nor about our overseas payments. Now, in a moment, all this was brought to an end. I do not know whether President Truman could have continued Lend/Lease for a reasonable period in order to give us time for redeploying our industry, but in fact he did not. I doubt if the American Administration realised how serious was the blow they had struck.²²

Truman cancelled Lend/Lease eight days after the Japanese surrender.²³ Keynes had recently warned the cabinet that Britain faced 'a financial Dunkirk'.²⁴ This could only be avoided by expanding exports, cutting overseas expenditure, and obtaining financial aid from the United States; these required actions often at odds with defence needs.

Britain's government debt problem at the end of the Second World War was extreme. By 1946/47 it had reached 240% of gross domestic product (GDP), despite continuing GDP growth.²⁵ By contrast, UK government net debt is currently running at about 86% of

GDP.²⁶ Government expenditure had risen during the Second World War to extreme levels, extensively financed by borrowing; it peaked at 70% of GDP in 1945; of that total, 52% of GDP was accounted for by defence spending. In the fifteen years to 1939, total government spending had only briefly risen above 30% of GDP; defence spending in that period averaged 2.9%, a level to which it would not fall again until 1997. During the period 1945-1955, defence spending averaged 16.7% of GDP; omitting the years 1945 to 1947, when spending was influenced by the gradual transition from a war economy to peace, the average was 8.9%.²⁷ This high level was influenced both by rearmament with modern weapons, including development of the V-force, and by Korean War costs. In real terms, defence spending almost doubled between 1950 and 1953.²⁸

Despite the country's financial problems, Labour's objective to 'win the peace' for the people met with considerable success. From 1948 to 1951, defence expenditure totalled at 2005 prices £99.1bn. This compared with a total for government spending in the four years on pensions, health, education and welfare of £158.7bn, a 72% increase over the four peacetime years of 1933 to 1936.²⁹ The building of public housing also advanced. From 1948 to 1951, public housing completions totalled 593,530; this compared with 205,751 from 1933 to 1936.³⁰ All this had been achieved whilst almost achieving balanced external trade by 1950; though the rearmament triggered by the Korean War put paid to that.³¹

Politics and nuclear deterrence

Whilst concern was voiced over the impact on Britain's economic position of the decision to create a British nuclear deterrent, it appears to have carried little weight with Attlee. As he said in his autobiography, he 'was not prepared to leave Britain fully dependent in this sphere on our friends across the Atlantic'.³² Pressures in early post-war years for international control of atomic energy were rejected on the grounds that they 'would only be observed as long as it suited the convenience of those who were a party to them'.³³ The need for the production of fissile materials for nuclear weapons was signalled as early as December 1945, when the construction of a plutonium production pile was agreed at a meeting of GEN75, the cabinet committee charged with assessing Britain's nuclear energy requirements.³⁴ At the same meeting the Chiefs of Staff were asked to submit a report on 'our requirements for atomic bombs and the possibility of making consequential reductions in other forms of armaments production'.

Here in 1945 was an early and important hint that nuclear deterrence was seen as a means of reducing the cost of conventional defences. In 1952 the United States' Joint Chiefs of Staff would accuse Britain of promoting the nuclear deterrence strategy as a means of avoiding its conventional force obligations.³⁵ The British Chiefs of Staff regarded the conventional force alternative to nuclear deterrence, based on the 1914/18 model of a long war in Europe, as 'an economic impossibility, a logistic nightmare and a strategic nonsense'.³⁶ The American objection to the British approach proved short-lived; in 1953 the Eisenhower administration's 'New Look' policy marked its acceptance that a nuclear strategy would allow a reduction in the cost of manpower.³⁷ British strategy certainly saw a great reduction in British forces' manpower;

at 878,000 in 1952, the total had halved by 1963, the point at which the V-force had reached maximum strength and conscription had ceased.³⁸

Economic concern over the nuclear programme expressed at GEN75 meetings came to a head at an October 1946 meeting. The influence of the Chancellor of the Exchequer (Dalton) and President of the Board of Trade (Cripps) in GEN75 is clear:

In discussion it was urged that we must consider seriously whether we could afford to divert from civilian consumption and the restoration of our balance of payments, the economic resources required for a project on this scale.³⁹

Foreign Secretary Bevin's response was unequivocal:

That won't do at all... we've got to have this... I don't mind for myself, but I don't want any other Foreign Secretary of this country to be talked to or at by a Secretary of State in the United States as I have just had in my discussions with Mr Byrnes. We've got to have this thing over here whatever it costs... We've got to have the bloody Union Jack on top of it.⁴⁰

Attlee subsequently established the GEN163 committee, to decide whether to proceed with a British bomb. The committee met once, on 8 January 1947.⁴¹ Chaired by the Prime Minister, Dalton and Cripps were not present. This at a time when ministers were engrossed with economic conditions and, as Gowing observed, 'Britain was almost at her darkest economic hour with factories closing down for lack of coal' during the worst winter for 200 years.⁴² Having considered a report by Lord Portal, the committee decided 'that research and development work on atomic weapons should be undertaken.'⁴³ Requiring the utmost secrecy, only three copies of the confidential minutes were to be retained.⁴⁴ The atomic path had been chosen, and with it the need for a force of advanced bombers.

The development of defence policy

The development of defence policy in the ten years following the end of the Second World War, and the emphasis on nuclear deterrence, had a public and a secret existence. The public face is summarised in annual statements relating to defence. The atomic bomb was first mentioned in 1946, but only as a matter to be dealt with in future.⁴⁵ The following year's white paper, published shortly after the GEN163 decision, referred to the supreme need to prevent war by deterring aggression.⁴⁶ In 1948 there was still no mention of the bomb or bombers.⁴⁷ There was however in May a low-key announcement that atomic weapons 'are being developed.'⁴⁸ The first public mention of new bombers came in a statement by the prime minister in January 1951 that 'the first order is being placed for a four-engined jet bomber'.⁴⁹ No explicit link was made between this development and the atomic bomb programme.

Following Labour's defeat in October 1951, the incoming Conservative government at first said little publicly. Although the 1953 white paper referred both to the bomb and bombers, it was

not until 1954 that the emphasis was first on the Communist threat to world peace; the three principal aims of defence policy were:⁵⁰

First, we must maintain our resistance to World Communism and to Communist adventures.... Secondly, we must, with our allies, build up the most effective possible deterrent against a major aggression which would lead to global war. Thirdly, we must do all we can, *within the limits of our resources*, to be prepared to meet such an aggression should our efforts to prevent it fail.⁵¹

The principal means of deterrence and of meeting aggression in the event of failure was clearly set out: 'the primary deterrent however, remains the atomic bomb.... We intend as soon as possible to build up in the Royal Air Force a force of modern bombers capable of using the atomic weapon to the fullest effect. A strong and efficient force of medium bombers is of the greatest importance.'⁵² Here finally was an explicit reference to the creation of a British bomber-borne nuclear deterrent.

Matters had advanced more quickly behind the veil of secrecy. Concerns about the Soviet threat post-war had grown from late-1943 onwards.⁵³ By May 1947 the advice of the Chiefs of Staff was clear. Their report, "Future Defence Policy", was unambiguous: 'The issue which cannot be avoided is that our Defence Policy must at present be based on the possibility of war with Russia.'⁵⁴ Having first set out Russian strengths, the Chiefs stated that the balance against Russia must be redressed by 'increasing and exploiting our present scientific lead. This applies particularly to the development of mass destruction weapons.'⁵⁵ To prevent Russia from using weapons of mass destruction in future it would be necessary, by 1956-57, to face her with the threat of British 'use of weapons of mass destruction on a considerable scale from the outset.'⁵⁶ The report set out the factors underlying that timetable:

All our intelligence sources indicate that Russia is striving, with German help, to improve her military potential;... We must expect that from 1956-57 Russia will probably be in a position to use some atomic bombs and biological warfare; that she may have developed ... rockets, pilotless aircraft, a strategic bomber force and a submarine force; and that she will continue to maintain very large land forces...⁵⁷

Three months later, the Joint Intelligence Committee (JIC) estimated that 'by January 1952, the Soviet Union's stock of bombs is unlikely to exceed 5,... By the end of 1956 the stock may be from 40-60'; it was 'estimated that some 30-120 atomic bombs accurately delivered ... might cause the collapse of the United Kingdom without invasion'.⁵⁸ At their conference with the Chiefs of Staff in June to consider the May report, Attlee and Bevin were concerned that pursuing a policy which Russia would see as aimed at her might precipitate war. The Chiefs' advice was however accepted, subject to no reference being made to Russia in the proposals for the future size and shape of the armed forces.⁵⁹ It was from this point that the concept of nuclear deterrence of Soviet aggression became a principal pillar of UK defence policy. By 1948,

the JIC advised that 'the fundamental aim of Soviet leaders is to hasten the elimination of capitalism from all parts of the world and to replace it with their own form of communism'; this would be effected by 'revolutionary struggle', 'assisted, should favourable conditions arise, by military action on the part of Soviet and satellite armed forces'.⁶⁰

Further papers by the Chiefs on global strategy were prepared in 1950 and 1952. The 1950 paper emphasised the essentially global nature of the Cold War, and the imperative of a joint strategy with the United States, the British Commonwealth and the Western European nations.⁶¹ It noted 'the discovery by Russia of the atomic bomb', and pointed to current Western weakness; 'from the purely military point of view, Russia could march to the Atlantic at any moment.'⁶² Richard Aldrich suggested that intelligence reports of Russia's first bomb test in August 1949 'were one of the key factors that triggered the recasting of British strategy in the period 1950-52'.⁶³ Research and development of nuclear weapons was a high priority.⁶⁴ The 1952 Global Strategy Paper (GSP), described by Baylis as forming 'a focal point for all strategic deliberations for the next five years', emphasised the need for a co-ordinated allied strategy; and that deterrence could only be achieved by 'the knowledge on the part of the Kremlin that any aggression on their part will involve immediate and crushing retaliation... with the atomic weapon'.⁶⁵ Economic pressures required a reduction in planned defence expenditure generally, and to the bomber expansion programme in particular.⁶⁶ Among the Chiefs' conclusions was that 'it would be wrong for the United Kingdom to take no part in the Atomic Air Offensive. To achieve this while meeting economic demands, the expansion programme of the Royal Air Force should be revised to include a larger proportion of four-engined medium jet-bombers, at the expense of aircraft for tactical use'.⁶⁷ The paper was approved by the Cabinet with few significant changes.⁶⁸

In 1953, the RAF continued to emphasise the centrality of the medium-range bomber force. In January, the Deputy Chief of the Air Staff (DCAS), in a minute to the Secretary of State for Air stressing its importance, emphasised the primacy of its deterrent role, but if war came it must 'strike as powerful an initial blow as possible... For deterrence the biggest force we can afford is the least we should provide'.⁶⁹ The Vice Chief of the Air Staff (VCAS) declared that 'the primary offensive agent of air power is the strategic bomber'. Reflecting that the first few days in a nuclear war would be critical to the UK's survival, the VCAS made clear that 'this offensive element of our defence [must be] immediately available – and it must be under our own control'.⁷⁰

Continuing economic problems in 1952 had led Churchill to establish a sub-committee of ministers at the beginning of 1953, whose task was to conduct a 'radical review of the focus of the defence effort after 1954', and from which the Chiefs of Staff were excluded.⁷¹ There was relentless pressure from the Treasury to reduce defence costs.⁷² This was a factor in the sub-committee's decision that the services should be instructed to plan for a war of only six weeks.⁷³ As Baylis wrote, this focused the military emphasis yet further on the nuclear deterrent.⁷⁴ Economic pressure continued to bear down on the military's capacity to deliver

policy objectives. A suggestion during the 1954 defence programme review, that reductions in the V-bomber force might be used to fund increases in Fighter Command's strength, was strongly resisted by the VCAS.⁷⁵ Looking ahead in 1954 to force sizes in the period 1958-1960, the Air Ministry assumed that strategic policy would remain 'to rely on our strength in nuclear weapons to establish our influence in the world, and, in conjunction with the United States, to blunt the enemy offensive if war comes.'⁷⁶

It is important to recognise that the strategy of bomber-borne deterrence was widely approved. Within the armed forces, Field Marshal Slim, Chief of the Imperial General Staff, and Admiral McGrigor, First Sea Lord, were with Slessor co-signatories of the GSP. Slessor and Slim had agreed to naval demands to cover the requirements for a period of 'broken-backed hostilities' at sea following an initial nuclear exchange; however, McGrigor later accepted that the GSP had recommended 'that preparations for war should be primarily directed to the requirements of the first few intense weeks, little provision being made for more long-term requirements.'⁷⁷ The strategy had cross-party support in Parliament. In closing the debate for the Opposition on the 1954 Statement on Defence, Attlee re-confirmed Labour's position. It did not force a division on the statement as a whole.⁷⁸ Attlee emphasised the deterrent strategy:

Our great hope is that the horror of the atomic weapon will be so great that it will lead to its never being used. I do not see much point in speculating upon broken-back warfare. If that war breaks out, both combatants will be ruined. It will be difficult to live, let alone fight.⁷⁹

Given the incessant economic pressure on the defence budget, it is instructive to attempt to assess the cost of the nuclear deterrent and its relationship to both total defence costs and other major government programmes. Establishing the basic figures with clarity is difficult, given the obscure nature of government accounting. An October 1953 note from the AUS(A) to the CAS estimated the cost of the RAF, by operational command, over the three year period 1953/54 to 1956/57; it provided a precise-looking cost for Bomber Command of £505m, 24% of the RAF total, for the period.⁸⁰ However, Bomber Command would comprise more than just the strategic nuclear strike force during this period; and, as the note goes on to say, the cost of the radar stations was mainly attributed to Fighter Command, a significant part of whose task was to defend the bomber bases. Additionally, the allocation of training, maintenance and overhead costs was 'necessarily arbitrary'.

The unreliable nature of the data means that any attempt to put the cost of the nuclear deterrent into a wider context will be flawed. It does however provide some sense of scale. Gowing gave figures for the nuclear project itself, subject to caveats, of capital expenditure for the period 1946 to 1953 of £72m, and current expenditure in the same period of £66.7m.⁸¹ If the annual rate for the period 1953 to 1957 implied by AUS(A)'s £505m figure is accepted as a basis for the earlier period, the implied average total annual cost for 1946 to 1953 for the

deterrent was £144m.⁸² This represented 2.2% of total government expenditure in 1953, 7.6% of total defence spending, and 7.3% of the total spent on healthcare, pensions, education and welfare.⁸³ The costs were significant, but their scale, at a time when government and public were alarmed by the magnitude of the Soviet threat, appears proportionate.

From policy to hardware

Successful deterrence promised the prevention of war, not its successful prosecution. But what if deterrence failed? The threat of retaliation had to be real. The bombers had to have targets of real military value which they could reach. In terms of what would actually be required of the future V-force, and consequently its design parameters, the period after the return of a Conservative government to power in 1951 was significant.⁸⁴ In his role as CAS, Sir John Slessor made arguably the greatest individual contribution to the creation of the V-force during this period.⁸⁵ He influenced strongly both deterrent strategy generally, and the targeting policy adopted. In a December 1950 note to the Chiefs of Staff Committee, he had said that “the effective modern bomber force” which is needed ... [must possess] the performance, range, accuracy and hitting power that will enable them to attack successfully’. In order ‘to hold the enemy as far to the East as possible’, targets would include airfields, expected to be those used for attacks against the UK, guided weapons sites, supply centres and possibly large troop concentrations. In this context, ‘most important of all, we must clearly have a bomber capable of carrying and delivering the A. bomb. . .’⁸⁶ As Ball wrote, by means of the GSP, Slessor ‘put the bomber at the centre of British strategy’ and this was seen as ‘a triumph for the RAF’.⁸⁷ Among the conclusions of the GSP was that there was no foreseeable defence against atomic air attack.⁸⁸ The deterrent would be effective provided ‘that the intention of the Allies to *use the atom bomb immediately* is unmistakably clear to the Russians’.⁸⁹ Slessor had made clear earlier to the Secretary of State for Air what he meant by this immediate use of the bomb if the deterrent failed to deter the Russians:

if it [a Russian invasion of Western Europe] came, I do not believe the Red Army could be stopped by the Divisions and Tactical Air Forces which N.A.T.O. can in fact build-up without busting Europe and U.K. economically – which may well be the Russian game. I believe the only really sound course would be to build up a completely overwhelming British/American bomber force with the A bomb, capable of pulverizing Russia itself *and eliminating the Red Air Force at its bases*.⁹⁰

This identification by Slessor of the British bomb as ‘the best counter-air weapon in existence’ became an important factor in target selection.⁹¹

Although Russia had dispersed much manufacturing capacity to the east during the Second World War, many potential targets, including many Soviet cities, lay west of the Urals.⁹² The great circle distance from the bomber bases of Lincolnshire and East Anglia to Moscow, for example, is somewhat less than 1,300 nautical miles. For a hypothetical attack on Russia, the actual route would have been rather longer, as the approach (at least in later years) was

over southern Norway.⁹³ The Joint Intelligence Bureau (JIB), established in June 1946 from wartime departments, played an important part in the assembly of targeting information for the medium bomber force. It was charged with the collection of topographic, economic, industrial and scientific intelligence, and later of atomic intelligence.⁹⁴ It decided in December 1945 'to prepare target intelligence surveys'.⁹⁵ Some of its output can be seen in a document comparing the operational value of the V-bombers, produced in January 1953; in it the DCAS set out a list, based on a study by the JIB in May 1952, of 'possible strategic target systems'. These included airfields 'considered to be most suitable for use as medium bomber bases', as well as administrative and industrial targets.⁹⁶ All of the airfield targets, and a significant proportion of the administrative and industrial targets, lay less than 1,500 nautical miles from the UK. The range requirement which had earlier emerged in the specifications which led to the creation of the V-force aligned with this targeting scheme.

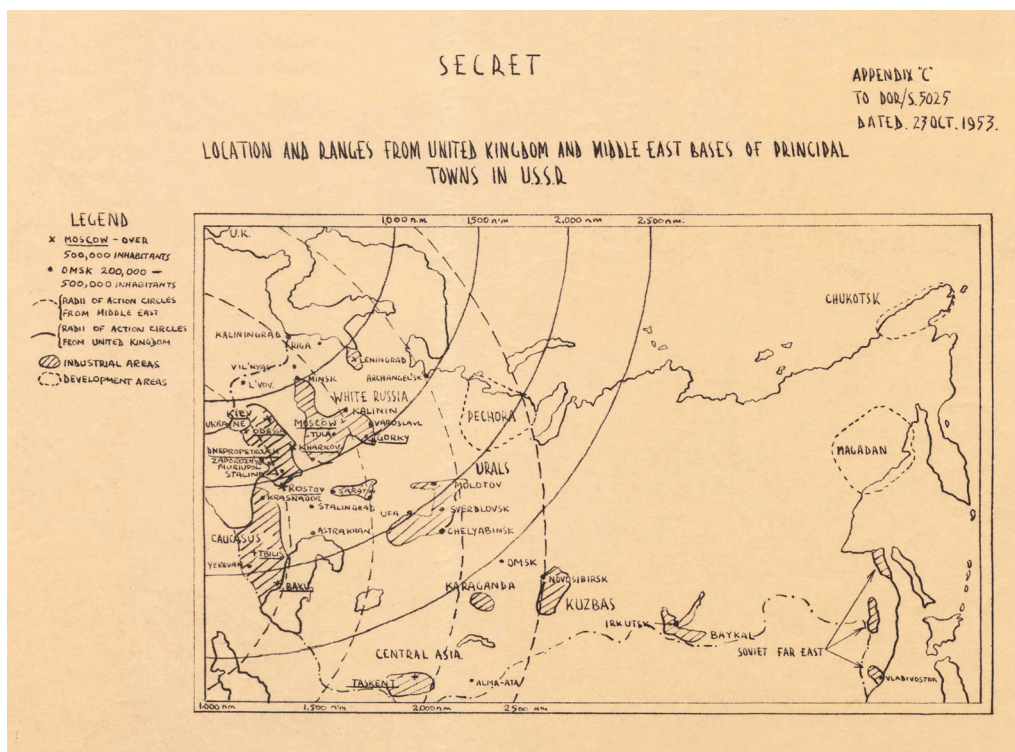


Figure 1: Distances of Soviet cities from UK and Middle East Bases. TNA AIR 20/8575 Crown copyright (OGL).

The practical steps to translate strategy into the required hardware first to deter, and if that failed, to provide the capability to deliver atomic bombs to their targets in an act of 'immediate and crushing retaliation', began earlier than the GSP, with the issue by the Air Staff in August 1946 of an operational requirement (OR1001) for the bomb itself.⁹⁷ This was five months before the GEN163 decision to proceed with development, but after the Cabinet Defence Committee

accepted on 22 July 1946 the need to plan for the adoption of both atomic weapons and the bombers needed to deliver them.⁹⁸ The size of the bomb, uncertain at first, was among the defining criteria of the atomic bombers.

Thinking about next generation bombers had begun much earlier. The Secretary of State for Air, Archibald Sinclair, emphasised as early as November 1943 that 'we need a big new bomber. We cannot afford to be left behind by America or perhaps Russia'.⁹⁹ Discussions in 1944 on future bomber policy centred on an armed heavy bomber, with an operating altitude of 35,000 feet at 350mph.¹⁰⁰ In July 1944, unhappy with these modest performance aspirations, the CAS pressed ACAS(TR) to follow up his desire for 'the exploitation of ceiling'.¹⁰¹ ACAS(TR)'s response to Portal's minute bears a hand-written annotation by the CAS; 'Certainly, but I hope you go for 60,000 feet!'¹⁰² The idea of the fast, high-flying strategic bomber seems first to have been expressed at the highest level at this time.

The development of these late-war ideas about future bomber capability, culminating in the technically unambitious Short Sperrin to specification B14/46, provides the background to what became the V-bomber programme.¹⁰³ The carriage of the British nuclear deterrent by bomber aircraft, rather than any other method, was firmly established during the tenure of Lord Tedder, the first post-war CAS. In November 1946 the Air Staff issued a draft operational requirement (OR230) which transformed earlier performance expectations: the next generation must carry a 10,000lb 'special bomb' (the atomic bomb) at 500kts and 50,000ft to a target 2,000 miles away from a base anywhere in the world; and would rely on speed, height, manoeuvrability, early warning devices and radar countermeasures for defence, rather than conventional armaments.¹⁰⁴ Research had shown that defensive armament would not be required if '500 knots could be achieved at high altitude', and indeed would be ineffective against modern rocket-firing fighters.¹⁰⁵ At the same time a draft requirement was issued for a 'medium range' bomber, OR229, with a less demanding range requirement.

The difficulties presented in meeting even the medium range bomber requirements were manifold, not least designing the aircraft in the absence of detailed design of the 'special bomb' that it was to carry while achieving the 100,000lb all-up weight requirement. Of that total, the Director of Technical Development noted that the fuel required to meet the range specification would weigh about 47,000lbs, and military equipment including the bomb would weigh 20,000lbs. The problem with all-up weight above 100,000lbs was the need to restrict operations only to those few airfields with suitable runways.¹⁰⁶ In practice the requirements set out in OR230 'were found to be unacceptable at the time'.¹⁰⁷ The decision was for the medium range bomber, for which specification B35/46 was issued by the Ministry of Supply (MoS) in January 1947.¹⁰⁸ It called for an aircraft to meet OR229 with an operational radius of 1,500nm; this put Moscow within range of eastern England.¹⁰⁹

Responses to the B35/46 specification were received from six manufacturers; Armstrong Whitworth, English Electric, Handley Page, Avro, Short Brothers, and Vickers-Armstrongs.¹¹⁰

The Avro 698 (later named Vulcan) and HP80 (later, Victor) designs, with their greater degrees of wing sweepback, were described as 'advanced' relative to the English Electric and Vickers designs, which were rejected, as were those of Armstrong Whitworth and Short Brothers.¹¹¹ Contracts were issued to Handley Page for two prototypes of the HP80 on 19 November 1947, and to Avro for two prototypes of the 698 in January 1948.¹¹²

Development of the Sperrin ceased in October 1949, its shortcomings having been recognised, and B14/46 was cancelled.¹¹³ There remained concern about the capability gap which would result from the long time-frame for the Avro and Handley Page developments. This gave rise to a new specification, B9/48, which had lower speed, climb rate and ceiling requirements, but with the same range and bomb load as the B35/46.¹¹⁴ Vickers submitted the successful bid. This left three live projects for the medium range bomber requirement: Avro's type 698 and Handley Page's HP80 to the B35/46 specification, and Vickers' type 660 to B9/48. All three were to see service.

Three designs?

Viewed from the perspective of the incoming CAS in 1950, Sir John Slessor, the decision to proceed with all three V-bomber designs seems straightforward. The only commitments made were for two prototypes of each of the designs, and in the case of the B35/46 aircraft, small-scale aerodynamic test models.¹¹⁵ Slessor emphasised the need to expedite the B9/48 aircraft to create "the effective modern bomber force" which we do not at present possess.¹¹⁶ The argument for putting the Valiant into production as soon as possible was accepted by the Chiefs of Staff Committee at their meeting on 28 December 1950, and approved by the Minister of Defence.¹¹⁷ A production order was placed in February 1951, about three months before the prototype's first flight.¹¹⁸ The first production aircraft was released to (limited) service in January 1955, having first flown in December 1953.¹¹⁹ The RAF had to wait until mid-1956 for the release to service of the Vulcan, and a year later for the Victor – two months before the last Valiant was delivered.¹²⁰ All nine Valiant squadrons were formed by April 1957, before the first Vulcan squadron; it was not until April 1961 that a total of nine squadrons of Victors and Vulcans had been formed.¹²¹ Given the overriding strategic requirement to establish the British deterrent, the decision to proceed with the interim B9/48 appears justified.

Failure to choose between the two B35/46 types is less easily understood. The first flight of a Vulcan prototype took place on 30 August 1952, and of a Victor prototype on 24 December.¹²² Production orders were placed before the first flight of either.¹²³ Surprisingly, at a meeting at the Air Ministry in May at which both the Secretary of State for Air and the Minister of Supply were present, the fact that buying some of each type would be more expensive than selecting one of the two B35 aircraft plus Valiant, or an all-Valiant force, was dismissed. 'In relation to the total expense of a sizeable medium-bomber force this extra expense was unlikely to be significant'.¹²⁴ That seems improbable; certainly the Treasury was critical at the time, and agreed to proceed only on the basis that Canberra orders would be reduced.¹²⁵ During the radical

review, the Air Staff fought to continue with all three types, pointing out both the need for the earlier in-service date of the Valiant, and the very early stage of development and great development potential of both Vulcan and Victor.¹²⁶ The initial judgement that because of their advanced designs it would be necessary to test both before making a choice appears to have stood up at this point, and memories of the failings of the Short Stirling and the Avro Manchester in the Second World War will have been fresher in the minds of the Royal Air Force leadership then than now.¹²⁷

The Chancellor remained unimpressed, challenging in February 1953 a proposed follow-on order for the Valiant.¹²⁸ The matter went to the Prime Minister, who sided with the Air Ministry; Butler conceded the point, but the Treasury continued to press for cost savings.¹²⁹ In January 1954 the Minister of Supply (Sandys) opined that 'it will be a long while yet before we have sufficient flying experience to enable us to make this choice with any confidence.'¹³⁰ In May the CAS (now Sir William Dickson) said that 'we are likely to be well committed to both of them well before sufficient data can be available.'¹³¹ As late as October 1955 the Air Ministry told the Treasury that 'it is not yet possible to make any decision as between the Victor and the Vulcan on operational grounds'; there was 'so little to choose between the two'.¹³² If there was indeed little to choose, then the choice of one over the other should have been possible based on other criteria; on cost, for example, and the capabilities of the respective manufacturers. Ordering of both types had continued in the interim, and as Brookes said, it is clear from the ordering pattern that the option of choosing between the Vulcan and the Victor had gone by the end of 1955.¹³³

It is difficult to find any convincing reason in the archives for the failure to make that choice, other perhaps than a failure of the MoS or the Treasury to insist that a choice be made. The maintenance of a significant aircraft industry may have been a factor. It may have been simple inertia, with all parties too deeply committed with orders for both types to pull back. Perhaps it was the thought that the failure of a type selected as the sole atomic bomber, such as happened later to the Valiant, would have destroyed the British deterrent. Air Force history suggests a long-standing historical tendency to hedge bets, arguably going back to April 1917 and seen again in the Second World War with the production of the Stirling, Lancaster and Halifax.¹³⁴ Slessor and Sandys agreed that any attempt to select between the V-bombers before all three had been tested would have been unwise.¹³⁵ Hindsight confirms that it was fortunate that a proposal by the Secretary of State for Air in January 1954, that the Vulcan and Victor should be sacrificed in favour of a faster build-up of Valiants, was rejected.¹³⁶

Technology and viability

Comparison of the performance and appearance of the V-bombers with the designs of one and two decades earlier makes obvious the advance of aeronautical technology in that period. The Handley Page Heyford, the last biplane bomber to enter service with the RAF, in 1933, had a maximum speed of 142mph. The Avro Lancaster, in service from late-1941, had a maximum

speed of 287mph. The Avro Vulcan, in service from 1956, had a maximum speed of 625mph.¹³⁷ The B35/46 designs offered by the industry in 1947 represented a move into a new world of swept wings and jet engines. As Sir John Slessor reflected in 1954, 'modern methods of control and reporting, modern computers and the proximity fuse in AA artillery have put an end to the great fleets of relatively slow bombers operating at modest altitudes of the last war...'¹³⁸ The V-force was expected to reach its targets defended by only height, speed, manoeuvrability and electronic countermeasures (ECM).

Late in the Second World War, government had considered how technological change might affect the performance of war. In its June 1945 report on "Future Development in Weapons and Methods of War", Sir Henry Tizard's committee, while foreseeing the possibility that missiles might eventually take over, believed that 'there will be a period, before the problems of supersonic flight are mastered, when the bomber will enjoy a maximum degree of immunity.'¹³⁹ Rockets might be used for distances of up to about 400 miles, but further than that 'we can imagine no method by which a sufficient accuracy could be obtained at these ranges [2,000 miles] to justify the effort.'¹⁴⁰ Not everyone agreed that bombers were, or would remain, the right vehicle for delivering nuclear weapons to their targets. Reporting in 1945 on his observation of the Hiroshima and Nagasaki missions, Leonard Cheshire said that accurate delivery of the weapon was paramount, and that 'the only foreseeable means of doing this was by space projectile.'¹⁴¹ At the time that was unattainable, but whether bombers would long enjoy immunity was contentious even before the first flight of the Valiant. Vannevar Bush wrote in 1950:

Will these high-flying planes be so completely immune? For a time yes; but looking ahead, perhaps not. For we have to think of the time required before atom bombs in quantity are in the hands of the two belligerents. The future enemy of the high-flying bomber is the guided missile.¹⁴²

Slessor responded publicly in 1954:

Dr Bush suggests that even the high-flying bomber may have only a temporary lease of life. There again he is almost certainly right, but I think it will remain effective long enough to be a decisive factor in our present strategy for the West.¹⁴³

The reality in 1946 had been that the options available to implement nuclear deterrence were few. Ball said that what lay behind the commitment of the RAF to manned bombers may have been 'a visceral preference for highly sophisticated, high performance and high cost aircraft'. Up to 1955, it is hard to see that the Air Staff had any choice.¹⁴⁴

Threats to the viability of the bomber-borne deterrent had started to emerge by 1955. The MiG-17 interceptor was in service with its ceiling of more than 51,000'. Both the S-25 surface-to-air missile (SAM) system around Moscow and the supersonic MiG-19 interceptor, with its ceiling above 57,000' and rapid climb rate, were coming into service.¹⁴⁵

These developments were known in the West. A CIA report dated 12 July 1955 commented on extensive modern Soviet radar coverage, strong anti-aircraft artillery forces around Moscow capable of continuous fire effective up to 45,000' in all weather conditions, and a strong suspicion of SAM defences for Moscow.¹⁴⁶ The presence of the extensive S-25 system surrounding Moscow, with its range of 28 miles and ceiling of 46,000ft, was confirmed by U-2 photographic reconnaissance in 1956.¹⁴⁷ The S-75 mobile system, with its range of 18 miles and ceiling of 65,000ft was in service in 1957.¹⁴⁸

How much American knowledge of Soviet air defences was conveyed to the British is unclear, but the RAF had similar information by about the same time.¹⁴⁹ Even absent the relevant intelligence, the position could have been assessed by attributing to the Soviets a similar degree of technical advance to that being achieved at home. In the interceptor field, the all-weather Gloster Javelin, with its 52,000' ceiling and Fireflash missiles, entered service in 1955. The English Electric P1A, a prototype for the Lightning interceptor, had achieved M1.5 in 1954; the Lightning would go on to M2.0+ and a service ceiling above 60,000', and the F1 was in service in 1960.¹⁵⁰

Concern within the RAF about the impact of improving Soviet air defences on the effectiveness of the V-force was apparent by 1954. In February, a minute from the CAS to the Secretary of State for Air, sparked by knowledge that the MiG-17 was faster than the Valiant, urged the purchase of more Vulcans and Victors because of their 'precious extra speed and height'.¹⁵¹ At a November meeting of the Air Council, there was optimism about the capability of the Valiant; C-in-C Bomber Command expressed the view that 'it should be capable of penetrating the existing Russian defence system without undue difficulty'.¹⁵² Such optimism did not last long. By July 1955, concern had begun to focus attention on steps which might be taken to improve the operational effectiveness of the V-bombers. A draft operational requirements report noted that:

Our plans for maintaining an effective strategic deterrent with the "V" bombers has [sic] been upset by the very rapid advance made by the Russians in the development of electronic equipment, a supersonic fighter and an all weather fighter, and their outstanding ability to finalise their requirements for production.¹⁵³

It went on to state that European Russia had complete early warning and GCI radar coverage, that the MiG-15 was rapidly being replaced by the MiG-17, and that a new all-weather fighter and single seat fighter were beginning to enter service.¹⁵⁴ By 1960, Soviet SAM coverage was expected to extend from the Baltic to the Caspian, with just one small gap. Recommendations in the draft report included high priority development of ECM, the introduction of a decoy missile, consideration of a low-level role for the Valiant, and urgent consideration of the feasibility of introducing 'an unmanned supersonic surface-to-surface guided weapon by 1962'. ACAS(OR) followed up immediately with a recommendation to the Air Council that efforts be made to increase the altitude capability over the target of the Vulcan

and Victor as rapidly as possible.¹⁵⁵

Planned new engines, new wings and comprehensive ECM would in time improve the position, but as an October 1955 paper noted:

even allowing for improvements resulting from these earlier plans, our most recent examinations have shown that yet more extensive developments must now be urgently considered. Intelligence information shows that the Russian defences are distinctly superior in many respects to our previous estimates.¹⁵⁶

Noting that the planned supersonic reconnaissance aircraft to OR330 remained further off than previously hoped, the paper suggested that the V-force 'would be in danger of becoming less effective' from 1958 onwards. Further, that 'an entirely new system of adequate performance', then expected to be the Blue Streak intermediate-range ballistic missile, was unlikely before 1964 'and probably much later'. That entirely new system, in the form of the then-unforeseen Polaris SSBNs, was not in place until 1 July 1969.¹⁵⁷ The paper's recommendations to sustain the force's effectiveness included higher priority for several existing projects, including the 'powered and guided bomb' to OR1132 (Blue Steel) and the addition of a bombing role in OR330. New projects proposed for 'additional development effort in the near future' were the decoy system mentioned in the July paper; subtler ECM; significant improvements to the range of the OR1132 weapon; and finding a means to avoid the generation of condensation trails. Contrails were expected, in daytime or on moonlit nights, entirely to negate the benefits of 'our whole ECM programme'.

Low-level attack was extensively investigated. It was thought in March 1955 that targets could be reached without in-flight refuelling by flying the low-level sections (the last 650nm to and back from the target) on two engines.¹⁵⁸ In May 1956 it was reported to a meeting between the Air Ministry and the MoS that if the Valiant were used in low-level operations for more than 150 hours there might be fatigue failures.¹⁵⁹ This was unsurprising; at a meeting in November 1946, it had been noted that to achieve high speed at high altitude, it would be necessary 'to get the minimum structure weight', and that consequently 'the aircraft would not be stressed for high speeds at a low altitude'.¹⁶⁰

In June 1956, a draft report suggested that all the V-bombers would be at risk by 1960.¹⁶¹ The Valiant would be unable to operate at high level even at night by then. The forecast loss level was prohibitive; even using Blue Steel, an attack to a depth of 530nm in Soviet territory might be expected to result in the loss of the whole Valiant force. The V-force eventually switched to low-level attack seven years later, spurred by the deployment of the S-125 SAM system.¹⁶² Plans for ECM were carried forward, but with uncertain success. Speaking to the RAF Historical Society in 2002, Wing Commander Rod Powell recalled his experiences as an Air Electronics Officer on Vulcans from 1966. Remarking that it is impossible to know what the survivability rate of the V-force would have been:

My guess is that many of the aircraft would have been shot down before they reached their missile release point or, in the case of the free-fallers, the target, because, to be honest, the EW [electronic warfare] suite that we had at the time was just not good enough.¹⁶³

He observed that all the EW equipment on the Vulcan at that time 'had been specifically designed to counter the Soviet high level threats of the 1950s but were of rather less value once the force had adopted low-level tactics.'¹⁶⁴

The idea that the effectiveness of the V-force could be extended by using weapons released well away from the target held promise. OR1132 called for 'a propelled controlled missile' which could be launched 100nm from the target and would be self-guided.¹⁶⁵ Despite many testing failures, the resulting weapon, Blue Steel, entered service in October 1962, though it was not fully operational until 1964.¹⁶⁶ By then its mark two version (intended to have a range of 600nm) had been cancelled in favour of an order for the Skybolt air-launched ballistic missile, itself cancelled by America in December 1962. That cancellation led to the acquisition of Polaris, and the transfer of the strategic deterrent to the Royal Navy in 1969. When the V-force switched to low-level attack in 1963, a low-level launch version of the weapon was developed; this had a much-reduced range of 50nm.¹⁶⁷

Two of the improvement projects called for in the October 1955 paper never came into service; these were the OR330 supersonic reconnaissance/bomber (the Avro 730) and the OR1139 medium range ballistic missile (Blue Streak). OR330's performance targets were extremely challenging, particularly given the required in-service date of 1962.¹⁶⁸ It was contentious at the time among the Air Staff; ACAS (Training) wrote to ACAS(OR) in August 1955 that 'the sooner we devote all our energies to the production of an effective weapon [an intercontinental ballistic missile]... the sooner we can 'rest easy in our beds'...¹⁶⁹ The project was cancelled in 1957 following the Sandys defence white paper that year.¹⁷⁰ Blue Streak too was cancelled, in 1960, principally on the grounds that its extended launch preparation time, and the small area of the UK in which to locate the silos, would make it vulnerable to pre-emptive Soviet strikes.

Technical issues aside, arguments about the *size* of the V-force illustrate the decision-making process. Slessor indicated the size of force that he thought might be necessary in a 1950 paper.¹⁷¹ While cautioning that the figures were 'highly speculative', he surmised that twelve squadrons might be needed of 8 aircraft each, a mix of B9s and B35s; together with training aircraft and war reserves, the total might be 200 aircraft. For many years, and particularly positioning the RAF for the 1953 and 1954 radical reviews, the Air Staff held out for a front-line force of 240 aircraft, using all three bomber types, making up 30 squadrons.¹⁷² In the event there were 23 operational squadrons prior to the withdrawal of the Valiant, and subsequently 15 squadrons (not far from Slessor's 1950 estimate).¹⁷³ The overall total produced of all three V-bomber types was 330 including prototypes.¹⁷⁴

Conclusions

The motivations and defence policy justifications of the grand strategic decision to create an independent British nuclear deterrent are clear. Intimate knowledge in government of how close the country had come to defeat in 1940 instilled in Attlee and Bevin (and probably in most Britons) a sense that the country and empire must be better defended in future. Russian actions in central Europe and around the world induced a real fear that, absent adequate allied conventional forces, Soviet armies could and well might roll across Europe to the English Channel; and in 1948 there was the risk of an isolationist America under a new president. The idea that Britain's status as a great power must be maintained was ingrained and a powerful motivator.

Britain's economic situation was difficult throughout the period. Despite this, much of Labour's 1945 policy platform was carried through while the country's economic position improved to some degree *and* the steps necessary to create the independent deterrent were taken. In the early 1950s Britain created the model of nuclear deterrence as a means of reducing conventional defence costs in the Cold War environment. The conventional force alternative would indeed have been 'an economic impossibility [and a] logistic nightmare' and arguably also 'a strategic nonsense'.¹⁷⁵

Whether nuclear deterrence was effective is a more difficult matter; an ineffective deterrent would be no deterrent at all. Attempting to answer the question 'did the bomb deter the Soviet Union from doing things it would otherwise have done', David Holloway concluded that 'there is no convincing evidence to show that the atomic bomb deterred a Soviet invasion of Western Europe in the first four years after the [Second World] war'.¹⁷⁶ More positively, Holloway said that:

Nuclear weapons did shape the way in which his [Stalin's] successors thought about East/West relations. It was the danger of nuclear war, above all, that led them to adopt the policy of peaceful coexistence.¹⁷⁷

The decisions which flowed from the grand strategy as they affected the creation of the V-bomber force are more readily analysed. The original decision to proceed with the development of advanced jet bombers in 1946 appears wholly justified. In the late 1940s and early 1950s there was no practicable alternative to strategic bombers to carry the deterrent. Given the widely shared perception in Britain at the time of the risk of another total war, the creation of the V-force seems a proportionate and economically effective response.

That Sir John Slessor put the bomber at the heart of British post-war strategy is clear, and his counterforce doctrine for the use of the V-force was technically coincident with the 1946 operational requirements which gave birth to the B9 and B35 bombers. Whether that doctrine would have proved effective had the Cold War turned hot is a matter of conjecture. Slessor's doctrine for the use of the atom bomb was in any case the child of the

pre-intercontinental missile and pre-thermonuclear weapon era. Targeting policy would change following the development of the hydrogen bomb and the ICBM, as would the concept of 'winning' a nuclear war.

Decisions which saw all three V-bombers in service are open to challenge. One interpretation of the archival evidence suggests that the problem was a lack of decisive leadership in the MoS to overcome the RAF's 'visceral preference for highly sophisticated, high performance and high cost aircraft'.¹⁷⁸ That said, the later experience of fatigue failure in the Valiant supports the decision not to rely on one type.

Air power technology moved on apace during the period. Less than sixteen years after Portal's aspiration for the next generation of bombers to fly at 60,000', that height was proved not to have been enough by the destruction of Gary Powers' U-2; and as has been shown, the vulnerability of high flying aircraft, and by extension the V-force, to Soviet air defences had been known at least since 1954.¹⁷⁹ Stand-off weapons might have extended the effective life of the V-bombers, particularly had Skybolt development been completed successfully and earlier. That the V-force was particularly vulnerable during the period from 1960 to 1963 seems clear. The degree of success which might have been achieved during the low-level attack era from 1963 to 1969 is open to question. The V-bomber electronic warfare suite was reportedly unsuited to low-level operations, and only part of the force was equipped with Blue Steel. Blue Steel itself was unproven at the eventual operational release altitude of 250ft.

The Earl of Bandon's comment in 1955, at the end of the period studied here, that Britons could not 'rest easy in our beds' until the deterrent was missile-borne, indicates concern at a high level in the Air Staff about the V-force's future capability to deliver the required 'crushing retaliation' if deterrence failed.¹⁸⁰ The evidence suggests that the nascent V-force already had vulnerabilities in the year in which its first aircraft entered service. The Chiefs of Staff had specified in 1954 that the nuclear deterrent must be 'demonstrably effective in the eyes of the world'.¹⁸¹ Whether and to what extent capability shortcomings diminished or dissolved the deterrent effect of the V-force is a question requiring further research. That said, the reality for Britain was that by 1960, to be sure of success, its nuclear deterrent required a delivery system other than aircraft.¹⁸²

Appendix: strategic bomber timeline 1945 to 1955

1945

July 3	Tizard committee report 'Future Developments in Weapons and Methods of War'.
July 16	First atom bomb test (plutonium), Los Alamos, USA.
July 26	Labour government formed in the United Kingdom.
August 6	Hiroshima bomb.

August 9	Nagasaki bomb.
August 15	Japanese surrender.
October 10	COS recommendation to PM that Britain should produce the atomic bomb.
December 18	GEN75 recommends construction of one plutonium production pile.
1946	
January 1	COS recommendation to PM to create a stock of atom bombs.
March 5	Churchill's Fulton 'Iron Curtain' speech.
August 1	Atomic Energy Act ('McMahon Act') enacted in the USA.
August 9	OR1001 issued.
1947	
January 7	Approved OR229 issued.
January 8	GEN163 committee agrees to develop the British atomic bomb.
January 24	Specification B35/46 issued.
November 19	Intention to Proceed document sent to Handley Page for two HP80 prototypes.
1948	
January	Contract issued for two Avro type 698 prototypes.
April 16	Intention to Proceed document sent to Vickers for two type 660 prototypes.
May 12	Announcement of development of the British atomic bomb in Parliament.
May 19	Draft specification B9/48 issued.
June 24	Soviet blockade of Berlin began.
November 2	Truman elected president of the USA.
1949	
April 4	North Atlantic Treaty signed.
May 12	Soviet blockade of Berlin ended.
August 28	First Soviet atom bomb test.
October	Specification B14/46 cancelled.
1950	
February 23	UK general election; Labour returned with a much reduced majority.
March 22	First RAF Boeing B-29 Washington arrived in the UK.

April 25	Beginning of the Korean War.
August 10	First RAF Washington squadron formed.
1951	
February 9	Production contract for 25 type 660 received by Vickers.
May 18	First flight of the first prototype Vickers type 660 Valiant.
May 25	Boeing B-47 entered service with USAF.
August 10	First flight of the Short SA4 Sperrin.
October 27	Conservative government formed in the United Kingdom.
1952	
July 22	First Victor (HP80) (for 25 aircraft) and Vulcan (Avro 698) (for 25 aircraft) production contracts issued.
August 30	Avro 698 Vulcan first prototype's first flight.
October 3	First British atom bomb test.
October 31	First US thermonuclear device tested (though not a usable weapon).
November 4	Eisenhower elected president of the USA.
December 24	Handley Page HP80 Victor first prototype's first flight.
1953	
June 9	OR1 139 (Blue Streak) agreed text.
July 27	Korean War armistice.
August 12	First Soviet thermonuclear test.
November 7	First production atom bombs delivered to the RAF.
1954	
March 1	First US thermonuclear weapon test.
March 31	Last RAF Washington returned to the USA.
July 26	British Cabinet approved the production of thermonuclear bombs.
August	OR330 issued for supersonic reconnaissance aircraft.
September 3	OR1 132 (Blue Steel) issued by the Air Staff.
1955	
January 1	First Valiant squadron formed (138 Squadron).
January 13	Valiant B1 release for service by C(A).

April	Second production orders for 40 Vulcans and 32 Victors issued.
April 6	Churchill resigned as prime minister; succeeded by Anthony Eden.
May 9	Third production orders for 24 Vulcans and 18 Victors approved by Cabinet.
May 26	UK general election; Conservative government returned to power.
June 29	First production Boeing B-52 delivered to USAF.
August 8	OR1139 (Blue Streak) issued.
October 26	Requisition approved for initial design work on Avro 730 to OR330 issue 2.

Notes

¹ See for example Kenneth O Morgan, *Labour in Power 1945-1951* (Oxford: Oxford University Press, paperback edition 1985 [1984]) 279-280; Anne Deighton, *The Impossible Peace: Britain, the Division of Germany, and the Origins of the Cold War* (Oxford: Clarendon Press, 1990), 77.

² Morgan, *Labour in Power*, 278.

³ Alan Bullock, *Ernest Bevin: Foreign Secretary 1945-1951* (London: William Heinemann Ltd, 1983), 65-66.

⁴ Peter Hennessy, *Never Again: Britain 1945-1951* (London: Jonathan Cape, 1992), 91.

⁵ *Ibid*, 93.

⁶ Morgan, *Labour in Power*, 279.

⁷ R N Rosecrance, *Defense of the Realm: British Strategy in the Nuclear Epoch* (New York NY: Columbia University Press, 1986), 36.

⁸ Hennessy, *Never Again*, 270.

⁹ Kenneth Harris, *Attlee* (London: George Weidenfeld & Nicolson Ltd, revised paperback edition 1995 [1982]), 289.

¹⁰ John Bew, *Citizen Clem: A Biography of Attlee* (London: riverrun, 2016), 421.

¹¹ Margaret Gowing, *Independence and Deterrence: Britain and Atomic Energy, 1945-1952* (London: Macmillan, 1974), volume 1, 36.

¹² See for example David Edgerton, *Warfare State: Britain, 1920-1970* (Cambridge: Cambridge University Press, 2006). Till Geiger, *Britain and the Economic Problem of the Cold War: The Political Economy and the Economic Impact of the British Defence Effort, 1945-1955* (Aldershot: Ashgate Publishing Limited, 2004). G C Peden, *Arms, Economics and British Strategy: From Dreadnoughts to Hydrogen Bombs* (Cambridge: Cambridge University Press, digitally printed paperback edition 2009 [2007]).

¹³ Humphrey Wynn, *The RAF Strategic Nuclear Deterrent Forces: Their Origins, Roles and Deployment 1946-1969, a Documentary History* (London: The Stationery Office, 1997), 10.

Other authors commenting on these aspects include S J Ball, *The Bomber in British Strategy: Doctrine, Strategy, and Britain's World Role, 1945-1960* (Boulder CO: Westview Press, 1995).

¹⁴ The first successful ICBM trials took place in 1957. As to the USA, see David K Stumpf, *Titan II*:

A History of a Cold War Missile Program (Fayetteville AK: The University of Arkansas Press, 2000), 8. As to the USSR, its first satellite was launched using the Soviet ICBM; see Julian Lindley-French, *A Chronology of European Security and Defence 1945-2007* (Oxford: Oxford University Press, 2007), 57.

¹⁵ Stephen Ransom and Robert Fairclough, *English Electric Aircraft and their Predecessors* (London: Putnam, 1987), 226.

¹⁶ Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 186. This was to be 'Blue Steel'.

¹⁷ Tony Buttler, *British Secret Projects: Jet Bombers Since 1949* (Hinckley: Midland Publishing, 2003), 82: this would have been the Avro 730.

¹⁸ C N Hill, *A Vertical Empire: History of the British Rocketry Programme* (London: Imperial College Press, second edition, 2012), 93.

¹⁹ For details of election results, see: <http://researchbriefings.parliament.uk/ResearchBriefing/Summary/RP12-43> (accessed 8.8.2016). The Labour Party's manifesto can be seen at <http://history.hanover.edu/courses/excerpts/111lab.html> (accessed 31.5.2016).

²⁰ The quotations in this paragraph are from the 1945 Labour Party election manifesto.

²¹ The newsreel is available on the British Pathé website (www.britishpathe.com/video) (accessed 7.8.2016).

²² C R Attlee, *As it Happened* (London: Odhams Press Limited, 'First Cheap Edition', no date. Originally published by William Heinemann, 1954), 174.

²³ Hennessy, *Never Again*, 94.

²⁴ TNA CAB 129/1, CP (45) 112, paragraph 27.

²⁵ UK government debt data: http://www.ukpublicspending.co.uk/spending_chart_1920_1960UKp_16c1li011tcn_G0t, accessed 7.8.2016. For the sources of the information on the UK Public Spending website, see <http://ukpublicspending.blogspot.co.uk/2009/04/how-we-got-spending-data.html> (accessed 7.8.2016). GDP data extracted from Samuel H. Williamson, 'What Was the U.K. GDP Then?' MeasuringWorth, 2016: accessed 8.8.2016 at <https://www.measuringworth.com/datasets/ukgdp/result.php>.

²⁶ Source: Office for Budget Responsibility at <http://budgetresponsibility.org.uk/#graphs>, accessed 30.3.2017.

²⁷ Government expenditure data are drawn from http://www.ukpublicspending.co.uk/spending_chart_1900_2020UKk_16c1li011mcn_30t00t10t20t40t (accessed 7.8.2016).

²⁸ Except as otherwise noted, the data in this paragraph are drawn from http://www.ukpublicspending.co.uk/spending_chart_1900_2020UKk_16c1li011mcn_30t00t10t20t40t. The validity of the defence data is confirmed by B R Mitchell, *British Historical Statistics* (Cambridge: Cambridge University Press, first paperback edition, 2011 [1988]), 594, which shows (in figures unadjusted for inflation) 1950 total defence spending at £740.7m in 1950 and £1,403.7m in 1953.

²⁹ The figures here are also at 2005 prices.

³⁰ Mitchell, *British Historical Statistics*, 392.

³¹ Mitchell, *British Historical Statistics*, 872.

³² Attlee, *As it Happened*, 189.

³³ TNA CAB 130/2, GEN75 4th meeting 11 October 1945, paragraph 1(ii). For an interesting summary of attempts at international control and the Baruch Plan, see Hugh Thomas, *Armed Truce: The Beginnings of the Cold War 1945-46* (London: Hamish Hamilton Ltd, 1986), 536-540.

³⁴ TNA CAB 130/2, GEN75 8th meeting.

³⁵ See for example Lawrence Freedman, *The Evolution of Nuclear Strategy*, third edition (Basingstoke: Palgrave Macmillan, 2003), 76; and Walter S Poole, *The Joint Chiefs of Staff and National Policy: Volume IV 1950-1952* (Washington DC: Office of Joint History, Office of the Chairman of the Joint Chiefs of Staff, 1998), 159-160.

³⁶ TNA AIR 20/11154, annex to COS 1467/5/8/52.

³⁷ Freedman, *The Evolution of Nuclear Strategy*, 76-77.

³⁸ Mitchell, *British Historical Statistics*, 121. As to V-force strength, see Wynn, *The RAF Strategic Nuclear Deterrent Forces*, chart between 500 and 501.

³⁹ TNA CAB 130/2, GEN75 15th meeting. The meeting was considering whether to proceed with the creation of a gaseous diffusion plant for the production of the Uranium isotope ²³⁵U; this was the fissile component of the gun-type weapon dropped at Hiroshima. In the event Britain developed the implosion design of bomb used at Nagasaki, in which the fissile component was plutonium. The official history contains a discussion of the decision between the two types of fissile component: Gowing, *Independence and Deterrence*, volume 1 165-167. For a description of the two weapon types, see C N Hill, *An Atomic Empire: A Technical History of the Rise and Fall of the British Atomic Energy Programme* (London: Imperial College Press, 2013), 75.

⁴⁰ As recalled in 1982 by Sir Michael Perrin, a Ministry of Supply civil servant who was present at the meeting, and quoted by Peter Hennessy, *Cabinets and the Bomb* (Oxford: Oxford University Press, 2007), 48.

⁴¹ TNA CAB 130/16.

⁴² Gowing, *Independence and Deterrence*, volume 1, 182. As to the 1946/47 winter, see <http://www.metoffice.gov.uk/learning/learn-about-the-weather/weather-phenomena/case-studies/severe-winters> (accessed 13.8.2016).

⁴³ TNA CAB 104/285. Portal was reporting in his post-CAS role of Controller of Production (Atomic Energy).

⁴⁴ Ibid. There is a letter dated 8 January on the file from Rickett, who minuted the meeting, to Sir Edward Bridges, the Cabinet Secretary, stating that this very narrow circulation was required. Another note dated 10 January, initialled by Rickett, stating that all other copies had been destroyed, as should be the waxes from which the copies were made.

⁴⁵ Cmd 6743 *Statement Relating to Defence*, February 1946, 3.

⁴⁶ Cmd 7042 *Statement Relating to Defence*, February 1947, 12.

⁴⁷ Cmd 7327 *Statement Relating to Defence*, February 1948, 5.

⁴⁸ HC Deb 12 May 1948, vol 450 c2117.

⁴⁹ Cmd 8146 *Defence Programme: Statement made by the Prime Minister in the House of Commons on Monday, 29th January 1951*, 5. The statement primarily addressed a partial mobilisation of forces, the economic impact of increasing the state of military preparedness, and the re-introduction of a number of wartime controls.

⁵⁰ The 1953 white paper: Cmnd 8768 *Statement on Defence*, February 1953, 16. The first British atom bomb test had occurred in October 1952; the first US thermonuclear device was tested in the same month. The 1954 white paper: Cmd 9075 *Statement on Defence*, February 1954, 4-5.

⁵¹ Cmd 9075 *Statement on Defence*, February 1954, 4; emphasis added.

⁵² *Ibid*, 4-5.

⁵³ See for example Huw Dylan, *Defence Intelligence and the Cold War: Britain's Joint Intelligence Bureau 1945-1964* (Oxford: Oxford University Press, 2014), 40.

⁵⁴ TNA DEFE 4/4, COS (47) 102 (O), paragraph 8.

⁵⁵ *Ibid*, paragraph 11. The Chiefs were contemplating the use of biological as well as atomic weapons.

⁵⁶ *Ibid*, paragraph 30.

⁵⁷ *Ibid*, paragraph 23.

⁵⁸ TNA CAB 158/1, JIC (47) 7/2 final, 6.8.47, paragraphs 58-59, as reproduced in Peter Hennessy, *Cabinets and the Bomb* (Oxford: Oxford University Press, 2007), 65. The JIC was a subcommittee of the Chiefs of Staff Committee.

⁵⁹ TNA DEFE 4/4, COS (47) 74th Meeting, page 5. The meeting was attended by the Chiefs of Staff, the Prime Minister, the Minister of Defence, the Foreign Secretary, and Sir Henry Tizard. Tizard had been involved with defence research since the early 1930s. Involved in the development of radar, and in the early stages of Britain's 'Tube Alloys' atom bomb project, Churchill had denied him access to atomic information in the latter part of the Second World War. He became chief adviser to the Attlee government on defence research policy (Gowing, *Independence and Deterrence*, volume 1, 5).

⁶⁰ TNA CAB 158/3, JIC (48) 9 (O) Final, paragraph 4(a), reproduced in Hennessy, *Cabinets and the Bomb*, 72.

⁶¹ TNA AIR 20/11154, COS (50) 139, 1.

⁶² *Ibid*, re the Russian bomb, 1, paragraph 1; and re marching to the Atlantic, 3, paragraph 13(a).

⁶³ Richard J Aldrich (editor), *British Intelligence, Strategy and the Cold War, 1945-51* (Abingdon: Routledge, 1992, digitally printed edition 2005), 4.

⁶⁴ TNA AIR 20/11154, COS (50) 139, 17, priority B.III(a).

⁶⁵ John Baylis, *Ambiguity and Deterrence: British Nuclear Strategy 1945-1964* (Oxford: Oxford University Press, 1995), 133. The Global Strategy Paper: AIR 20/11154 annex to COS (52) 361, paragraph 37.

⁶⁶ TNA AIR 20/11154, COS (52) 361, 18, paragraph 72 re the UK economic problem.

⁶⁷ *Ibid*, 29, paragraph 139(u).

⁶⁸ Rosecrance, *Defence of the Realm*, 164.

⁶⁹ TNA AIR 20/7560, DCAS/1096 S.534, 30.1.1953. At this time ACM Sir Ronald Ivelaw-Chapman was DCAS.

⁷⁰ TNA AIR 20/7560. Report by the VCAS "Radical Review" – RAF Medium Bomber Policy, file reference '8A'. At this time ACM Sir John Baker was VCAS.

⁷¹ This was the Ministerial Committee on Defence Policy. See CAB 134/809.

⁷² See for example TNA AIR 8/1875; letter from R A Butler (Chancellor of the Exchequer) to

Harold Alexander (Minister of Defence), 28.7.1953.

⁷³ Baylis, *Ambiguity and Deterrence*, 165.

⁷⁴ *Ibid*, 166, 175.

⁷⁵ TNA AIR 20/8716, POL (AS) 4406 VCAS 1201, 25.8.54. By this time Ivelaw-Chapman had taken over as VCAS.

⁷⁶ TNA AIR 20/8716, G.412554/IB/8/54/50, 27.8.1954.

⁷⁷ As to broken-backed hostilities, Ian Clark and Nicholas J Wheeler, *The British Origins of Nuclear Strategy 1945-1955* (Oxford: Clarendon Press, 1989), 171-173. As to the later report, TNA CAB 131/12, D (52) 41, paragraph 3. The file has been digitised; accessed 9.8.2016.

⁷⁸ HC Deb 02 March 1954 vol 524, cc1125 and 1128.

⁷⁹ HC Deb 02 March 1954 vol 524, c1126.

⁸⁰ See TNA AIR 20/7560, AUS(A)/1148, 1.10.1953. AUS(A) was the assistant under-secretary of state for air.

⁸¹ Gowing, *Independence and Deterrence*, 36-37.

⁸² Total costs of the bomb for the eight years 1946-1953 inclusive ~£17.4m p.a.; annual rate for Bomber Command £505m/4 = £126.3m p.a. This gives a total of £143.7m p.a.

⁸³ Source: http://www.ukpublicspending.co.uk/spending_chart_1945_1955UKb_16c1li011mcn_F0t30t10t accessed 16.8.2016.

⁸⁴ See for example Lawrence Freedman, *The Evolution of Nuclear Strategy* (Basingstoke: Palgrave Macmillan, 3rd edition, paperback, 2005 [1981]), 74-76; Gowing, *Independence and Deterrence*, volume 1, 440-441; Bernard Brodie, *Strategy in the Missile Age* (Santa Monica CA: RAND Corporation, paperback edition 2007 [1959]), 160-172.

⁸⁵ Slessor was CAS from 1.1.50 to 31.12.52. Bill Pyke has recently drawn attention to Slessor's significance in the creation of Cold War strategy; see "Air Marshal Sir John Slessor: The Unsung British Cold War Strategist" in *Royal Air Force Air Power Review*, volume 20 number 1, Spring 2017, 66-91.

⁸⁶ TNA AIR 20/7359, COS (50) 538.

⁸⁷ Ball, *The Bomber in British Strategy*, 53.

⁸⁸ TNA AIR 20/11154, annex to COS (52) 361, page 7 paragraph 12.

⁸⁹ TNA AIR 20/11154, annex to COS (52) 361, page 10 paragraph 37. Emphasis added by the author.

⁹⁰ TNA AIR 20/8711, draft note from CAS to Secretary of State for Air, 10.3.52, paragraph 9. Emphasis added by the author.

⁹¹ Noted by Ball, *The Bomber in British Strategy*, 58.

⁹² Andrew Roberts, *The Storm of War: A New History of the Second World War* (London: Allen Lane, 2009), 182.

⁹³ See Roy Brocklebank, "World War III – The 1960s Version" in *The Journal of Navigation* volume 58 number 3, September 2005, 341-347.

⁹⁴ Huw Dylan, *Defence Intelligence and the Cold War: Britain's Joint Intelligence Bureau 1945-1964* (Oxford: Oxford University Press, 2014), 1-3 and 22-23.

⁹⁵ Dylan, *Defence Intelligence*, 40-41 fn14.

⁹⁶ TNA AIR 20/11154, appendix E to 'Comparative Operational Value of Medium Bombers'.

⁹⁷ As to 'immediate and crushing retaliation', see TNA AIR 20/11154, annex to COS (52) 361, 'Defence Policy and Global Strategy', 10.

⁹⁸ OR1001 is in TNA AVIA 65/1153. The minutes of the Cabinet Defence Committee meeting on 22 July are in TNA CAB 131/1, DO (46) 23rd meeting (accessed 23.8.2016); however, the relevant parts of the minutes have been withheld from the scanned file, so the source here is Wynn, *The RAF Nuclear Deterrent Forces*, 19-20.

⁹⁹ TNA AIR 20/1734, 15.11.43.

¹⁰⁰ For example, TNA AIR 20/1734, minutes of a meeting held on 12.4.44. The meeting was at a high level; it was chaired by the VCAS, and MAP was represented by the Controller of Research and Development (CRD) and the Director of Technical Development (DTD). Also see TNA AIR 2/5587.

¹⁰¹ TNA AIR 20/1734, minute dated 26.7.44, CAS 2604, TR/16/453. Portal was CAS at the time. ACAS(TR) was the assistant chief of the air staff for technical requirements, at the time Air Commodore J D Breakey.

¹⁰² TNA AIR 20/1734, ACAS(TR) to CAS 31.7.44 TR/16/453, CAS 2604. Portal's comment is also dated 31.7.44; interestingly, he appears first to have written 50,000 ft., and then amended it to 60,000 ft. ACAS(TR)'s minute said that 'we cannot afford to decorate our future bombers with multiple turrets.'

¹⁰³ As to the Sperrin, see for example TNA AVIA 15/2254, Rowe (DTD at MAP) to Lipscombe (head of Short's design team) and Lipscombe's 21.2.45 reply. Short's offered six- and four-engined aircraft; the four-engined design became the Sperrin: TNA AVIA 15/2254. SB.66527/C.4(a) dated 26.4.1946, "High Altitude High Speed Bomber, Project SA4, Report on an Investigation into the Practicability of a Four Engined Design of Smaller Size." Tedder was critical of the work being given to Short Brothers; see TNA AIR 8/1613, CAS to VCAS 19.9.47.

¹⁰⁴ TNA AIR 20/7355, C25747/45.

¹⁰⁵ TNA AIR 20/7355, 45542/II, page 2 paragraph 2 et seq.

¹⁰⁶ The discussion of the problems takes up much of TNA AIR 20/7355, 45542/II, from page 2 onwards.

¹⁰⁷ Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 45 and 45fn.

¹⁰⁸ TNA AVIA 54/96, reference number 7/Aircraft/1353/RDT2(d) dated 24.1.47. B35/46 would give rise to the Avro Vulcan and Handley Page Victor; B9/48 resulted in the Vickers Valiant.

¹⁰⁹ The great circle distance from, for example, Lincolnshire is somewhat less than 1,300nm. The actual route would have been rather longer, as the approach (at least in later years) was over southern Norway – see Brocklebank, "World War III", 341-347.

¹¹⁰ Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 47. The technical brochures from English Electric, Handley Page, Short Brothers and Vickers-Armstrongs are contained in TNA AVIA 54/95 and AVIA 54/96. The Avro and Armstrong Whitworth brochures are in TNA AVIA 54/97.

¹¹¹ Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 55.

¹¹² *Ibid*, 582-583.

¹¹³ Re-cessation of Sperrin development: TNA AIR 20/1734, L.M./TS.6/ACAS(TR), ACAS(TR) to VCAS 14.10.49. Re-cancellation of B14/46, Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 587. The two prototypes did fly, though the first of them later than Vickers B9/48 (*Ibid*, 592).

¹¹⁴TNA AVIA 54/288. The file contains both the draft specification dated 19.5.48, sent to Vickers on 25.5.48, the finalised version dated 19.7.48, and various subsequent amendments.

¹¹⁵The Handley Page HP80 (hereafter referred to as the Victor) prototype contract was issued on 19 November 1947, and the Avro 698 (hereafter, Vulcan) prototype contract in January 1948. The Vickers 660 (hereafter, Valiant) 'Intention to Purchase' contract was issued on 16 April 1948. Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 582-583. The aerodynamic test model of the Victor was the 40% scale HP88 to specification E6/48, using a Supermarine Swift fuselage (see C H Barnes, *Handley Page Aircraft since 1907* (London: Putnam & Company Ltd, 1976), 496-497). For the Vulcan, it was the one-third scale Avro 707 to specification E15/48 (see A J Jackson, *Avro Aircraft since 1908* (London: Putnam & Company Ltd, new edition 1990 [1965]), 439).

¹¹⁶TNA AIR 20/7359, COS (50) 538: note from Slessor to the Chiefs of Staff committee.

¹¹⁷The relevant CoS Committee minute is at TNA AIR 20/7359, COS (50) 213th meeting. The Minister's approval was recorded in the minutes of the Joint War Production Committee meeting of 10 January 1951 at TNA 20/7359, ISAB/1/51/28.

¹¹⁸Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 591.

¹¹⁹*Ibid*, 597, 599.

¹²⁰*Ibid*, 603, 606, 607.

¹²¹*Ibid*, chart between pages 500 and 501. Five squadrons of Vulcans and four of Victors had formed by April 1961. It is impossible to know how much sooner Vulcans and Victors would have been available (if at all), had B9/48 not been pursued.

¹²²Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 594-595.

¹²³*Ibid*, 595.

¹²⁴TNA AIR 2/11443, note of a meeting to consider orders for future RAF medium range bombers, 27.5.52.

¹²⁵TNA AIR 2/11443, R A Butler to Duncan Sandys, then Minister of Supply, 15.7.52.

¹²⁶The radical review referred to here was of 'defence effort after 1954'. It was established by Churchill in 1953 and carried out by the Ministerial Committee on Defence Policy. See CAB 134/809.

¹²⁷The twin-engined Manchester was seriously overweight and underpowered; see Anthony Furse, *Wilfrid Freeman: The Genius behind Allied survival and air supremacy 1939 to 1945* (Staplehurst: Spellmount, 2000), 92. The Stirling's performance was less than optimal, in part because of the Air Staff's stipulation that it should have a wing span not exceeding 100'. For an interesting discussion of the reasons for the Stirling's poor performance, and whether it related to the need to fit within the then-standard hangar width, see Sinnott, *The Royal Air Force and Aircraft Design*, 168-170.

¹²⁸TNA AIR 2/11443. R A Butler to Lord De L'Isle and Dudley (DLD), 26.2.1953.

¹²⁹TNA AIR 2/11443. Personal minute WSC to RAB 29.3.53; RAB to WSC 2.4.53.

¹³⁰TNA AIR 2/11443. Personal letter Sandys to DLD 21.1.54.

¹³¹TNA AIR 2/11443, loose minute CAS to CA, 12.5.54.

¹³²TNA AIR 2/11443, Air Ministry to Treasury, 21.10.55.

¹³³Andrew Brookes, *V-Force: The History of Britain's Airborne Deterrent* (London: Jane's Publishing

Company Limited, 1982), 68.

¹³⁴ HC Deb 26 April 1917 vol 92 col 2624. The Parliamentary Secretary to the Air Board suggested that nothing could be more fatal than large scale standardisation of aircraft types.

¹³⁵ Brookes, *V-Force*, 67. Duncan Sandys' agreement is sourced in TNA AIR 41/85 to *Flight Magazine*. That is correct; quoting it as a recent statement, it appeared on page 42 of the issue of 9.1.1953, number 2294, volume LXIII. Sandys likened the decision to putting all your money on a single horse.

¹³⁶ TNA AIR 2/11443; the Secretary of State for Air's suggestion was dated 22.1.54, and the negative response is contained in a minute from the DCAS to the CAS (since 1.1.53, Sir William Dickson). As to the Valiant's premature withdrawal from service, Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 464-471.

¹³⁷ For details of the Heyford (B9/27) and Lancaster (developed from the Manchester, to P13/36) see Colin Sinnott, *The Royal Air Force and Aircraft Design 1923-1939: Air Staff Operational Requirements* (London: Routledge, paperback edition 2013 [2001]), 67 and 165-174. Performance figures are drawn from Owen Thetford, *Aircraft of the Royal Air Force since 1918* (London: Guild Publishing, eighth edition 1988, published by arrangement with Putnam): Heyford, 309; Lancaster, 68; Vulcan, 80. Advances in range, service ceiling and bomb load are equally striking.

¹³⁸ John Cotesworth Slessor, *Strategy for the West* (London: Cassell & Company Ltd, 1954), 109.

¹³⁹ TNA DEFE 9/19, COS (45) 402 (O), paragraph 61(a). Tizard chaired an ad hoc committee established by the Joint Technical Warfare Committee, to consider "Future Developments in Weapons and Methods of War". The first edition of its report was dated 16 June 1945.

¹⁴⁰ TNA DEFE 9/19, COS (45) 402 (O), paragraph 59.

¹⁴¹ Gowing, *Independence and Deterrence*, volume 1, 209.

¹⁴² Vannevar Bush, *Modern Arms and Free men: A Discussion of the Role of Science in Preserving Democracy* (London: William Heinemann Ltd, 1950), 134. Bush was an engineer who had led the United States' Office of Scientific Research and Development during the Second World War.

¹⁴³ Slessor, *Strategy for the West*, 109.

¹⁴⁴ Ball, *The Bomber in British Strategy*, 80 (as to the Air Staff's position) and 10 (as to a taste for high performance, high cost sophistication).

¹⁴⁵ As to the S-25 Berkut system: Steven J Zaloga, *Red SAM: The SA-2 Guideline Anti-Aircraft Missile* (Oxford: Osprey Publishing, 2007), 4. As to the MiG-17 and MiG-19, Bill Gunston, *The Osprey Encyclopedia of Russian Aircraft 1875-1995* (London: Osprey Publishing, 1995), 192-195 and 196-200.

¹⁴⁶ National Intelligence Estimate 11-5-55 dated 12 July 1955, accessed 20.6.2016 at <https://www.cia.gov/library/readingroom/nic-product-type/national-intelligence-estimates>.

¹⁴⁷ Performance of the S-25 system is drawn from the Air Power Australia website at <http://www.ausairpower.net/APA-Rus-SAM-Site-Configs-A.html#mozTocId357043> (accessed 13.4.2017). Confirmation of the presence of the S-25 system round Moscow is described in Gregory W Pedlow, Gregory W and Donald E Welzenbach, *The CIA and the U-2 Program 1954-1974* (Washington DC: Central Intelligence Agency, 1998), 103-105; and Mike Gruntman,

Intercept 1961: The Birth of Soviet Missile Defence (Reston VA: American Institute of Aeronautics and Astronautics, Inc., 2015) 63.

¹⁴⁸ Zaloga, *Red SAM*, 43. Later developments of the system had a maximum range of 41 miles and a ceiling of almost 100,000ft.

¹⁴⁹ Michael S Goodman, *The Official History of the Joint Intelligence Committee Volume 1* (Abingdon: Routledge, 2014). Goodman noted that the 'JIC's relationship with the CIA developed in the latter's favour' (215), but that by mid-1955 it had 'undoubtedly improved over the last two years' (214). As to RAF knowledge, see for example TNA AIR 20/11551, CAS to SoS, 20.2.1954, referred to below.

¹⁵⁰ Stephen Ransom and Robert Fairclough, *English Electric Aircraft and their Predecessors* (London: Putnam, 1987), 227, 236. M represents Mach number, the local speed of sound.

¹⁵¹ TNA AIR 20/11551, minute CAS to Secretary of State for Air dated 20 February 1954 in response to minute DCAS to CAS dated 16 February 1954, referring to the 'latest version of the MIG 15', which seems likely to have been the MiG-17.

¹⁵² TNA AIR 20/11551, Air Council Conclusions of Meeting 21 (54), held on 18 and 24.11.54.

¹⁵³ TNA AIR 20/11552, OR16(55)5, DOR/TS.5849 dated 8.7.55; page 14 paragraph 52.

¹⁵⁴ The all-weather fighter, NATO code Flashlight, was the Yak-25; and the single seat fighter, NATO code Farmer, was the MiG-19. It was reported that 50 Flashlights and 60 Farmers had been seen.

¹⁵⁵ TNA AIR 20/11552, appendix to loose minute C.60493/ACAS(OR)/9270 dated 18.7.1955. ACAS(OR) (Assistant Chief of the Air Staff (operational research)) at the time was AVM H V Satterley, a keen proponent of OR330 (see Guy Finch, *Replacing the V-Bombers: RAF Strategic Nuclear Systems Procurement and the Bureaucratic Politics of Treat*, unpublished PhD thesis submitted to the University of Wales at Aberystwyth, December 2001, 87-105).

¹⁵⁶ TNA AIR 20/11552, attachment to DOR/TS.3321/ACAS(OR)/474, DCAS/4276/55 dated 6.10.55. This is the source of all the quotations in this paragraph.

¹⁵⁷ Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 630.

¹⁵⁸ TNA AIR 20/11552, map attached to OR16(55)1.

¹⁵⁹ TNA AIR 2/14578, C.75259/55, 'The Valiant in the low level bombing role', meeting held 23.5.56.

¹⁶⁰ TNA AVIA 15/2254, Note of a meeting held on 11.11.46, attended among others by the Controller of Supply (Aircraft), the ACAS(TR) and the Director of the Royal Aircraft Establishment.

¹⁶¹ TNA AIR 2/14578, CMS.2733/55, 'Employment of the Valiant in the low level role' dated 12.6.56.

¹⁶² Per Air Commodore Norman Bonnor in a presentation to the Royal Air Force Historical Society on 21.10.96, 'From the '60s to the '80s 'The Last Days of Airborne Analogue Computing', *Royal Air Force Historical Society Journal* 17A, 1997, 101. The Soviet S-125 SAM system had the NATO reporting name SA-3 Goa.

¹⁶³ Wing Commander Powell's presentation to the RAF Historical Society, 10.4.02, 'EW during the V-force Era', *Royal Air Force Historical Society Journal* 28, 2003, 71.

¹⁶⁴ *Ibid*, 71-74.

¹⁶⁵ Except as otherwise noted, the information in this paragraph is drawn from Wynn, *The RAF Strategic Nuclear Deterrent Forces*, chapter 13, pages 186-220; chapter 23, pages 373-402; and chapter 26, pages 449-463.

¹⁶⁶ Per Air Commodore Norman Bonnor in a presentation to the Royal Air Force Historical Society on 1.4.15, 'Blue Steel – The V-force's Stand-off Bomb', *Royal Air Force Historical Society Journal* 62, 2016, 36-37, there were 15 launches in 1961, most of which failed, and a further 15 in 1962 of which about half succeeded.

¹⁶⁷ As to the 50nm range, see Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 441. However, Powell said (*RAFHS Journal* 28, 71) that operationally Blue Steel was to be released at 25nm from the target at an altitude of 250ft.

¹⁶⁸ TNA AVIA 53/516 contains the specification, RB156D; this called inter alia for the ability to reach 80,000' for short periods, and a maximum cruise speed at altitude of M2.5.

¹⁶⁹ TNA AIR 20/7723, minute dated 22.8.55. ACAS (Training) at the time was (then Air Marshal) Percy Bernard, 5th Earl of Bandon.

¹⁷⁰ The cancellation letter is in TNA AVIA 53/516, dated 25.3.57. The Sandys defence review *Defence: Outline of Future Policy Cmnd 124*, paragraph 61.

¹⁷¹ TNA AIR 20/7359, COS (50) 538, 21.12.1950.

¹⁷² See for example TNA AIR 20/11154, note from the DCAS dated 27.1.53.

¹⁷³ Wynn, *The RAF Strategic Nuclear Deterrent Forces*, chart between pages 500 and 501.

¹⁷⁴ Ultimately 108 Valiants were built, 136 Vulcans and 86 Victors. Valiant production number: John W R Taylor (editor), *Jane's All the World's Aircraft 1960-61* (London: Samson Low, Marston & Company, Ltd., 1960), 70. Vulcan: David W Fildes, *The Avro 698 Vulcan: The Secrets Behind its Design and Development* (Barnsley: Pen & Sword Aviation, 2012), 454-455. Victor: Ball states 83 aircraft delivered, but for consistency with the Valiant and Vulcan, the 3 prototypes have been added; Ball, *The Bomber in British Strategy*, 207.

¹⁷⁵ TNA AIR 20/11154 annex to COS 1467/5/8/52.

¹⁷⁶ David Holloway, *Stalin and the Bomb: The Soviet Union and Atomic Energy 1939-1956* (New Haven CT: Yale University Press, 1994), 271.

¹⁷⁷ *Ibid*, 344.

¹⁷⁸ Ball suggested this RAF preference in *The Bomber in British Strategy*, 10.

¹⁷⁹ The height of Powers' aircraft when it was shot down is confirmed in Pedlow and Welzenbach, *The Central Intelligence Agency and Overhead Reconnaissance*, 176. The individual chapters of the report in largely un-redacted form are available here: <http://nsarchive.gwu.edu/search.html> (accessed 27.8.2016). The details of the Powers shoot-down are in Chapter 4 (accessed 27.8.2016). Interestingly the UK archives concerning the use of RAF pilots to fly CIA Soviet overflights, openly discussed in the CIA report, remain closed; see for example the Op KNIFE EDGE files at TNA AIR 40/2753 and AIR 40/2754.

¹⁸⁰ TNA AIR 20/7723, minute dated 22.8.55. Then Air Marshal Percy Bernard, 5th Earl of Bandon was ACAS(Training) at the time.

¹⁸¹ TNA AIR 20/11154. The words quoted are in the summary of the Chiefs of Staff Committee report on United Kingdom defence policy circulated by ACAS(P) on 9.7.54, page 4 paragraph (c)(i), referenced VCAS 935 and ACAS(P)/4150.

¹⁸² The RAF did operate the Thor missile system from 1959 to 1963; however, being liquid-fuelled and not protected by silos, the missiles were vulnerable to a pre-emptive strike. See Wynn, *RAF Nuclear Deterrent Forces*, 345.

¹⁸³ Dates are mainly drawn from Wynn, *The RAF Strategic Nuclear Deterrent Forces*, 576-601; others are drawn from original documents cited in the text.



Four Canberra B.2s of 21 Squadron flying in formation past rugged mountains in Aden during a month-long detachment to Cyprus and the Middle East in early 1955 alongside 27 Squadron.



Blue Steel stand-off nuclear missiles in the storage hangar at Scampton, Lincolnshire, in February 1963. Blue Steel, built by Avro, was introduced into service by 617 Squadron in 1963. It carried a one megaton warhead and was used by two squadrons in Bomber Command - 617 (Avro Vulcan B2) and 139 (Handley Page Victor B2).



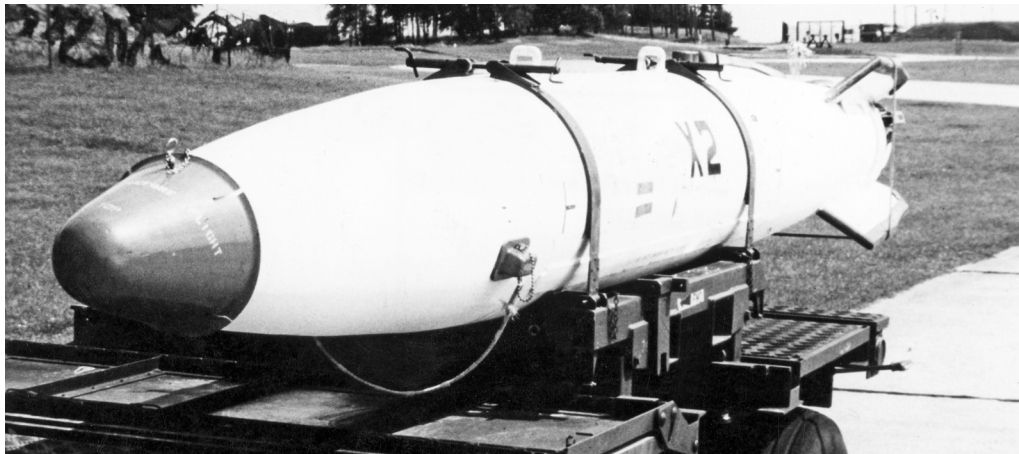
Avro Shackleton MR.2, WR960/X, of 228 Squadron, RAF Coastal Command, in flight near its base at St Eval, Cornwall.



The crew of a Valiant bomber 'scramble!' during a visit to Wyton by HRH the Duke of Edinburgh, 24 June 1958.



Vulcan bombers from RAF Waddington flying in formation in 1957.



A 2,100lb US Mk 43 nuclear weapon mounted on a SA trolley.



Handley Page Victor B1, XH615, of 232 Operational Conversion Unit in flight from its base at Gaydon, Warwickshire, in 1960.



Avro Vulcan B.2, XH537, carrying a pair of dummy Skybolt missiles on underwing pylons. Trials with the missile had started at Avro's Weapons Research Division at Woodford, Cheshire, in November 1961 following an Anglo/American agreement for the supply of up to 100 of the air-launched nuclear missiles which had been proposed as a way of extending the airborne nuclear deterrent into the next decade.

Viewpoint

A View from Whitehall

By Mr Peter Hudson CB

Biography: After war service in the Royal Navy, Peter Hudson joined the Air Ministry in 1947. From 1948 to 1951 he was Private Secretary to the Permanent Under Secretary (PUS), the civilian member of the Air Council. From 1953 until the end of 1961 he served in the Air Staff Secretariat. He was a student at the Imperial Defence College in 1962. Shortly after returning to the Air Ministry he was posted to the MOD central staff, and in 1969 to the Cabinet Office. In 1974 he joined the Air Force Board as a Deputy Secretary.

Abstract: This paper offers a valuable personal insight into a senior Air Ministry civil servant's perspective during the Government's deliberations in the late 1950s on the effectiveness of the RAF's V-Force. It places the V-Force into the context of financial pressures on the Air Ministry, criticism of the UK's nuclear posture and examines UK-US relations in the period 1960- 62. The Air Ministry successfully argued the case for the continued operational effectiveness of the V-Force, despite often being isolated in debates over the V-Force's vulnerability on the ground and airborne efficacy.

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Introduction

In 1950, as Private Secretary to the PUS at the Air Ministry, I became involved in the processing of a manuscript produced by the new CAS, Sir John Slessor, setting out, for what I believe was the first time, the role, build-up and deployment of the proposed strategic bomber force of 240 aircraft. How that strategy came to be accepted by the Government wasn't merely down to the fact that Jack Slessor could write and think faster than his colleagues; his overwhelming advantage, it seems to me, was that he could, at a time when NATO was little more than a paper concept, point to a Joint Intelligence Committee (JIC) appreciation, that the Soviet armies were capable of reaching the Channel ports in X days, and ask his colleagues what they would propose to do about it.

But, despite Slessor's success in his years as CAS in establishing the nuclear deterrent as the essential feature in our national strategy, attacks on it, most significantly by the other Services, had, by 1960, become pretty intense. In fact, in 1960, it was by no means a foregone conclusion that the V-Force, as such, would continue in existence for that decade at all.

By the late 1950s I was head of the Air Staff secretariat division concerned with long-term planning. When the House of Lords was having one of its annual defence debates I was summoned to attend the First Lord, Lord Carrington, who was to be in charge of the debate. I had provided him with that part of his speech which dealt with the nuclear deterrent. The discussion was all very amicable but when we came to a paragraph claiming that the cost of the force was no more than 10% of the Defence Budget the First Lord said, by way of commentary, that the Admiralty had produced a paper showing how much could be done to improve conventional capabilities if the V-Force were given up. He turned to the Admiralty briefers to confirm this, only to be met by a lot of clearing of throats - I was not meant, I gathered, to be told about this....

The other big change by 1960 was that in the preceding years we had been compelled progressively to abandon our 240 aircraft target, ostensibly as a result of external criticisms, which we had resisted. I fear though, that we should have been obliged to cut the planned force even without such pressures.

One of my jobs was to concert a cost assessment of the department's long term plans over a five, and later a ten, year period, and to help work out ways in which they could be adapted, if necessary, to be acceptable to ministers, including the Minister of Defence in Storeys Gate, and to the Chancellor. This was all part of obtaining agreement to the next year's Estimates, and hence the cash with which to continue in business.

Even though the Defence Budget was at that time, in terms of GDP, about three times larger than it is now, the pressures were intense. Apart from world-wide commitments, we had a highly ambitious equipment programme outside the strategic nuclear field - not only the TSR2,

but two aircraft which would not look out of date today - a high subsonic V/STOL transport, the HS681, and a very advanced version of what was later to become the Harrier.

Figures for those aircraft appeared of course only in the later years of the costing, but much more immediate in its effect was the US Mutual Defence Assistance Program. Under it the US paid for weapons destined for the defence of the NATO area, provided that they were additional to what we would have bought for ourselves anyway. This aid certainly enabled the RAF to punch above its weight. Some hundreds of Hunters were acquired under the programme and the USAF would have been prepared to do the same for the ill-fated Swift. The downside was that even though the Americans picked up the bill for the aircraft and their spares, the other running costs - airfields, personnel, etc - came out of Air Ministry Votes. These, and other inevitable pressures on the Budget - cost-escalation over the whole field and emergencies of various sorts - would alone have compelled us to lower our sights and by 1960 our planned 240 had shrunk to 144.

More importantly, critics of our nuclear posture were becoming more vocal. We had for several years clung to a painfully agreed JIC appreciation that 1963 would be the midpoint of the period in which the air threat to this country would change from being predominantly from aircraft to predominantly from missiles. That mantra had implications for both our defensive and our offensive postures. Moreover, various Soviet moves, from the first Sputnik onwards, together with increasing doubts about the viability of BLUE STREAK,¹ led ministers to decide to set up a committee which was in the event to examine our whole nuclear stance. This committee, the British Nuclear Defence Study Group (BNDSG), was to play a crucial part in our story from its inception in 1959 until it was pre-empted by the Nassau Conference decisions of December 1962.

The Group had the Permanent Secretary of the MOD as its chairman, with members from the Treasury, the Service Departments and the Ministry of Aviation. VCAS, Edmund Hudleston, was our representative. Its first task, which proved to be more political than military, was to consider the future of BLUE STREAK. It came to the somewhat curious conclusion that the weapon should continue in development 'provided that a fire-first weapon is acceptable.' It was curious, because every member of the Group knew that a fire-first weapon was *not* acceptable. Anyway, after a few more twists and turns, not unrelated, I suspect, to the known views of Duncan Sandys, BLUE STREAK was in due course cancelled.

Before dealing with the Group's deliberations on the V-Force, I need to deal with one key element: early warning. During 1958, some very informal links were established between my branch and the General Counsel of the USAF - a lawyer who masterminded their overseas negotiations. Our first exchanges on early warning (which succeeded talks we had previously held on the Thor missile agreement) concerned a system called MIDAS, under which it was proposed to place a vast cloud of steel needles in orbit to act as a radar reflector with which

¹ The **de Havilland Propellers Blue Streak** was a British **medium-range ballistic missile (MRBM)**, and later the first stage of the **Europa satellite launch vehicle**. Blue Streak was cancelled without entering full production.

Soviet missile launch sites could be kept under surveillance. Fortunately for the future of space exploration, this scheme proved to be a non-starter.

The second scheme, floated soon after, concerned BMEWS. The deal was similar to that for Thor. In return for providing the site, carrying out the construction programme and meeting the UK running costs, including manning, at Fylingdales, we would be given full access to the data we needed. The aim, which was achieved, was to have a fully reliable system operational by 1963.

The detailed negotiations went smoothly. We had our own Works and Lands Departments in those days, so that all the action was under one roof. I remember that when the Treasury queried the works costs it was explained that with radars of such range the base had to be stable, 'not like that building, for instance,' pointing to County Hall over the river, 'that goes up and down with the tide.' As of course it does.

The upshot, so far as the V-Force was concerned, was a bargain that benefited both sides, enabling us to show that we would have, by 1963, a warning system that would give us a minimum of four minutes' notice of a land-based missile attack.

It was a natural consequence of the close relations between the two air forces that the Americans looked first to *us* for a BMEWS site in this part of the world. It was lucky for the V-Force that they did. If the station had been sited elsewhere - and they had had in any case to approach the Danes (over Thule) - we would not have had such a strong claim to receive vital early warning data, and we would certainly not have been able to provide it for ourselves.

Now, back to the BNDSG. In parallel with the BLUE STREAK discussions, the validity of the V-Force as a deterrent was being questioned. The key virtue of the manned aircraft over BLUE STREAK - that it could take off under positive control on radar warning - was accepted. But the Group, and its working parties, argued at length on two immediate questions - could the force be pre-empted, and could it reach its targets? The Air Ministry was usually in a minority of one in the arguments, and we were fortunate in having Teddy Hudleston as our representative on the main Group. I was lucky to be part of his briefing team, which consisted of the late lamented Digger McGill (Director of Bomber Ops), Jock Henderson (our scientist) and me.

The first of these disputed points - vulnerability on the ground - required us to show that we had enough warning time in which to react. At first it seemed doubtful whether the four minutes which BMEWS would give us would be enough - its primary role was, after all, that it gave the *US* bases up to half an hour. But the development of QRA by Bomber Command, and the robustness of the Vulcan, in particular, in the low level role, enabled us to leap that hurdle.

The second concern - reaching the target - entailed some vigorous argument about low-level penetration, stand-off weapons, both actual, like BLUE STEEL Mk 1 and Hound Dog, and

projected, like BLUE STEEL Mk 2 and Skybolt. Broadly speaking though, we were able to show that, until the SLBM threat became real, possibly not until the end of the decade, the V-Force would remain a valid deterrent. And so it continued in the front line in the strategic role until 1969.

It was a near thing. Despite our relative success in the BNDSG, its chairman, Sir Robert Scott, separately minuted the Minister of Defence in July 1961, without the Air Ministry's knowledge at the time that, 'the time has come to consider.giving up control of British nuclear weapons and their delivery systems.....and negotiate the best terms possible with the Americans in return for handing over control to them.' This advice was rejected, but the fact that it was given at all is an index of the cross-currents running at the time.

My story ends with the arguments about Skybolt and Polaris which preceded the Nassau agreement, when as Jack Slessor said, two politicians and a zoologist decided on the future of British strategy without any help from the Chiefs of Staff. The Air Staff had from the first been keenly interested in acquiring Skybolt, and at Camp David in March 1960 the two governments had agreed that, if it proved technically feasible to develop the weapon, we could buy it. The two air forces were, for different reasons, enthusiastic about the arrangement, but the US administration was divided as the months went by. In the summer of 1961 the Defence Counsellor of the US Embassy took the extreme measure of taking me out to lunch to emphasise the doubtful status of Skybolt in the US R&D programme. This of course I faithfully reported, but there were conflicting noises coming from elsewhere in Washington. There were questions over Skybolt; but equally there were question marks over any other solution to the problem, which the BNDSG next addressed, of maintaining a British deterrent in face of a submarine-launched missile threat.

The problem was to devise a second strike force which would be credible in the virtual absence of early warning. The Air Staff, in seeking a feasible RAF alternative to Polaris, concluded that we needed a force capable of maintaining a constant air patrol, implying an aircraft with a designed-in high utilisation rate, that is, of the order of 250 hours a month. Hence the decision to field for discussion a force of thirty-six VC10s, each able to carry four Skybolts. It was not until December 1962, at the Kennedy/Macmillan summit at Nassau, which was dominated by the consequences of the US decision to cancel Skybolt, to the great embarrassment of the British Government, that a conclusion was reached. By this time I had moved on, and my only personal knowledge of the event comes from a very informal lunchtime debriefing from the then ACAS(OR), Christopher Hartley, who was at Nassau. It is clear that, in bidding for Polaris, the Prime Minister skilfully deployed all the arguments, notably the difficulties created for him by the cancellation of Skybolt. The unique record which Richard Neustadt has assembled of those discussions shows convincingly that, without that cancellation, it is unlikely that we would have been able to acquire Polaris, and later Trident, on anything like the terms agreed. Another example, perhaps, of the law of unintended consequences.

Section 2:

Case Study: The Cuban Missile Crisis, 1962

Witness Seminar: RAF Bomber Command and the Cuban Missile Crisis, October 1962

Edited by Dr Michael Kandiah

Institute for Contemporary British History/Centre for British Politics and Government, King's College London

With Dr David Jordan

Defence Studies Department, King's College London

Editor's note: The following transcript of the King's College London Witness Seminar on Bomber Command's role during the Cuban Missile Crisis has kindly been edited for this publication by Dr Michael Kandiah and Dr David Jordan. It is reproduced by permission of the King's College London Witness Seminar Programme, to whom the *Air Power Review* is extremely grateful. In particular, our thanks are extended to Dr Michael Kandiah and Dr Kate Utting for their assistance in allowing us to reproduce this exceptionally important record of the views of those who were intimately involved in the crisis from the UK's and, in particular, the RAF's perspective. Whilst the editors have taken care to remove unnecessary references to contemporary events that took place at the time of the seminar in 2009, it should be emphasised that the opinions of those involved in the seminar have not in any way been altered, and it is accepted that some would dispute some of the views expressed or the absolute historical accuracy of some of the comments made during the course of the seminar. Nevertheless, what is conveyed beyond doubt by the testimonies of the seminar witnesses is the existential crisis that Cuba might have represented the first steps towards, and the concerns, fears and preparedness of those members of the Royal Air Force who would have implemented Bomber Command's role once the Rubicon of deterrence had been crossed. At the end of this article is a timeline of the Cuban Missile Crisis, to which readers may wish to refer.

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Participants

Chair:

Dr Richard Moore

Dr Moore is a Visiting Research Fellow in the Centre for Science and Security Studies, King's College London. He is the author of *The Royal Navy and Nuclear Weapons* (Frank Cass, 2001) and *Nuclear Illusion, Nuclear Reality: Britain, the United States and Nuclear Weapons 1958-64* (Palgrave, 2010). At the time of the seminar, Dr Moore was a Visiting Research Fellow at the Mountbatten Centre for International Studies at Southampton University.

Witnesses:

Squadron Leader Roger Atkinson was Mike Robinson's Navigator Radar on 100 Squadron (Victor B2) at RAF Wittering during the crisis. He contributed to the BBC Radio 4 *Document* programme examining the Cuban Missile Crisis in 2008.

Marshal of Royal Air Force Sir Michael Beetham (1923-2015), GCB, CBE, DFC, AFC, DL was commissioned in 1942 then flew with Bomber Command. He commanded 214 Sqn (Valiant), then RAF Marham before a range of senior staff and operational tours including serving as C-in-C Germany and Chief of the Air Staff (1977-82). In October 1962 he was Group Captain (Operations) at HQ Bomber Command serving under Air Marshal Sir Kenneth Cross and AVM Menaul. He also contributed to the RAF Historical Society's 'The RAF and Nuclear Weapons' seminar in 2001, and was another contributor to the BBC *Document* programme.

Air Commodore Norman Bonnor, a specialist navigator was, in 1962, a Navigator Radar on XV Squadron (Victor B1A) at RAF Cottesmore. He now lectures on the MSc in Navigation Technology course at Nottingham University and is President of the 100 Squadron Association

Squadron Leader Jock Connelly flew several tours as a Vulcan pilot and captain. During the crisis he was a co-pilot on 617 Squadron (Vulcan B2, Blue Steel).

Peter J Hudson, CB, was a senior civil servant in the Air Ministry. He attended the Imperial Defence College in 1962, becoming Deputy Under Secretary of State at the MOD 1976-1979. He contributed to the RAF Historical Society's 'Nuclear Weapons Seminar' on 2001.

Air Vice-Marshal Michael Robinson in 1962 commanded No 100 Squadron (Victor B2) at RAF Wittering. During the crisis he captained his crew with Roger Atkinson as his Nav Radar. He contributed to the 2001 RAF Historical Society 'Nuclear Weapons Seminar' and the BBC radio programme in 2008.

Wing Commander Peter West flew Valiants on 214 Squadron under the then Wing Commander Beetham then converted to Vulcans. During the crisis he was the Air

Electronics Officer on the crew of the Commanding Officer of No 12 (B) Squadron (Vulcan B2) at RAF Coningsby.

Organisers:

Dr Michael D. Kandiah, Director, Witness Programme, ICBH co-organised the witness seminar. He continues to organise witness seminars as part of King's College London's Centre for British Politics and Government. His publications include *Cold War Britain* (Macmillan/Palgrave, 2003).

Squadron Leader Robin Woolven joined 617 Squadron at Scampton (Vulcan B2) as a Navigator Plotter 15 months after the crisis so, although he was not a 'survivor' he does speak the language. His 2002 PhD (War Studies at KCL) followed his retirement from the Security Service and recently he has been a Visiting Fellow at the Mountbatten Centre for International Studies at the University of Southampton. He co-organised the seminar with Michael Kandiah.

Session 1

Dr Richard Moore (Chair): Welcome to this afternoon's witness seminar. I am Richard Moore and will be the Chairman this afternoon. A witness seminar is a bit like a group interview. The testimony that the gentlemen here can provide is absolutely vital to us historians as a supplement to the dry documents that we enjoy delving into, because to have a proper, full rich picture of the past, it is essential to understand the testimony of eye witnesses. I now turn to ex-Squadron Leader Robin Woolven. He will say a little about the subject of this afternoon's session, after which time I shall be asking the other participants to introduce themselves.

Squadron Leader Robin Woolven: Thank you, Richard. Why are we here for a couple of hours? I am speaking for just a couple of minutes merely to introduce the topic as we have the opportunity this afternoon to hear the memories of our spread of distinguished witnesses of what really went on at the front line of Britain's nuclear deterrent during the October 1962 Cuban Missile Crisis. The official papers in The National Archives at Kew have a few references to the crisis, but they lack any real detail, while the monthly Top Secret operations record book for Bomber Command for October 1962 does not mention any crisis! One school of thought maintains that there is little in the records because little actually happened, but nearly 47 years after the event, I am aware that our witnesses who were then in Bomber Command were far more active during that long week in October than the records suggest.

Last year in May 2008, Clive Richards of the Air Historical Branch wrote a full historical account of the official records, which was published in the *Journal of the RAF Historical Society*.¹ Since he was concerned with the official record, he made no mention of the rather different recollections of the survivors—the people who contributed to the same society's 2001 RAF and Nuclear Weapons Seminar, which was published in the society's journal later that year.²

When I was researching the Home Front aspects of the Cuban Missile Crisis for the Mountbatten Centre at Southampton, Lord Allen of Abbeydale,³ later Permanent Secretary at the Home Office, told me, 'The Cuban crisis was treated by the Home Office and Whitehall with complete indifference. The Government's reaction was the very British one of hoping that it would go away, and it did!' I also know that, although not recorded, the Home Office banned its 300,000-strong Civil Defence Corps from taking any action during the crisis, presumably because alerting them could not have been unobtrusive and that would have increased tension across the community.⁴

By way of contrast, and totally unobtrusively, we will hear today about what went on at Bomber Command during what was surely the closest the world came to a nuclear exchange. I also hope that our witnesses with their wide experience of sensitive, nuclear matters and, thus, of the practice of deterrence might suggest why the archives records lack the detail of what went on in that long week in October 1962. I shall now withdraw because, at the time I was the Navigation Leader of a Canberra Squadron in the Near East Air Force in Cyprus⁵ where it flowed over the top of us and nothing happened. Back to you, Richard, with our witnesses.

Moore: Thank you, Robin, for the background to the story. Starting with you, Peter, will the rest of you gentlemen introduce yourselves and say a little about what you were doing in 1962?

Wing Commander Peter West: At the time of the Cuban Missile Crisis, I was a junior officer serving on No. 12 Bomber Squadron at RAF Coningsby in Lincolnshire where I was the Air Electronics Officer on the Commanding Officer's crew. He was Wing Commander Philip Largessen, who was a Bomber veteran of World War Two. I was married with three small children. My family were in married quarters on the base.

Air Commodore Norman Bonnor: I retired 19 years ago as an Air Commodore. I started as a Cranwell Cadet, and joined 15 Squadron at RAF Cottesmore in Rutland. I was a Nav Radar⁶ on the crew. I had been on the squadron for about 15 months by the time the crisis occurred. I was still single and living in the Officers' Mess.

Squadron Leader Jack Connelly: I was a Vulcan Captain and Vulcan Co-pilot during the crisis in 1962. I was a Co-pilot to Mike Beavis, my skipper. I had been married for eight weeks and was waiting for a house to be built.

Marshal of the Royal Air Force Sir Michael Beetham, GCB CBE DFC AFC DL: At the time of the Cuban Missile Crisis, I was the Group Captain (Operations) at Bomber Command Headquarters, working through the Senior Air Staff Officer to the Commander-in-Chief. I was responsible for Bomber Command, Alert Stage and the targeting if we did have to go to war.

Air Vice-Marshal Michael Robinson: I was Commanding Officer on a Victor B2 Squadron, No. 100 Squadron at RAF Wittering.⁷ One of my memories is that of arranging for my wife and

two children to see my parents in Putney, London as, had been planned, I had to give her a cover story about why I was not there. She duly repeated it to my father. He just looked at her and did not believe it.

Squadron Leader Roger Atkinson: At the time of the crisis, I was Michael Robinson's Navigator Radar, the navigator who looks after the weapons systems as well as the radar. I would deliver the weapon to the appropriate place. I was living in the mess. I had no wife to worry about, so I was a free agent in my work. I previously had had a V-Bomber tour with the Valiant aircraft and moved directly from that to the Victor aircraft. I had been in the crew flying with the Wing Commander only from 18 September, as the squadron was working up.

Peter J. Hudson, CB: I am the odd man out. I was a civilian member of the Air Staff Secretariat for some time before the Cuban crisis. At the time of the crisis, I was part-time as I was on a course at the Imperial Defence College,⁸ although I was in and out of the Air Ministry every day. The operational side was too remote from me.

Moore: Thank you very much, gentlemen. We have an enormous variety of experience from four different Bomber stations, the Air Ministry in Whitehall and HQ Bomber Command, so I hope that we can get several different perspectives of what was going on in October 1962. Before we talk specifically about the Cuban Missile Crisis, will you describe the atmosphere at Bomber Command in 1962? Was it young lads having a whale of a time in big fast aeroplanes or was it a bit more of a sobering experience than that?

Connelly: It was a bit of both, to be honest. I had just come off Canberra B2 in Germany and, in my mid-20s, to get on to such a big white bomber that had lots of power, four engines and that would fly as high as we like was the epitome of a flying career. There were three squadrons at Scampton, three squadrons at RAF Waddington and three squadrons at Coningsby, all flying them [Vulcans]. Quite a lot of the crews had been trained together so there was great macho rivalry between the squadrons. It was a bit like Manchester United and Manchester City: 'We are better than you are; we can fly faster than you', blah, blah. There was great rivalry and fun.

We used to have happy hour on a Friday night, when we would raid their mess and they would smash up our mess the next week. There was young, high-spirited, good-natured banter between the squadrons, but then we went to work on a Monday morning, they clipped on a nuclear weapon and it all began to dawn on us that there was a serious part to all of it. I started Quick Reaction Alert [QRA], which for those who do not understand, was when we put on all our flying kit and lived in it. We never took it off from the minute that we were in QRA until the minute we left it. We ate in it; we slept in it; we did everything in it. It must be remembered that they were rubber suits, so they got quite uncomfortable.

We used to do 12 hours [QRA duties] to begin with, and at the very end we did 48 hours. That aspect was serious, but we had some high spirits, too.

Bonnor: I can give another perspective. I was straight out of training and I was very relieved to leave the training machine, which was where we still had to be careful about how well we cleaned our shoes and polished our buttons. It was therefore good to go to a place that was for the serious business of flying. It was good fun, too but not quite so dogmatic about everyday life in the RAF. It was a great delight for me to go to the squadron. At the time, 15 Squadron had tremendous spirit. In the same way, we had our rival team squadron, and the same sort of events occurred at Cottesmore.

Looking back, my abiding memory is that we were not indoctrinated. We were all young officers who were going through the promotion exam systems—having to study defence White Papers to take promotion exams. It was assumed that we understood why we were there and were the deterrent force of the nation. However, my equivalents in America had definite propaganda lectures and were told why they were doing it and were pumped up. That surprised me when I first came across some Strategic Air Command [SAC] crews. We were never indoctrinated in that way. It was assumed that we knew why we were there: because we read defence White Papers and were serious young men doing a job.

West: I agree completely with what the other two have said. There was an enjoyable atmosphere on the squadrons. We were a group of young men with two things in common: a love of flying and a belief in this country. There is no doubt that we were very patriotic—not xenophobic, patriotic. We believed in the country and we believed passionately in the efficacy of the nuclear deterrent. We really believed that. The more that I talk to veterans like myself, the more I am convinced of that. The rivalry was healthy rivalry between the squadrons. We actually cared about each other even though we would never dare show it. There was a huge *esprit de corps* and tremendous comradeship.

I had come into the V-Force as a sergeant, which was quite unusual in those days. I went to Sir Michael's squadron as a young sergeant and was with him for about six weeks, after which my commission came through and I went away. I was very pleased to be on the V-Force. I had been in Coastal Command before that, when I was one of a very large crew. That was great. We did some very good work, particularly search and rescue, but to be on a V-Bomber crew to me was the ultimate, and I still believe that 47 years later.

When I spent some time later as an instructor and flew with an experienced crew on refresher, the crew were almost totally silent. They did not need to speak because each of them knew what the other wanted to get the job done. When you flew with a new crew, it was like being in an aviary—the chattering that was going on. That closeness and unity that came between the five on a constituted crew meant that we stayed together all the time. It was something

very special and something that I have not forgotten. To illustrate it, I am still in touch with the surviving members of my crew.

Bonnor: We were 'constituted' partly for the reason of getting high-quality teamwork and because of the targets that we had to study. We had no idea on our crew about the targets of other crews on the squadron. We were given certain Accounting Line Numbers. They were our targets. We only ever studied those three or four targets. We never saw the targets of anyone else. That was part of the personal vetting system that we had to go through to reach that level.

Connolly: To add a rider, the reason why we were constituted was that no aircraft flew exactly the same. Some tilted slightly to the left, some tilted slightly to the right while others would corkscrew through the sky. The Nav Radar, the chap who was to drop the bomb, and the Captain basically flew the aeroplane together. I knew exactly how Terry [my Nav Radar] flew the aircraft in terms of the bombing run. He knew exactly how I flew it in terms of keeping it straight and level, so that is why we were constituted. We knew what each other was going to do and, as Peter said, without talking to each other.

Beetham: I was at the Bomber Command Headquarters during the Cuban Missile Crisis, but before then I was commanding a squadron of V-Bombers. Yes, some people had fun, but everyone was conscious that we had the role of Britain's strategic nuclear deterrent and that was very sobering. If we think of the Air Force in general, we were the cream of the Air Force with very high professional standards. There is no question about that. A lot of very experienced people were in the squadrons of Bomber Command at the time.

No doubt we shall get into the alert stage and things that went on, but we were very conscious that we were responsible. We had targets to study, which were not revealed to other crews on the squadron. We had certain readiness states to maintain because, with the nuclear deterrent, the one thing that we did not want to have was part of the force or the whole force knocked out on the ground. We had to be ready to go when the alert stage called. It was a very responsible job and the crew was very conscious of its responsibility.

Robinson: I wish to say something about the informality. There were no great tests of personality. Crews just came together. I arrived at Wittering, having come back to flying. I had done staff college. I was then told that Roger Atkinson was to be my Navigator Radar. I said that I would see how it worked out, but nothing was pre-destined. We were not checked for whether we liked or hated each other; we just gone on with it.

Atkinson: That is right. I take all the points about the fun and the build up of *esprit des corps*, which you get on squadrons. The V-Force was different from the Canberra Force, which I had been on before. The particular squadron that I joined during the crisis was my second V-Bomber squadron. The first had been on Valiants, so I was used to the role. It involved a very

careful preparation—in terms of our war requirement—of the routes to the target, delivery of the weapon and the recovery thereafter. The crew each had a designated role, interwoven to deliver the weapon. That was what it was all about. Picking up earlier points, we realised that we were part of a deterrent force—not only in the United Kingdom but with the Americans umbrella, too. We also felt that we—the British—would do a darned good job.

Moore: Thank you very much. One thing that strikes me coming out of all those comments is the elitist *esprit de corps* of Bomber Command. I am right, am I not, that Bomber Command really was—not only as far as you guys were concerned, as far as the rest of the RAF was concerned—the spearhead of the spearhead?

Atkinson: All the perks were really that plenty of money was spent on our sleeping accommodation and, at one time, we had a marvellous free uniform.

Connelly: You mentioned the accommodation. On QRA, we lived in our flying kit. We had to sleep in it. We had to be in the aircraft in five minutes. A railway carriage would therefore be superb accommodation compared with what we got. We had caravans that were the length of this table, and as broad. We opened the door, went in sideways because the cabins were so small and all that was inside was a bunk. That was our accommodation for 48 hours.

Bonnor: That is unfortunate for the poor Vulcan Force. That was really because there was a main road between it and the Officers' Mess. Fortunately, at Cottesmore and Wittering, the Officers' Mess was on the same side of the main road as the aircraft were on the readiness platform. We lived in the Officers' Mess, I am sorry. It was luxury.

Moore: Peter, as you said, you were a bit of an odd man out, but I would be interested to know what life was like at the Air Ministry in the early 1960s. What kind of place was it and how was the atmosphere there?

Hudson: The predominant theme in the 1960s was being near to the US Air Force. In the early 1960s, we had, for example, a situation in which we had more capability than money. The United States Air Force provided the RAF with an enormous amount of material equipment that enabled us to get with our own thing. For example, there were about 465 Hunter fighters provided on the house by the United States Air Force under plan KA aid. It meant that our resources enabled us to continue with the original concept of the force, envisaged 240 V-bombers, that were intended originally to be Vulcans and Victors. However, the programme was slow—as programmes often are—and the Valiant came in as an interim V-Bomber.

The other element in that period was the development of the missile early warning system, which I negotiated with the American Air Force in the early part of the 1960s. It was just about able to produce a signal at the time of the Cuban Missile Crisis. It was not fully turned over to the RAF and operational until about 1963, but there was some result well before the

three big golf balls in Yorkshire.⁹ As the problem developed, 'how do we cope with the four minutes' warning from the radar at Fylingdales?' became the criteria. The Cuban Missile Crisis anticipated that problem. One thing that I remember about the crisis was that Bomber Command wanted to carry out some dispersals, spreading the aircraft to other airfields in order to increase the number of targets. The political objection to that was that they were not allowed to do it!

Moore: That is an interesting point. Perhaps you could follow that up, Sir Michael. Can you say a little about the process of orders coming down and requests coming up about readiness levels?

Beetham: What we wanted to do when the crisis developed was to use the BBC and recall people that were on leave, to get them back to their stations. We were told that we could not do that. We wanted later to disperse, because we had a dispersal plan when you could put aircraft to some other Bomber Command airfields to help from a security point of view. We did not want all our eggs in one basket. Macmillan¹⁰ as Prime Minister said, 'No.' He made it clear from the start that he did not want any overt measures taken. He did not give us a reason, but I think that he had CND¹¹ and various protesters round his neck, particularly around the Thor sites¹² and such places. He did not want any measures taken that would exacerbate that sort of problem.

Nevertheless, Macmillan said that he wanted Bomber Command to take all measures without alerting the general public, and that is how we operated. We got our people back to the stations remarkably well, by the use of telephone and doing things quietly. You will hear later from those who were involved at station level, but we got everyone back and to a reasonable state of alert and availability. We were able to put the bombs on the aircraft and prepare, but it all had to be done quietly.

Robinson: I always thought that Macmillan's concern about mobilisation was that he saw it as something *à la* World War One, with Orders in Council and everything, whereas what we practised regularly with our exercises was a form of mobilisation—with a small 'm'. But he saw it with a big 'M'. The instructions that he therefore gave about Bomber Command making arrangements had a marvellous political ring about them because they did not actually say anything. I believe that that left it to the Commander-in-Chief to decide what he could and should do. The political instructions told us nothing. It told me nothing, and I suspect—given that Sir Michael is nodding—it told him nothing.

The area that always intrigued academics is whether our Commander-in-Chief, 'Bing' Cross, exceeded his remit.¹³ I think that the answer is no, because he did not disperse the force. The great thing about these things is that you have plans, but then you have to be flexible because you will not carry them out as they are written but do something different on the spot. So we did not disperse.

Beetham: I am quite sure that the Commander-in-Chief did not exceed his authority. He operated within his discretion as to what measures he took. It was not generally known to the British public what was going on.

Moore: One of the things that we, as historians, have an obsessive interest in is when exactly things happened. A particular question that troubles historians about the Cuban Missile Crisis is when did the unobtrusive alert measures in Bomber Command actually start and on whose authority? The documents, such as they are, suggest that Macmillan was not even approached until Saturday 27 October when the political crisis had been going on for a week and there was evidence that some of the stations were already taking unobtrusive measures.

Macmillan's guidance was to take unobtrusive measures so, clearly, that had been understood or anticipated in advance. Can anyone shed any light on at what point guidance came from higher authority and from whom?

Beetham: It fed down to the Commander-in-Chief. I was his staff officer, and it was fed down right from the start. From the 21st, the previous week, we knew that things were going on. I am pretty sure that we knew at that stage—what Macmillan had pushed out in telephone calls, I do not know—that we had to get the force and take all reasonable quiet measures that would not alert the public. That was when it started. The big weekend was the next weekend, the 27th. Macmillan knew from the start that, with the publicity, we could not use the BBC. We could not disperse the force. We had to take measures that could be done from the station quietly.

Bonnor: I can add to that a little in that my log book shows that I flew the last sortie on 16 October—in other words, before the weekend before. I do not think that the station flew again. The following week, we were generating aeroplanes by then.

West: We were the same.

Bonnor: I did not fly again till 7 November. I am pretty sure that we were already generating aircraft at the beginning of that week and the most that would have happened would have been perhaps an air test. I certainly do not remember anybody flying in that week leading up to 27 October.

Woolven: The 540s¹⁴ for stations and squadrons in both Nos. 1 and 3 Groups showed some flying during the week.

Bonnor: That might have been air tests.

Woolven: Absolutely. Not just aeronautical air tests, but system testing, too. There were R[adar] B[omb] S[ite] runs during the week [to calibrate the V-Force weapons systems].

Connolly [referring to his log book]: This is my log book for 1962. I flew on 14 October a Blue Steel¹⁵ trip and there is a gap to 30 October, when I flew again.

Bonnor: Mine is the same.

Atkinson: We were the same. It is worth pointing out that there was always a small proportion of the V-Bomber force on ready state day-in, day-out—minute-in, minute-out [the QRA force, generally one aircraft per squadron]. A certain number of crews were at 15 minutes readiness to take-off. As the exercise—or the war plan—may dictate, so the crews were moved up from 15 minutes to five minutes to take-off and other alerts before the take-off. It was not unusual to be involved in the quick reaction alert force to find that we were ready to go, and that there was an atmosphere of preparedness. That was what we were about. A small number of us were ready to go, and through the week, say, before the Cuban crisis, it would not be unusual for our crew to be on standby on the Monday and another crew to take over on the Tuesday, and us to do Thursday and Friday and so on. We were constantly alerted to the concept of going.

Robinson: What was the difference on that Saturday afternoon on 27 October from the well-practised routine of being a Quick Reaction Alert crew? Those practices were on a 7 day 24-hour basis so that QRA crew, normally just one per squadron, was used to be brought up at any time of the day or night from Readiness 15, which meant that the crew was on the station either doing target study, eating or sleeping together, but we were out of the cockpit. The call would then come. The practice would come to Readiness 05, which meant that, wherever we were together, day or night, we had to get to the aircraft, get in it, check it all out and report that the aircraft was ready and that we were genuinely at 05 [minutes' readiness to take off]. That was the day-in, day-out test. The difference was that on that Saturday afternoon, it was not just one crew or one aeroplane, but all the available aircraft and systems. I use the word 'systems', being the mating between the aircraft and the crew. They were brought up to Readiness 15 and then, for a considerable period, we were at cockpit readiness 05. We were used to hearing a Bomber Controller broadcast changes in readiness state, which we heard either through the public address system when about the station or through our earphones when we were sitting in the cockpit.

There were various forms of alert and readiness exercise, and each had its own code name, which the bomber controller always used as a prefix. I am convinced that on 27 October, the bomber controller used no exercise prefix. It was for real. As we waited in the cockpit, we could not foretell if the next Bomber Command controller change of state would be, 'Start engines' or 'Scramble'. In the event, it was to revert to Readiness 15, so once we were assured that our aircraft remained fully primed or cocked, we left it and returned to the Operations Room or the Mess. In another place, I ended that bit by saying, 'It was quite a long afternoon'!

Bonnor: There was significance in that, because the weapons all had what was called 'a last minute loading requirement'. In other words, they were deliberately designed to be extremely

safe, but to definitely go off when you wanted them to. They therefore had things hanging out underneath that were screwed in when you went to Readiness State 05. I recall doing that on that day. It usually meant that, having done it, there was a lot more testing and fiddling about to be done to put it back again and take it out again to be sure that the weapon was now back in an ultra safe condition. I do not recall that being a major issue on that occasion, so perhaps we did just drop the thermal batteries back out and not go through all the testing process that we would have done on other occasions, because we were still at a high readiness state.

Moore: Is it definitely the case that all four stations had at least one crew go to 05?

Bonnor: There was not just one crew.

West: We always had one crew.

Connelly: We had 24/7, always one crew at 15. We are saying that, on that Saturday, every crew that came in went out [onto cockpit readiness with their armed, combat ready, aircraft].

Bonnor: I think that my squadron had reached seven crews at 15 by that stage. They must have all been called to 05. I just remember doing it, but I do not remember that everyone did. It must have been everyone. It would not be done for an individual crew.

West: Air Vice-Marshal Robinson is absolutely right. The Bomber Controller who normally prefixed our ordinary QRA exercises with something like, 'Exercise Edom'.¹⁶ He would say, 'This is the Bomber Controller for whatever it was' and, 'Exercise Edom for bomb list echo, readiness state 05.' He would repeat that. You would dash into your aircraft and be ready to go.

When such practices were rehearsed, which they were frequently, they would take it right through. It was just with aircraft that were not bombed up. It was done just to exercise the procedure. Remarkable as it may sound, the record was 90 seconds for getting four Vulcans off the ground, which is amazing. That was seen by us as a challenge. We wanted to do it, and do it properly. Time was vital. We knew that, God forbid, if the Soviet Union had launched an attack against us, we literally had minutes to launch our counter strike. As I said at the beginning, we did not want it to happen. That would have been suicide, but we had to be prepared for the possibility.

May I just refer back to something else that was said earlier? Mention was made by Peter Hudson about the Strategic Air Command. The Strategic Air Command was the United States Air Force equivalent of Bomber Command. It was more than the equivalent, because it was absolutely huge. We were tiny by comparison. However, it acknowledged our role. I wish that I could remember the date, but it was not long after the Cuban Missile Crisis. We used to get their Strategic Air Command monthly magazine called *Combat Crew*. We quite enjoyed reading

what it was up to, but on one particular occasion one the chaps came into the crew room waving the magazine saying, 'Hey, we have a mention in despatches.'

On the cover of *Combat Crew* was a Vulcan—sorry that it was not a Victor, Norman [Bonnor]! - underneath was the title 'Kissing Cousins'. When we looked at the article, the author had said, 'You guys may think that, if you ever have to go over the Soviet Union and drop your bombs, you will be the first. But you will not, because the Royal Air Force Bomber Command will have been before you.' It was a very timely article because we in this country frequently get the feeling that the Americans are desperately trying to airbrush us out of history. On this occasion, for once, it acknowledged that we were—as the Americans put it—'kissing cousins'. We were working with them for the same purpose.

Bonnor: I think that Sir Michael mentioned that it was not just us. It was 59 out of 60 Thor missiles were at the same alert stage as we were. If you have not been to RAF Cosford¹⁷ and the Cold War Museum: in the booth about the Cuban Missile Crisis, the Royal Air Force [initially] got no mention whatever. You would not know that we had been there.

Beetham: I think that it has changed. It told me that it had. When I saw it, I raised exactly the same point. The museum was using official records and, as we have heard, there is little mention in the documentation about the efforts of Bomber Command. It has seemed to have been ignored. Why, I do not know. I do not know who compiled the operations record.

In my job as Group Captain (Ops), I worked closely with the Strategic Air Command, albeit we did not do much talking during the actual crisis. It has certainly been acknowledged that the Thor missiles were very few and far between. If you were going to attack Europe, the Thor missiles were intermediate range and a potent weapon. The Thors spent their time at 15 minutes readiness and we brought them to two minutes readiness. They were excellent missiles.

Moore: Sir Michael, you mentioned that there was not a lot of contact with Strategic Air Command during the week of the crisis. I have heard that story before. Can you say a little bit more about it and explain why it was?

Beetham: I do not really know. I was surprised to be told that the C-in-C Bomber Command had not spoken to the C-in-C Strategic Air Command,¹⁸ although he was a great friend during that period. When America has a problem—Kennedy¹⁹ was really handling it—it was not diverting its thoughts towards us. We did know that certain squadrons had American weapons and that required clearance. The Thor could not be fired without the Americans, so we did know a little of what was going on.

Moore: Did we know what was happening at Strategic Air Command stations in the United Kingdom that week?

Beetham: It was not so much ones in the United Kingdom, but Airborne Alert was operating from the United States. I am not sure what they have in this country.

Moore: I think that it still had a few B-47 sat at one or two stations in the United Kingdom.²⁰

Connelly: We had a ground-based QRA and the Americans had an airborne QRA. They had B-52s²¹ in the air night and day, always replaced—a bit like the Trident submarines. When one came in, another went out and replaced it. They had an airborne QRA all the time.

When you say, 'Did you talk to the Americans during the Cuban crisis?'; in normal peace time, we used to go to America and fly exercises against the B-52s on a regular basis about every three months. We had a competition to knock them out of the sky, come back and laugh about it. I was trying to get into a competition against a B-52. The Americans loved the B-52 because it is twice the size of a Vulcan and has more engines. [Once] a B-52 was ahead of me on the bombing run, the range called up and said, 'What is your target? What is your height?' The American voice came in and said, 'We are high level at 25,000 ft.' When the range told me to call my height, I said, 'We are at 45,000 ft.' They did not like it terribly much.

Robinson: I think that the Americans are pragmatic, and when you have something to offer, they are very interested. What we had to offer was geography. We were an offshore aircraft carrier. An aircraft launched from the UK would be some hours ahead of the mass of the force coming out of America. That was attractive, and why not? Geography had played its part.

Bonnor: One reason why it is not mentioned in many of the squadron histories, such as the [Form] 540s [operations book] and the station history documents is, first, that completing it is a secondary duty that none of the young folks on the squadron bother to do anyway and, secondly, we were still highly classified and did not talk about anything in those history documents that was in any way classified. We were not allowed cameras on to the base or M[ilitary] P[olice Officer]s would arrest us at the gate. The only time that we had a chance to take pictures of the aircraft was when we went to Omaha, Cyprus or Goose Bay,²² where we could take pictures of our own aeroplanes. We definitely did not take pictures of panels inside that would give away some details of our capabilities. We all understood and abided by some very strong security rules.

Moore: You gentlemen were all flying officers. Can you explain what it felt on the basis that, to be ground crew, your wives and your loved ones did not have the luxury of flying off if there was trouble?

West: I would not call it a luxury of flying off because, without being melodramatic, young men are always the same about their chances of survival. It would not happen to them, but to someone else. It worried me that the rest of the squadron would be shot down. Statistically, we had a very high chance of being dead within a couple of hours. When I have been confronted

by people from CND, I always ask them whether they really thought that we wanted to die and to, 'come on, be real'. As I said at the outset, we believed passionately that the deterrent was right and that it would work—and it did. What it was like for the ground crew, it is difficult to say. They were not going to escape to anywhere. Our bases were undoubtedly among the primary targets for the Soviet Union.

As for our families, I can only speak for my own wife: one of the things I did that I found very illuminating was when I first got from Robin [Woolven] the tasking about today, I talked to her about it. It is not something that we had ever spoken about. I asked what she remembered, and I was astounded by how much she remembered. One of the first things that my wife said to me was, 'Are they really suggesting that you didn't think that it was real? I knew that it was real.' She remembered that I said to her, 'If you see us take off'—I did not believe that we would take off, because I believed in the deterrent—'take our three little children, put them in the car, put a few things in the car with them, but most importantly get the hell out of there. Drive up to Scotland, but don't go home because that is next to an air base in Scotland. Go to your brother in Skye and if you are to be safe anywhere, you will probably be safe there. The thing is: please survive.'

In the highly improbable idea that we would take off, we knew that if we did get back, there would be nothing to get back to. It was Domesday, Armageddon. Long afterwards, my wife said that she thought to herself at the time, 'What a bloody fool. Where does he think I am going to go? How far does he think I will get? I would be passing all the airfields, all of which would be primary targets, come on!' I was quite amused by her thinking that, but not having told me for 47 years!

Connelly: I had been married for eight weeks. RAF Scampton, RAF Waddington and RAF Coningsby were the three prime targets in the United Kingdom—and I lived in a caravan right in the middle. I was waiting for a house to be built. My wife did not drive; we did not have a telephone. I doubt if we had a radio, but even if we did, as the Air Marshal said, it was not broadcast anyway. I was in bed on Saturday and a knock came on the caravan door. It was the local bobby in helmet saying that I would have to go in to the base. I thought that someone had gone ill and I was wanted to make up a crew for a quick trip. I told my wife that I would see her after lunch, and I disappeared. My wife did not have the vaguest idea where I had gone. She did not know when I would get back. She was not told anything at all. I appeared back on the Monday morning and, to this day, she has no idea where I went because I had been on the base and they had locked the gates. No one had got in or out. No one telephoned. The families suffered more than anyone.

West: On the ground crew side, we had almost got completely rid of National Servicemen by that time.²³ Some were still on deferred National Service jobs, but most of the ground crew were all dedicated, full-time [regular] servicemen. They were very proud of us. In some respects, it was embarrassing. They always supported the squadron events to the nth degree. I do not

remember precisely which day, but it was on the Friday or Saturday at the end of the week that one of them rushed up to tell me, 'They've shot down a U-2', which occurred at some stage during the crisis.²⁴ They were really paying a lot of attention and were as involved in it as we were.

West: We relied on them totally. We had complete confidence in our ground crew. The technicians were superb and we could not have done anything without them. They know that we acknowledge that.

Woolven: Although we are concerned with Britain's nuclear deterrent, RAF Coastal Command at the time was also involved in a higher state of readiness on Saturday, the 27th. The sort of comments that Peter, in particular, has made about wives and families applied. In the course of preparing for this last year, I was speaking to a retired Air Chief Marshal who was a Flight Lieutenant Pilot at the time on a Shackleton²⁵ squadron at Ballykelly²⁶ when he was called in on the Saturday to a fully war-loaded aircraft. All three squadrons at Ballykelly and additional units had their full war-loads on. He shared cars with his co-pilot into the squadron, leaving the other car with the families in married quarters with the instruction, 'If we take off, get in the car and drive south of the border because we might well have to go somewhere.' I know that that sounds terribly melodramatic, but the crisis had a tremendous impact on a lot of people. The retired officer to whom I was referring said that that was the only time in his life that he had a full war-load on his aircraft and he taxied with it. It was not just Bomber Command, although it carried the nuclear deterrent.

Did you say that you were Mike Beavis' co-pilot, Jock?

Connelly: Yes.

Woolven: You missed out during this week because Air Chief Marshal Sir Michael Beavis,²⁷ who now lives in Cyprus, in an email exchange last year looked in his log book and said that he went with Les Leader, one of the other captains on 617 Squadron and they were at the SAC Headquarters at Omaha, Nebraska²⁸ that week. He detected that things were very different.

When an American complained to him that the Russians were putting missiles within striking distance of their home base, Mike Beavis said, 'Well, we have suffered it for years.' The element of humour was there, but he certainly was not recalled from Omaha. Once again, nothing obtrusive went on. He came back [to Scampton on 27 October] in a record time, but that was due to the tail wind on the day. They got back on the Saturday. The crew obviously fitted in with the arrangements at Scampton. My two boring points were that it was not just Bomber Command, but Bomber Command was the important bit and whatever went on was certainly unobtrusive.

Moore: We have been talking for about an hour, so I wish to give people the opportunity to stretch their legs now. We will resume after 4 pm.

Session 2

Moore: Just to pick up on some of my conversations during the tea break, I wish to ask about Ground Crew again. Roger [Atkinson] and Norman [Bonner] would both like to say a little more about their involvement.

Atkinson: Ground Crew were called in, as the Air Crew were called in, on various exercises. I want to consider the scenario of a state of alert. They would all have a system of being called in to their duties. Those duties were clearly and carefully designated. Yes, there was a degree of high morale when they got the job completed, but they first had to get the aircraft on line and the weapons on them. They worked and worked to achieve that point. I do not know their precise targets in terms of time, but it was pretty tight. They had to have a high morale. One of the key things that their own officers and the squadron commanders aimed for was a high morale among the men. We have heard that they were quite proud of their achievements on behalf of the air crew. Once they had the major job sorted, their own officers and warrant officers would start up a shift system. The cooks would decide when to produce meals. Even the padre would decide when he would visit the squadron. It was a matter of the station coming together—even the medics had duties to which they had to turn in a station exercise. That might give people more of a clue about the total involvement of the station staff when an alert was called.

Bonner: I wanted to add a little about the person whom we called the Crew Chief. Every aircraft had a dedicated man assigned to it called a Crew Chief, the chief technician. In many cases, he had gone to the factory to collect it [their aircraft] with the crew that delivered the aeroplane. He was therefore very dedicated to the aeroplane and, if you bent it, by God he really got cross. Many of the younger lads obviously aspired to becoming a Crew Chief, so they had their aeroplane and also flew with us on detachment—not on ordinary training sorties around the UK, but if we dispersed on the dispersal plan they flew with us either to St Mawgan²⁹ or wherever we went. They also came on overseas deployments with us to Omaha, Nebraska; Karachi or Goose Bay. They would not fly the training sorties that we would fly at those bases, but they came with us to be the primary person to help make sure that the aircraft could be turned round properly and serviced, while we were away.

We were all trained to a bare minimum of requirements to be able to turn the aeroplane around. One of my jobs was to help the co-pilot pack the big 46ft [drogue] parachute back into the aeroplane, which is not an easy thing to do. Crew Chiefs were vital from that point of view, so they flew with us quite often and were very dedicated men. They had huge pride in us. It was always daunting to think that those people had such pride in their squadron's air crew. It really stemmed from how Bomber Command was in the Lancaster in the Second World War. Again, the Ground Crew were dedicated to particular aircraft and, in those days, an aircraft was dedicated with a crew. If you look at Second World War flying, you will find that the same crew

flew the same aircraft on missions night after night. The same dedicated Ground Crew would be desperately waiting for them to come back, although on many occasions they did not.

Connelly: As a rider to that, even if the normal squadron at least changed a piece of the aircraft that was vital to flying—an engine or tail plate—I always said to the Crew Chief once he had brought it back on line, ‘Get your parachute, you are coming with us’, just to make sure that he was doing a good job.

West: Which they always did.

Connelly: Oh yes.

West: I want to illustrate the role of the Crew Chief and the respect with which the crew held him because of his incredible depth of technical knowledge of the aircraft. One of our aircraft’s engines had become unserviceable on its way to the Far East where we had an operational commitment. The aircraft was stuck in Bahrain. Our crew were told to take the Crew Chief with them, go on out and take them a spare engine. It was the first time I knew that we could carry a spare engine in a bomb bay, and that was interesting. We hoisted the thing up in the bomb bay and off we went to Bahrain. When we got there, we were told that we were staying there with the lame aircraft and to give our good aircraft to the crew that had been waiting. We were told to stay there and, under the supervision of our Crew Chief, do an engine change. My God, I could not see a British Airways crew doing that—or even Virgin [Airlines]!

We did, and that was all thanks to the Crew Chief who supervised those officers, all of whom were senior to him. We did what we were told and changed the engine. It worked. It had to; we had to fly back.

Robinson: The test of our belief in the Crew Chief was when he handed us the Form 700 before each flight.³⁰ That gave all the details of the aircraft’s condition and fuel state. He had signed it, ‘The aircraft is serviceable’. It was serviceable, because we believed what he said. That was the trust that we had in the Crew Chief. He said that the aircraft was serviceable or if odd things wrong with it had been clearly stated, we would know what worked fully. The Crew Chief’s signature and quality was such that we believed in what we were told by him.

Moore: That is interesting. It is the first time that I have really grasped that the whole week of the Cuban crisis, when there was a week spent unobtrusively generating aircraft, was a week that the Ground Crew knew better than anyone else and something that historians have not recognised.

Bonnor: No working hours directive!

Moore: No. Let us fast forward through that week of intensive, unobtrusive preparation to the afternoon of Saturday 27th, which was the real calm at the eye of the storm when everyone was at 15 readiness, while some aircraft were at 05. What was going through your minds that afternoon?

Robinson: I have often been asked what I was thinking about during that period of Cockpit Readiness [05 minutes]. I have given an obvious, rather bland answer and said that, having checked the aircraft systems, particularly the navigation and defensive electronics to the nth degree, I would wonder whether it would all work again when I pressed the four-engine [simultaneous] start button as it would be rather disappointing if it did not. There was the moment of whether it would all fire up and would I hear the right noises from the rear crew in the back saying that their radars were coming up and the generators were on line, so it was all go.

A more considered thought was, 'What were we actually deterring?'. At the lower end of the scale, were we simply showing solidarity with the Americans in their response to the threat of nuclear attack on their homeland—something which was peculiar to their experience, as opposed to us who lived in the European land mass who were always aware of the Soviet nuclear capability, a point that was made earlier. Did the nuclear game of chess and later we understood that the Soviet plan to bargain American missiles in Turkey for theirs in Cuba include the status of Berlin? Did our evident state of readiness help to deter any Soviet plans to get the Western allies out of Berlin?

From the Kremlin's viewpoint, 'The dynamic and prosperous Western sector compares so markedly with the poverty and deprivation of East Berlin that to them Berlin must have looked like the Great Wen. As the Army correctly assessed, Berlin was not militarily defensible, but that does not invalidate the concept that the West and nuclear threat could discourage any such Soviet adventure.' When I gave a contribution to a RAF Historical Society seminar in April 2001, I posed the question, 'Was there military intelligence of such a possibility of Soviet adventure against Berlin or was it a question of intelligent, political second-guessing?', but the answer came there none.³¹ That is, until we take note of Robin Woolven's selected chronology of occurrences as recorded in official documents:

'The Cabinet meeting of 9th October reported the Foreign Secretary³² saying that the relationship between increasing Russian activity in Cuba was in order to provoke USA intervention, which they would then use as a pretext for the forcible occupation of West Berlin.' On 23rd October, the Prime Minister briefed the Cabinet on his initial conversation with President Kennedy when the President had acknowledged that action to contain the Cuban situation might have repercussions in Berlin. What was Bomber Command's response? In particular, it was about whether the increased level of the aircraft readiness was just a side show, as some people still held, or whether we contributed to the balance of considerations that the Soviet hierarchy had to weigh up in its chess-like moves about Cuba versus Turkey

missiles. The subject at that time was secret negotiations and Berlin, and any more conclusive understanding may have to wait the availability and scrutiny of Kremlin documents of late 1962, although my Chairman tells me that there is now a book called—

Moore: A book, '*Khrushchev's Cold War*' has come out, which says a little about the political aspects from a Russian point of view based on Russian archives.³³

Robinson: I would like to think that, in the next year or so before I cease thinking at all, perhaps that Saturday afternoon with our evident readiness might have discouraged a Berlin adventure. The whole of peace and the Cold War would have been entirely different and dramatically changed for the worse, if we had been forced out of Berlin. Because we were not, and because the deterrent worked in that not one single square inch of land of either Warsaw Pact or NATO was exchanged, won or lost, I call it now not the Cold War, but the Cold Peace.

Atkinson: The problem when you review how you felt on the day is that it is conditioned by your present knowledge. We did not know what Macmillan was saying. We did not know what Kennedy was up to. We knew about the U-2 being shot down. We knew that there was a tension, but that did not sink home too much to the crews on QRA because that was our normal job. We were called to the aircraft, expected to be ready to go and that is what we were doing.

The difference was that, on the Saturday, rather than being called to the aircraft for readiness 15 minutes, then to readiness 05 minutes and then a wait for something further, we were called to the aircraft and stayed in it at readiness 05 for an interminably long time.

Bomber Command had its own routines. We accepted that, but normally we got through them pretty quickly. Often, we were not in the aircraft more than 15 or 20 minutes, but on this particular day the atmosphere was a little different in that there was no flying, a few air tests or a few other sorties. We were asking what was going on and how long would it go on for. We were not as *au fait* in those few minutes as the Air Marshal has carefully explained now. Some people were alert to the fact that something was going on. The more senior you were in the Air Force, the closer you were to it.

Robinson: I will tell you one characteristic: it was very quiet.

Atkinson: It was.

Beetham: From the perspective of being at Bomber Command Headquarters and responsible to the Commander-in-Chief for setting out all the messages and putting them into a high state of readiness, that particular Saturday was [for me] rather traumatic. Khrushchev was just beginning to say that he was prepared to withdraw the missile, but we did not know that at the time. Things looked pretty bleak including the messages that we were getting from the

Air Staff in Whitehall. My Chief and I transmitted the message to put the whole force at a high state of readiness. We had to hold it until later on when it became clear that we did not want to leave the whole force indefinitely, although we would still have people on readiness. It was traumatic at headquarters, but it seemed like, 'Surely, we are not going to launch the force. I can't believe it. Surely the deterrent will work and matters will not run down to the crews.'

I spent the whole week at Bomber Command Underground Headquarters, virtually living there. I had a house only about 400 yards away with a wife and family, and on the Saturday I nipped home and took an hour off. It was unreal because it was Saturday afternoon, a sunny day and all I could pick up on the radio was some football match. The general public did not seem to know anything. My wife asked me what was going on. I could not really tell her, although she knew a bit about it given that I was incarcerated. The situation seemed unreal. It was all part of Macmillan's plan to play it down, play it quietly.

What happened is brought out in your summary: the Home Office did not take any Civil Defence precautions, so it was all left to us in isolation to keep the deterrent operational and working. Berlin, the matter that Mike Robinson just raised, was certainly a possibility and I think that it was in the American minds, too. When America first had the Cuban Missile Crisis, it was going to focus on Cuba—invade it, bomb it or do something else—but it would depend on the Russian reaction. We could get to Europe because of geography a lot quicker with the Thor missile or the V-Bomber force and the crews that were standing on alert. But it was an unreal situation.

I still find it difficult to comprehend the matter to this day. Why it is not recorded in the Operations Record Book, I cannot answer. I do not know. I never had anything to do with the Operations Record Book. Someone was obviously doing it and they had not written it. I never remember seeing any policy saying that we did not record it. If the Commander-in-Chief had sent out a message saying that we were not to record it, I would have known. I cannot explain it. The historians might like to do so.

Hudson: You said that you were surprised that there was nothing in the Whitehall records about moving towards a war footing. The answer is that it did not really work in that way. The Air Force knew how much it wanted to do certain things and the general steer was to be quiet. The only time when you had to consult the Prime Minister was when it was felt, quiet or not, it wanted to do x or y. Apart from the denial of a QRA station, Bomber Command did not want to be constrained and that did not require going to the Cabinet or the Prime Minister. There would not have been a major record of what went on in Whitehall, unless there was a major blow-out, in which the Ministry of Defence would have said that it must do x or y, and the Prime Minister and others would have said, 'No, you can't'. That did not happen.

Bonnor: I may have this confused because only twice did I do the [weapon] last-minute loading. The second occasion was at Wittering when Fylingdales reloaded software and forgot

to put the Moon in. The QRA crew therefore went to 05 last-minute loading until SAC said, 'Well, Thule³⁴ isn't seeing it nor is any other BMEWS site seeing it, so what are you doing at Fylingdales?' It was finally realised what it was about, so we are not sure whether it was that occasion or the Cuban missile crisis occasion, but I remember looking at the [authorisation] envelopes. In the war bag, we had sealed envelopes with code words that gave us engine start instructions. There was a coasting-out envelope and an 8 East—an irrevocable release code word, too. I remember trying to make sure that I had the envelopes in the right order and wondering if the damn word would agree with what was in the envelope.

Connelly: To add to that, we always had a two-man system in respect of atomic weapons when one person could not do anything on his own. It always had to be a two-man thing. The navigator had a set of envelopes, as did the captain. The code words were different, but they had to match. If both of them matched what they already had, you could turn the key—but not until both agreed.

Moore: One of the things that interests me about the envelopes is the fact that round about 1962 there were two possible targeting plans: a UK national targeting plan and an Anglo-American targeting plan. Was it apparent to you guys on the aircraft which you had on board? Did you have both plans on board?

Bonnor: No. On QRA, we were on the NATO plan. There was no question. The bag that we had was the Accounting Line Number [i.e. the targets] for the NATO plan and the code words were separated. If we were called in to a national plan, we would have been issued with a different bag.

Moore: What happened that afternoon?

Bonnor: I am pretty sure that we were on a NATO bag.

Robinson: We were.

Moore: Peter, you have not said what you remember about the afternoon of the 27th.

West [at RAF Coningsby]: I think that it was the 26th! Sorry, it was 47 years ago ... I am sure that we were called in on the 26th. I am sure that the Corporal RAF Policeman knocked on my front door about breakfast time on Friday, the 26th. I may have got that wrong.

Bonnor: It was much earlier in the week [at RAF Cottesmore]. It would have been the previous week.

Connolly: It was definitely the Saturday morning [at RAF Scampton]. I know, because I was going to go shopping.

Bonnor: It took two or three days for us to get all the aircraft generated and to the point at which our squadron was at 15 minutes readiness with seven crews. I am pretty sure because our other crews were not yet Combat Ready.³⁵ We could only mount seven crews, and of the eight aircraft we could only get seven aircraft—one was in major servicing and would take two weeks to put together again. We were at maximum state by Wednesday or Thursday of that week. The Saturday was the day when it boiled, but I think that we were called in the weekend before.

Moore: Peter, can you remember what happened at Air Ministry in Whitehall over the 26th, 27th and 29th?

Hudson: I was a detached member of the outfit at the time. Apart from the tension, I do not have a firm incident in mind except to say that they were to-ing and fro-ing on QRA. Some people thought that we should have persuaded the Secretary of State to go to Cabinet on that, possibly after discussion with the C-in-C, and they decided not to. The link with Berlin meant that no doubt there was an element in the appreciation that Ministers were making here too. After all, Berlin was the first instance of our nuclear cover being provided for a mature conventional operation. If we had not strengthened our airfields in order to take B-29s³⁶ in 1948, there would have been a lot less confidence in the outcome of the Berlin airlift. Deterrence is deterrence and has a wide-ranging effect.

Moore: We have about 25 minutes left. Can I open the discussion to questions from the floor?³⁷

Alex McFie: The whole point of the programme that you were engaged in was that the Russians should know exactly what you were doing. How far were you aware of how far the Russians actually knew what they were threatened with, if they did engage in some act of war? Deterrence depended on the Russians being thoroughly aware and you are speaking as if it were highly secret. The whole thing depended on Russians knowing exactly what you were doing.

West: You are absolutely right, sir. When I finished my flying time in the Air Force, we were called General Duty Officers, which meant that we did anything else as well. I went into the world of intelligence and it was manifestly obvious to me then that it was important that we leaked information that we wanted the Russians to have. There was no doubt that we were being very closely watched by people who were just strolling past the airfield or taking photographs of the aeroplanes from the perimeter, which a lot of people liked to do anyway. I later learned from references made by a Soviet KGB officer who defected to us, Oleg Gordievsky,³⁸ that they were fully aware of what was going on, which was exactly what we wanted. It is vitally important that knowledge of what we were up to, what we were capable of and what we were prepared to do was part of the deterrent.

Bonnor: I have read it since, rather than knowing about it at the time, that when SAC changed from DEFCON³⁹ 3 to DEFCON 2, it deliberately did not encrypt the message, Possibly Bomber Command did the same, I do not know.

Beetham: In 1956, Khrushchev and Bulganin⁴⁰ visited RAF Marham where there were [eventually] three V-Bomber squadrons.⁴¹ They were given a good look at the station and a reasonable enough briefing of why the bombers were there. It was an attempt. I do not know the length of their visit or where else they went, but I know that they went to Marham in 1956. That was an attempt to show them Britain's determination and resolve.

Professor Peter Hennessy: Given the tension, was there any attempt on that Saturday to seek people who were lurking on the A1 looking for Wittering or on the A15 because there is a British genius for not concealing ourselves? On that Saturday when the bases were closed and Macmillan had insisted on unobtrusiveness, was there any attempt by security people on the bases to move people on the A15 or the A1, or was it part of the deterrence that you did not do that in case Soviet Union disguised, as heaven knows what, ...

Robinson: As far as I know, there was no attempt and, if there had been, it might have come into the category of being rather obtrusive. We occasionally received messages to the effect that there was a Russian [Embassy] car coming out of London and the reaction was to limit the testing of our electronic equipment in the electronic bay. However, I do not think that there was any such attempt on that day, which is why I have always used the words 'evident ability'. We produced evidence of what we were doing and that was a paradox. On the one hand, we were told to be unobtrusive while, on the other hand, it was very obvious to anyone who wanted to see and hear what was going on that they could.

I have recently passed that bit of the A1 and the trees have all grown up. Oddly enough, it is not a bomber station any more, but there would not be such an uninterrupted view of the aircraft. The aircraft were concentrated at the downwind end of the runway, so it must have been fairly evident to anyone who was not watching a football match.

Moore: It is important to be obtrusively unobtrusive.

Connelly: On a normal Vulcan, the bomb bay closed underneath it and nothing could be seen. At Scampton, we were a Blue Steel Squadron. Blue Steel was a stand-off weapon, which weighed 15,000 lbs, which we fired from a distance away from the target. You can see from photographs that that cannot be disguised in any way underneath the aeroplane, especially when the fin is put down. Anyone walking or cycling past the airfield could see immediately what weapon was underneath the aircraft.

Woolven: Last year, I spoke to Squadron Leader Ken Hayes who, during the crisis, commanded a Thor squadron at RAF Feltwell.⁴² That Saturday afternoon he was called in and the first thing that he did on his own initiative was to double the RAF Police patrolling the boundary and he issued them with live ammunition. When his Wing Commander heard what he had done, he rescinded the order because, as the Wing Commander said, they might shoot somebody.

Atkinson: And miss!

Connelly: Before I went into Vulcans, I was on a squadron in Germany on Canberras. It started off as a jolly nice flying club, but half way through the tour it became serious. You had to put a chinagraph mark on the wall saying how many bombs had been dropped and how many times the aircraft had been flown. After we had done that for a few months, the Americans came in and we had to load American tactical nuclear weapons. Although the weapons belonged to the Americans, the aircraft belonged to us. We had on the squadron an American officer with a key round his neck and a revolver. He had the key to the weapon, as did the pilot because if you were to take off on a mission, you both had to turn the key.

We had to change the weapons every 30 days because they were out in the rain. People were frightened that they would get wet. Because I had a key, as did the American officer, we both had to go out together and turn it so that the thing could be downloaded. It was just wheeled to the side of the revetment. It was like a pit, which the aircraft sat in, so it could not be harmed from outside. It was just wheeled to the side while we sat on it and they wheeled the new one in and clipped it on. A big American chap of about 6ft 5in was standing at the entrance with a carbine. I was sitting on the bomb and said jokingly to him one day, 'What would you do if I came out, climbed into the aeroplane, started the engines and took off?' He pulled back the bolt of his carbine and said, 'Look up the chamber, you wouldn't make it!' I could tell by the look in his eyes that I certainly would not have made it.

Bonnor: We were the same. We had very high security on the QRA plane and, whenever a nuclear weapon was loaded on any aircraft on the airfield, each had a dog and giant police handler with it. That is why the Air Force had such a huge number of dogs at that time. They had to work shifts. They were not allowed to work, as we were—24 hours a day. Although they were good enough with their handlers, they were one-man dogs. On occasions, my colleagues had rushed out on an exercise QRA alert to find the dog sitting at the bottom of the stops and no handler in sight so that they could not get into the aeroplane until he came back. He was probably round the back having a smoke or something and had not heard the hooter. However, I assure everyone that they [the armed aircraft] were very well guarded.

West: We were more frightened of the dogs than we were of the Russians!

Alison Appleby: You have made various references to CND. I wondered how you had experienced it. Did you see it as anything more than a nuisance or an irritant, or did you think that it had any chance of changing the public policy? How did it impinge on you? I was interested that you seemed quite annoyed by CND activities.

West: I do not remember CND being particularly active around our airfields. Occasionally it was, but seemed to prefer annoying the Americans [more] than us. I remember on one

occasion when we had to do our crew drills at the OCU at Finningley,⁴³ so that meant a drive up the A1 to get there from our place. I picked up two hitch-hikers who were from Newcastle University. They saw my kit on the back shelf and both announced themselves as passionate supporters of CND. I felt like saying, 'Get out and march then', but I carried on. It really was terribly irritating.

We were not allowed to talk about what we were doing at all. It was very much top secret, but they were coming out frankly with fatuous comments, clearly terribly ill-informed—politically rather than practically informed—and I had to sit there and take it by being a good Samaritan and giving them a lift. I must admit that I was relieved when I reached my destination and said that that was as far as I went. After that, I knew that I would look carefully at any hitch-hikers. We regarded supporters of CND as an ill-informed nuisance, but to be fair they were certainly sincere and well meaning, just ill informed.

Woolven: Sir Michael, Mike Robinson and Roger appeared on a radio programme last year.⁴⁴ On being interviewed on her reaction to the Cuban missile crisis, Pat Arrowsmith said that it was to go to Dublin with her partner then hitch hike to the West Coast of Ireland.⁴⁵ From my time at Scampton, which was from 1964 to 1966, the only manifestation of CND that I remember was that someone inscribed on the bus station outside the main gate, 'Those who live by the sword, die by the sword', which made the *Look North* local television programme. That is all I remember of the CND.

Connelly: If you are in the V-Force, you go to Finningley to learn to fly the aircraft. You are then probably posted to Waddington—I was there for a day—and then probably to Scampton. You go to Coningsby to do simulator training and back to Finningley to pick up your crew. You basically live inside Lincolnshire. I was there for six years and never came across CND at any of the bases.

Beetham: That is right. We were not bothered at all really in Bomber Command by CND. Although Macmillan, as Prime Minister, was worried about marches and noises in London, they were a fringe activity. They were a nuisance activity, but I do not think that they had any influence on the general population, except for being nuisances.

Daniel Sharfe: Was there any capacity to recall you once you had taken off?

Bonnor: Yes, we had a series of code-worded, sealed envelopes. The last one was 8 East. If that code word agreed, it was irrevocable. It almost certainly meant that there was the odd mushroom cloud around south-east England by then, so we could not be recalled. But 8 East is quite a long way over.

Connelly: I am not a navigator, but each degree is 60 miles, so 8 East is $60 \times 8 = 480$ minutes [of longitude].

Woolven: Times the secant of the latitude.⁴⁶

Connolly: I never could find my way around!

Moore: It is the navigators' union at this end.

Robinson: If we had been launched, it would have been under what was called 'positive control' and you did not go just beyond the 'no go' line, somewhere off the Norwegian coast. You did not go further if you had a coded message that you could read as 'do not proceed', but you could also get the one, 'continue going', but you had to get that second message to go further. You cannot do that with a submarine.

Atkinson: The dilemma would be if you did not get a message at all. That would be the problem because, as you realise, there would be a degree of holocaust. Fortunately, the hope that, by the Norwegian coast, we would have a 'go' message or a 'recovery' message, and I think that we might have got it.

Connolly: I'm not an AEO [Air Electronics Officer] either. There is an AEO somewhere around, the radio operator. We had VHF and HF radio and, if one did not work, the chances were that the other would.

Woolven: The BBC Light Programme?⁴⁷ [i.e. on the medium of the long wave broadcasts.]

Connolly: Yes, we could tune into the Light Programme.

West [a former Air Electronics Office]: Radio 2 for the uninitiated.

Professor Lord Hennessy Of Nympsfield: As for Radio 2, could the code word just come up in the middle of *Educating Archie*⁴⁸ or would a newsreader speak? I obviously wondered what the code word was and whether it would just happen in the middle of a normal programme.

Connolly: If my memory serves me right, it was not a code word, as such. It was a bit like internet passwords. It was a series of six [letters]. They had to match.

Hennessy: Six words?

Connolly: Not words, no. It would have been phonetically spelt out, yes.

Hennessy: Otherwise, the scriptwriters of *Educating Archie* included it accidentally.

We were so naïve that we had Peter Brough⁴⁹ as a *radio* ventriloquist!

Atkinson: We also had the Morse key, which is virtually unstoppable. People could not only get it on those frequencies. We had UHF, VHF, *Educating Archie* and all sorts of other things, but basically the aircraft systems were sound. We needed it to come to one of those systems.

West: The reason why we stuck with Morse, which already in 1962 was rather dated, was because it could break through jamming, which would have been very much in evidence.

Beetham: But it was not ever put to the test.

Moore: Well, what an excellent note to finish on. I am sure that the guys will hang around for a few minutes if anyone else has questions for them but, for now, I wish to conclude by saying that we historians are conditioned to think of the Cold War as a cultural phenomenon, but those around the table today were on the front line of the Cold War in the sense that Charlie Chaplin or Alf Ramsey certainly were not.⁵⁰ I would like us all to show our appreciation.

Notes

¹ Clive Richards, 'RAF Bomber Command and the Cuban Missile Crisis, Oct. 1962', *RAF Historical Society Journal*, No. 42 (2008), pp.26-39.

² Proceedings of the RAFHS Seminar, 'The RAF and Nuclear Weapons, 1960-1998', *RAF Historical Society Journal*, No. 26 (2001), pp. 10-104. See: <http://www.rafmuseum.org.uk/research/journals.cfm>.

³ Lord Allen of Abbeydale (Philip Allen, 1912-2007), civil servant. Deputy Under-Secretary of State, Home Office 1960-2; Permanent Under-Secretary of State, Home Office 1966-72.

⁴ Robin Woolven interview with Eric Alley, Civil Defence Officer for Norwich in 1962, on 20 Dec. 2006. Alley again recalled these events in the BBC Radio 4 programme broadcast on 25 Sept. 2008.

⁵ No. 249 Squadron, one of four Canberra light bomber squadrons station at RAF Akrotiri, Cyprus, as part of the UK contribution to the Central Treaty Organisation [CENTO].

⁶ Navigator/Radar – the navigator operating the aircraft Navigation Bombing System, which included the H2S radar.

⁷ In Cambridgeshire. <http://www.raf.mod.uk/rafwittering/>.

⁸ Now the Royal College for Defence Studies, Belgrave Square, London.

⁹ The Ballistic Missile Early Warning System site at Fylingdales in North Yorkshire was visible to the public as three large 'golf ball' geodesic radar domes. The 'golf balls' were demolished and replaced by a Solid State Phased Array in the early 1990s.

¹⁰ Harold Macmillan (1st Earl of Stockton, 1894-1986) Prime Minister (Conservative Party), 1957-63.

¹¹ The Campaign for Nuclear Disarmament (CND). Formed in 1957, advocating unilateral UK nuclear disarmament.

¹² American ballistic missiles deployed in the UK between 1959 and 1963.

¹³ Air Chief Marshal Sir Kenneth ('Bing') Cross (1911-2003). Air Officer Commander-in-Chief, Bomber Command, 1959-63.

¹⁴ The RAF Form 540, the Operations Record Book, is completed monthly by all RAF Commands, Groups, Stations and Squadrons to record operational and administrative occurrences.

¹⁵ British nuclear stand-off missile operational between 1962 and 1970. At the time of the Cuban Missile crisis, the weapon was still being introduced into RAF service.

¹⁶ Exercise Edom was a no-notice readiness exercise called by the Bomber Controller to exercise the QRA crews. Called at roughly 36-hour intervals at any hour of the day or night, the crews responded by driving rapidly to their loaded aircraft and to further respond to the Exercise instructions (cockpit readiness, start engines, taxi or scramble) before the exercise was terminated when the crews reverted to 15 minutes' readiness.

¹⁷ The RAF Museum (formerly The Aerospace Museum) Cosford, adjacent to the Defence College of Aeronautical Training Cosford, and home to the National Cold War Exhibition.

¹⁸ General Thomas S. Powers (1905–70; Commander-in-Chief, Strategic Air Command, 1957–64). Hosted by AVM Stewart Menaul (1915–87), General Powers witnessed a four Vulcan Scramble demonstration at RAF Scampton on 9 Oct. 1962. 5 days earlier, and hosted by AM Cross, General Curtis LeMay (1906–90; Chief of Staff, USAF, 1961–5), had seen a similar four Vulcan demonstration at Scampton.

¹⁹ John F. Kennedy (1917–63), 35th US President, 1961–3.

²⁰ The Boeing B-47 Stratojet was a medium range USAF strategic bomber during the 1950s and 1960s. From 1958, the USAF conducted 21-day deployments of B-47s known as 'Reflex' deployments, with the aircraft operating from RAF Fairford, RAF Brize Norton, RAF Greenham Common, RAF Mildenhall and RAF Upper Heyford.

²¹ The Boeing B-52 Stratofortress was a long-range USAF strategic heavy bomber from the mid-1950s onwards.

²² V-Force crews regularly flew to Omaha, Nebraska, on 'Western Ranger' liaison flights to visit the nearby SAC headquarters and they routinely detached to Cyprus and Goose Bay, Labrador, Canada, to train on low level flights over, respectively, the Libyan Desert and the Canadian tundra.

²³ The RAF Scampton ORB for the month records that the last National Service officer (an Education Officer) to serve at the station was photographed planting a tree commemorating the end of National Service.

²⁴ The U-2 piloted by Major Rudolph Anderson (who posthumously became the first recipient of the US Air Force Cross) was shot down over Cuba by an SA-2 surface-to-air missile on 28 Oct. 1962.

²⁵ Avro Shackleton aircraft were used by the RAF for maritime patrols.

²⁶ RAF Ballykelly (operational 1941–72), County Londonderry, Northern Ireland.

²⁷ Air Chief Marshal Sir Michael Beavis. Flew Vulcan aircraft, Bomber Command, 1958–62.

²⁸ The United States Air Force's Strategic Air Command (SAC) HQ was located at Offutt Air Force Base near Omaha, Nebraska.

²⁹ RAF St Mawgan in Cornwall was one of the 36 'dispersal airfields' across the UK regularly used by Bomber Command to disperse two, three or four aircraft on the 'Operational Readiness Platforms' during readiness exercises.

³⁰ The RAF Form 700 was (and remains) the extensive aircraft servicing log in which technicians

signed that they had completed their servicing, weapon loading and refuelling tasks. The 700 was then signed by the Crew Chief and the aircraft captain, who thus accepted the aircraft until signed over again after the flight.

³¹ See the RAFHS seminar proceeding mentioned in footnote 2 above.

³² The 14th Earl of Home (Sir Alec Douglas-Home (disclaimed peerage, 1963; later Lord Home of the Hirsell) 1903-95), Conservative Foreign Secretary, 1960-3.

³³ Aleksandr Fursenko and Timothy Naftali, *Khrushchev's Cold War: The Inside Story of an American Adversary* (New York: Norton, 2006).

³⁴ A Ballistic Missile Early Warning Site [BMEWS] was constructed near Thule in 1961.

³⁵ Crews were first trained to 'Combat' classification before progressing through the classification system of 'Combat Star', and 'Select'; and, for a very few crews, on to 'Select Star'.

³⁶ Boeing B-29 Superfortress bombers, flown by the USAF, were deployed in the UK during the 1948 Berlin Crisis. They were again deployed to the UK at the time of the Korean War (1950) and some were armed with atomic weapons.

³⁷ Participants from the audience here named and quoted completed appropriate documentation to give consent to their questions and remarks being included in this transcript.

³⁸ Oleg Gordievsky defected to the West in 1985. Participant in the 1997 Moscow Embassy witness seminar. KGB: *Komitet Gosudarstvennoy Bezopasnosti*, Committee of State Security.

³⁹ Defence Readiness Condition – the increase to DEFCON 2 across SAC was broadcast openly and reported worldwide. The increase in Bomber Command Readiness to 15 minutes at 1300 on 27 Oct. was recorded in Nos. 1 and 3 Group Forms 540, but the further increases to Cockpit Readiness (05 minutes) was not.

⁴⁰ Nikolai Bulganin (1895-1971), Soviet Premier, 1955-8.

⁴¹ RAF Marham in Norfolk was home to 207 and 214 Squadrons (Valiants) and 35 and 115 Squadrons (Canberras) when the Soviet leaders visited the UK in April 1956. A third Valiant unit (148 Squadron) formed later in the year, replacing 35 and 115 Squadrons.

⁴² Squadron Leader Hayes commanded No. 77 (Strategic Missile) Squadron. Closed for RAF use in 1963, Feltwell was subsequently employed by the US Air Force for accommodating personnel based at RAF Mildenhall.

⁴³ OCU - Operational Conversion Unit. RAF Finningley, near Doncaster, ceased to be used by the RAF in 1996, and after redevelopment became Robin Hood Doncaster Sheffield Airport (now Doncaster Sheffield Airport).

⁴⁴ The BBC Radio 4 *Document* Programme, produced by Neil George, was broadcast on 25 Sept. 2008. On Robin Woolven's suggestion the document selected as an introduction to the Cuban Missile Crisis was the report by the Chief of the Air Staff made to his fellow chiefs of staff at 14.30 on Saturday, 27 Oct. 1962 [The National Archives, DEFE 32/7, Secretary's Standard File, 1962]. The programme contributors included Sir Michael Beetham, Mr Hudson, AVM Robinson, Wg Cdr West and Sqn Ldrs Atkinson and Woolven from today's seminar as well as Eric Alley, OBE (former Civil Defence Officer at Norwich) and the CND activist, Pat Arrowsmith.

⁴⁵ Pat Arrowsmith, an anti-war activist, was a founder member of CND.

⁴⁶ The distance between degrees of longitude decreases with increasing latitude. Thus the distance between the longitude of the Lincolnshire bomber bases (roughly around the

Greenwich meridian around latitude 53 North) and longitude 08 East is: 8 x 60 minutes at 53 North = 290 nautical miles.

⁴⁷ The BBC's *Light Programme* broadcast what was called 'light' or mainstream radio programmes between 1945 and 1967, when it evolved into BBC Radio 2.

⁴⁸ *Educating Archie* was a series broadcast on the *Light Programme*, featuring the ventriloquist Peter Brough and his dummy 'Archie Andrews'.

⁴⁹ Peter Brough (1916-99). His obituary in *The Guardian* observed: '[he] became nationally famous for proving that a ventriloquist could be highly successful on radio - the one medium in which a ventriloquist's skill would seem to be totally unsuitable.' Mr Brough's brief transition to television was not a success.

⁵⁰ Charlie Chaplin (Sir Charles Chaplin, 1889-1977), comedian and film-maker.
Alf Ramsey (Sir Alfred Ramsey, 1920-99), footballer and football manager.

Selected Chronology of the RAF and the 1962 Cuban Missile Crisis

By Squadron Leader (Retd) Robin Woolven
Institute for Contemporary British History

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew	Occurrences from Other Sources and Survivors' Memories
1959 1 January		Batista government in Cuba overthrown by Fidel Castro - recognised by UK on 7 January.
1961 20 January		John F Kennedy inaugurated as President of US
1961 Mid – August		Berlin wall erected
1961 19 September	AOC-in-C Coastal Command (Sir Edward Chilton) seeks advice from VCAS on including an additional form of precautionary alert. He was advised that '... there was no need for formal Air Ministry authority ... [but] do take such steps as you can to prevent leakage...it is extraordinary how very many crises appear to occur on Fridays – do talk to 'Bing' Cross about avoiding publicity ...' (Air20/11118)	
1962 1 February	RAF Bomber Command adopts Quick Reaction Alert (QRA) posture – one aircraft weapon system and crew per V-bomber squadron at 15 mins readiness. (Air2/16435)	
1962 15 April		Abortive Bay of Pigs invasion of Cuba by Cuban exiles sponsored by the CIA. Of the 5 merchant ships carrying 1,400 Cuban exiles that arrived at the Bay of Pigs, two were sunk, including the ship that was carrying most of the supplies.
1962 July		Mr Khrushchev orders deployment of SAMs in Cuba

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
1962 20-21 September	Exercise MICKY FINN II, a no notice dispersal exercise, in which all units of Bomber Command participated with the exception of the QRA Aircraft, the Canberra OCU, the Tanker Squadrons and No 617 Squadron (on Blue Steel Trials): At the beginning of the exercise, a total of 166 weapon-carrying aircraft were present in Bomber Command. (Various including AIR28/1638)	
1962 3 October	General Curtis Le May (Chief of Staff, USAF) sees a four Vulcan Scramble demonstration at RAF Scampton... (AIR27/2926)	
1962 4 October	AOC-in-C Bomber Command [AM Cross] departed Lyneham in Comet 4 for tour of SAC in USA [route Goose Bay, Offutt, Norton, Vandenberg, Los Angeles, Elgin, Bermuda, Lajes] (AIR24/2720)	
1962 Tuesday 9 October	0930 Cabinet: The Foreign Secretary said that current Russian activities in Cuba had caused intense feeling in the United States. President Kennedy had been placed in a difficult personal position because of the pledges he had given during the Presidential Election and there would be increasing pressure upon him to intervene. ... the Soviet Government were deliberately increasing the scale of Russian activity in Cuba in order to provoke such intervention which they would then use as a pretext for the forcible occupation of West Berlin. CAB128/36 CC(62) 59th Meeting Hosted by AVM Menaul (SASO), General Powers, (Commander SAC), witnessed a four Vulcan Scramble demonstration at RAF Scampton... (AIR27/2926)	
1962 Wednesday 14 October	AOC-in-C Bomber Command returns from his tour of SAC (AIR20/2720)	
1962 Friday 19 October	Sec of State for Air (Hugh Fraser MP) witnessed a four Vulcan Scramble from RAF Scampton (AIR27/2960)	

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
1962 Sunday 21 October	Evening - Prime Minister Harold Macmillan warned by the United States Ambassador to expect a personal message from President Kennedy. This was the first intimation to PM of the chain of events which had led to the imposition of the United States blockade of Cuba.	
1962 Monday 22 October	'A more detailed letter from President Kennedy was received and the US Ambassador provided information, but not in great detail, about the extent of the Soviet build-up. The most disturbing feature of this had been the identification of 21 medium-range ballistic missile sites and eight intermediate-range ballistic missile sites capable between them of covering the whole of the United States. The presence of nuclear warheads in Cuba had not been definitely established.' CAB128/36 CC(62) 61st Meeting	Gen Norstad (SACEUR) continues to push the replacement of medium bombers by ground and submarine launched missiles. On this, his farewell visit to London, he is dined out that evening by PM who warns Norstad of the dangers of mobilisation as seen in August 1914.
1962 Tuesday 23 October	<p>0930. 'HQ 19 Group ordered all [of its] flying to cease. Orders were received to prepare for an immediate squadron (Shackletons, No 201 Sqn) move to the Bahamas, front guns to be fitted, tropical kit to be collected etc. By 1700 hours the last (6th) aircraft was ready and pack ups, war load etc. stored in the aircraft. However, the squadron was held on the ground at six hours readiness until the morning to the 26th. ... once again the situation changed ... and one aircraft of the squadron went to one hour's readiness for operations; the remainder of the squadron at two. The reason for these hectic changes in plans were all caused by the discovery of Russian missiles in Cuba, and the announcement by President Kennedy of a blockade of Cuba. ... Had the squadron been ordered off to Nassau the intention would have been to establish a British presence in the area'. (Air 28/1636)</p> <p>1030 <i>Cabinet</i>: 'The Prime Minister said that in his first message, President Kennedy had reported evidence of the build-up of a Soviet missile capability in Cuba, and had said that on his own responsibility he had decided to prevent any further build-up by sea and to</p>	At the 2001 Seminar, Sir Michael Beetham, (in 1962 Gp Capt Operations at Bomber Command), stated 'As soon as the missile crisis began to develop we got the message from the Government, from Macmillan, that no overt action was to be taken. So, anything that we did decide to do had to be done quietly. We couldn't, for instance, use the BBC to recall people from leave as we would have liked to have done. In fact, we were so successful that nothing ever seemed to appear in the Press, despite the fact that we had generated the entire V-Force to a very high state of readiness. We even put the crews in their cockpits at one stage but basically they were held at 15 minutes' notice'.

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
	<p>demand the removal of this threat to the Western hemisphere. He recognised the seriousness of this step and that action to contain the Cuban situation might have repercussions in Berlin. He had however, felt it essential to demonstrate to the Soviet Government that if they counted on weakness or irresolution, they were mistaken. President Kennedy added that he regretted any lack of consultation, which had been due to the lack of firm evidence of the Soviet capability had come to light only in the preceding week, and he had judged that speed of decision had been essential. He hoped however, that in the further development of the crisis the United States and United Kingdom Governments would act closely together.'</p> <p>CAB128/36 CC(62) 61st Meeting</p> <p>Afternoon: <i>Chiefs of Staffs Meetings with the Secretary of State</i></p> <p>Cuba. 8. The situation arising from the intended American blockade of Cuba was discussed. It was stated that we were likely to support the American resolution in UNO. It was therefore desirable that we should assist the Americans as much as possible ... the Ministry of Transport and British Chamber of Shipping should be able to give considerable assistance ... and could give instructions to British ships to co-operate with the United States authorities.</p> <p>9. Although it would be practicable to reinforce the Caribbean with ships and aircraft (Shackletons) and to integrate them with the U S forces, it was considered that it would be wiser to wait and see what the Russian reactions were likely to be so that they might well start counter-blockades in say Turkey and Norway. Under these circumstances we would require all the force we had available in the European area to deal with such a reaction. ... it would be necessary to ensure that the Americans curbed their naval activities and make sure that they did not molest British shipping ... [and] to deal with questions as to</p>	<p>At the Seminar, Sir Michael Quinlan recalled: 'I was in Tom Pike's office as his Private Secretary at the time of Cuba and I would offer the thought that, in those days, ministers were far less apt to micro-manage affairs than they are today. ... In the 1960s ministers did not expect to be involved in the fine detail. The political guidance was <i>'Nothing overt, please' and the military were largely left to get on with it.</i></p> <p>AVM George Chesworth, (then B Flt Cdr, 201 Sqn) clearly remembers the excitement when all his Shackleton aircraft were fitted with guns, 'we really thought we were going to war'</p>

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
	<p>why the Royal Navy were allowing British merchant ships to be 'pushed around' (DEFE13/212)</p> <p>1730 No 201 Sqn (Shackletons) held at St Mawgan. (Air27/2978 and DEFE13/212)</p>	
<p>1962 Wednesday 24 October</p>	<p><i>Cabinet Defence Committee</i> R A Butler in the Chair. Others attending included: Maudling, Thorneycroft, Carrington, Amery, Profumo and Hugh Fraser. In attendance: Lord Mountbatten (CDS), Adm Sir Caspar John (FSL), Gen Sir Richard Hull (CIGS), MRAF Sir Thomas Pike (CAS) and Sir Charles Cunningham (PUS Home Office) ... [but no mention at all of Cuba in the Minutes]. (CAB131/27)</p>	<p>DEFCON 2 was ordered by SAC and widely publicised.</p> <p>US naval quarantine of Cuba enforced.</p> <p>At the 2001 Seminar, Gp Capt Ian Madelin (Former Head of the Air Historical Branch) stated 'Astonishingly, there was no reference to Cuba at all, and it does not appear anywhere in the subject index for the Committee's minutes of that year. The retained Item 3 was released in 2008 and refers not to Cuba but to 'UK Strategic Assumptions on Civil Emergency Planning'.</p>
<p>1962 Thursday 25 October</p>	<p>1415: <i>Cabinet: Cuba.</i> 'The Foreign Secretary informed the Cabinet of the latest developments in the situation arising from the imposition by the US Government of a partial blockage of Cuba designed to prevent the transport to the island of offensive military equipment. A number of Russian ships had been known to have been carrying military supplies had been diverted or had been ordered to return home. Others believed to have been carrying grain, oil and other civilian supplies were still on course. The US naval commanders were under orders to intercept them using minimum force, but no interceptions had taken place so far. In the Security Council the debate on a US resolution calling for the withdrawal of offensive missiles from Cuba and the dismantling of missile sites under UN supervision had been adjourned in consequence of an intervention by the Acting Secretary General, who had called on President Kennedy and Mr Khrushchev and the Dr Castro, to accept a truce for two or three weeks so that discussions could take place. No replies to the appeal had yet been received.'</p> <p>CAB128/36 CC(62) 62nd Meeting</p>	

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
<p>1962 Friday 26 October</p>	<p>The sole relevant entry in the Bomber Command ORB for October is that for this Friday evening 'Bomber Command Annual Ball – attended by AOCs 1 and 3 Groups and the senior officers of Bomber Command'. (Air24/ 2688)</p> <p>[Comment: The holding of this major social event cannot be taken as evidence of 'normality' as not only did the AOC-in-C have his senior officers on hand at High Wycombe but cancelling the annual ball, a major social event in the locality, would hardly have been an 'unobtrusive' measure].</p>	<p>Wg Cdr Peter West, (then 12 Sqn at RAF Coningsby), remembered 'I was called early morning by RAF Police Cpl at my OMQ (I have 26th Oct in my Log Book). [and next day] we were definitely brought to cockpit readiness.</p> <p>SASO Bomber Command, AVM Menaul, wrote ('Countdown' 1980) that '... as tension mounted, SAC increased its readiness state from alert [defence] condition 3 to 2. Fortunately, Bomber Command Stations ... were able to take certain preliminary measures as a matter of routine, in case the situation got worse. On the evening of 26 October, the C-in-C decided to allow an [allegedly existing but unrecorded] exercise to proceed and to retain the existing readiness state for the time being in Bomber Command...'</p>
<p>1962 Saturday 27 October</p>	<p>1100 CAS (MRAF Sir Thomas Pike) met the Prime Minister at Admiralty House. (DEFE 32/7)</p> <p>1300 HQ 1 Group ORB, Para 11. (Air 25/1703) 'a. As a result of the Cuban crisis and the political situation BCOC initiated Alert Condition 3 (Precautionary Alert) at 1300Z on 27th October. All key personnel were required to remain on station and Operations Room staff to be available at short notice. Although no generation of aircraft was ordered, some preparations were made to ensure rapid generation if necessary. All measures were unobtrusive.</p> <p>1307: HQ 3 Group ORB merely states 'The AOC-in-C declared Alert Condition3 at 1307'. (Air28/1612)</p> <p>1430 CAS reported his meeting to First Sea Lord and CIGS stating 'The Prime Minister had been adamant that he did not consider the time was appropriate for any overt preparatory steps to be taken such as mobilisation. However he did not wish Bomber Command to be alerted although he wished the force to be ready to take the appropriate steps should this become</p>	<p>AVM Menaul: 'In the early hours of Saturday, at about 2 a.m., the C-in-C went to the operations room to discuss the exercises with senior staffthen decided to increase the readiness state of the force, purely as part of the training exercise...'</p> <p>Sqn Ldr Jock Connolly recalled 'At about 1100 on the Saturday a civilian policeman knocked on my caravan door and said that I was required immediately at the squadron [No 617 at RAF Scampton] .. we were there locked in for a few days. We collected our 'go bags' and, after a station briefing, we spent the day on target study and in taking over a loaded aircraft. We spent the next day or so mostly at 15 minutes readiness .. I remember being at cockpit readiness [5 minutes] at one period'.</p> <p>The late ACM Sir John Willis recalled in 2008 'I was captain of a Vulcan B2 crew on IX Squadron at Coningsby ... The whole crisis was most surreal as I was hoping to properly celebrate my 25th birthday on the Saturday, 27th October 1962 but I actually spent the whole time on duty, standing by with my crew in flying suits and ready to go and deliver nuclear weapon on a target in the Soviet Union.</p>

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
	<p>necessary. If the situation deteriorated further, the Prime Minister intended calling a Cabinet Meeting on the next afternoon, however he did not wish the CDS to be brought back to London, since his intention was that matters should be played in as low a key as possible. as a result of his conversation with the Prime Minister, CAS had warned the AOC-in-C Bomber Command that he should be on the alert and that his key personnel should be available on station. There were ten bombers overseas at the moment but he felt that it was not desirable to recall these aircraft at the moment'. (DEFE 32/7)</p> <p>1810 UK <i>Coastal Command Stations</i> 'A Coastal Command State of Vigilance was declared and the [Shackletons and Hastings] squadrons prepared themselves for possible action. Everyone was relieved, however, when the Vigilance was relaxed on 29th October.' [for the Shackleton squadrons, full war loads were fitted] (AIR28/1543)</p>	<p>At the 2001 Seminar, AVM Michael Robinson recalled: 'For me, as a V-Force Squadron Commander [100 Sqn], a peak of the RAF's nuclear story was reached on the afternoon of Saturday 27th October 1962 when all available Victor aircraft and crews at RAF Wittering were brought to cockpit Readiness 05. Each aircraft was loaded with one free-fall thermonuclear weapon, the crews had their Go-Bags with all of the necessary route and target information and authorisation codes. ... we remained in our cockpits for several hours before being ordered to revert to Readiness 15... It had been a long afternoon.</p>
<p>1962 Sunday 28 October</p>	<p>1015 HQ 1 Group ORB 'A recall of aircraft overseas on a <i>Sunspot</i> detachment was ordered by signal at 1015Z on 28th October' [All except one aircraft returned to base 29th October. The remaining aircraft (which was Cat. 3) returned on 1st November]. (Air 25/1703)</p> <p><i>Lunchtime: Senior Ministers lunching with PM hear the BBC news of Mr Khrushchev's statement on his intention to withdraw his missiles.</i></p> <p><i>Afternoon: Chiefs of Staff Meeting with the Minister of Defence. [in place of the planned evening Cabinet Meeting] ... 'CUBA The Minister said that President Kennedy had made it plain on Friday 26th October 1962, that unless he received assurances regarding the disarming of Russian missiles in Cuba, the cessation of further construction work, and a halt to the shipping of further offensive weapons, he would have to consider what</i></p>	<p>AVM Menaul (SASO) later wrote: The Command maintained a high state of readiness throughout Saturday and Sunday, listening to the 'Voice of America' on radio sets in their homes, in offices or in dispersal platforms. ... [on Sunday 28 October].. It was all over. The crisis had passed. The exercise was finished and the C-in-C quietly ordered the force to be relaxed to a lower state of readiness. It is doubtful if more than a handful of people outside Bomber Command had any idea of what had happened.</p>

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
	<p>action should be taken to gain those ends. In the light of this it would have been prudent to consider what precautionary measures the United Kingdom should take; dispersal of the V-Force and possibly even mobilisation represented possible solutions. He had therefore invited the Chiefs of Staff to meet him before his meeting with the Prime Minister later in the evening. In the event tension had eased following Mr Khrushchev's Message to President Kennedy which they had just received, and which, at first sight, appeared to offer the assurances which President Kennedy had demanded. The Minister of Defence did not therefore consider that any immediate precautionary measures were necessary. (DEFE13/212)</p> <p>1547: HQ 1 Group ORB para 11c. An increase in the number of QRA aircraft from 6 to 12 aircraft was ordered by HQBC, to be in effect at 0800Z on 29th. (Air 25/1703)</p> <p><i>RAF Coningsby Station Commander's Remarks in ORB</i> 'The Cuban Crisis made its impact on Coningsby during this month. The station was called upon to take certain precautionary measures to ensure a high state of readiness. As these measures had to be carried out unobtrusively, only some 50 men were called back to duty during the weekend 27th/28th and they succeeded in generating all the station aircraft by midnight on Sunday' (AIR28/1563)</p>	<p>12 (B) Sqn ORB - at Coningsby: 'As a result of the Cuban crisis, the station was brought to Alert Condition 3 on Saturday 27th October. This involved the squadron in providing double its normal Quick Reaction Alert quota of aircraft, and the remaining crews on the squadron moved up to two hours readiness. As the month closed the squadron had generated all of its available aircraft and the aircrew had settled into a workable QRA routine'. Air27/2903</p>
<p>1962 Monday 29 October</p>	<p>0900: QRA force doubled across 1 Group stations. (Air 25/1703)</p> <p>1008 Coastal Command State of Vigilance relaxed.</p> <p>1030: Cabinet: 'The PM said that during the preceding days he had been in close consultation with President Kennedy about the development of the Cuban situation.</p>	<p>There is no references in Home Office files to alerting its 300,00 Civil Defence Corps and, in 2007, Lord (Philip) Allen of Abbeydale (later PUS Home Office) recalled that 'the Cuban</p>

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
	<p>In retrospect it was evident that the President had played his hand with great skill; he had in fact turned the usual Communist methods against themselves by observing to the full the proprieties of international consultation e.g. in the UN, but by showing at the same time an unwavering determination to attain his objective of securing the removal of offensive missiles from Cuba, with the implication that he would not shrink from the use of force in the last resort. He had also dealt effectively with the pressures which had been brought to bear upon him within the US, where a strong body of opinion had been calling for violent measures. President Kennedy had steered a difficult course between being driven into a premature use of force and appearing to waver in his determination'.</p> <p>CAB128/36 CC(62) 63rd Meeting</p>	<p>crisis was treated by Home Office with complete indifference ... I have no recollection of the HO taking any action in response to the rising international crisis in October 1962 we had faith in Lord Harlech at the time - the Government's reaction to the Cuban crisis was the very British one of hoping that it would go away – and it did.</p>
<p>1962 Friday 2 November</p>	<p><i>Revised Operation Order for Exercise Mick issued by HQBC to HQs Nos 1 and 3 Groups</i></p> <p>1. SITUATION Alert Condition 3 of Bomber Command Alert and Readiness Procedures (Aircraft) enables the AOC-in-C Bomber Command, during a period of political tension, to take certain precautionary measures short of the full and specific measures involved in the calling of higher Alert Conditions. <i>Exercise MICK</i> is designed to test, in peacetime, measures to be taken under Alert Condition 3. This may involve the generation of all, or a proportion, of the Force as specified in the exercise alert message. The exercise may be held conjointly with any one of the no-notice readiness exercises for the Missile Force.</p> <p>2. MISSION To exercise the operational readiness of all or a proportion of the Medium Bomber, Reconnaissance and Saceur assigned Forces with measures appropriate to an Alert Condition 3.</p> <p>3. EXECUTION</p> <p><i>Outline Plan.</i> The exercise will be ordered without warning by signal from B C O C.</p> <p><i>Command and Control.</i> Ordered at any time by AOC-in-C ...</p>	

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
	<p><i>Duration</i> at discretion of AOC-in-C ...</p> <p><i>Dispersal</i> Aircraft will not be ordered to disperse. They should be fuelled for take off to dispersal or for operational take off from main base ...</p> <p><i>Readiness States</i> On generation, aircraft are to the readiness state ordered which will normally be Readiness State 15. ... Crews are to be prepared at all times to advance from an Exercise to an Operational Alert Condition/ Readiness State but no exercise measures taken are to prejudice this capability.</p> <p><i>Quick Reaction Alert Force (QRA)</i> The permanent QRA Force are to remain fully operational at their normal Readiness State 15 but are to react on an exercise basis to higher readiness states called under Exercise 'MICK'. The SACEUR assigned QRA aircraft will be exempt from Exercise readiness states higher than Readiness State 05.</p> <p><i>Armament:</i> Live weapons are to be loaded ... and are to remain on the aircraft for the duration of the exercise. ...</p> <p>This Operation Order is effective immediately .. (Air2/16435).</p>	
<p>1962 Monday 5 November</p>	<p>0909: HQ 1 Group ORB 'Alert Condition 3 was cancelled.' (Air 25/1703)</p>	
<p>1962 Tuesday 6 November</p>	<p>1030 <i>Cabinet ... Cuba. The Foreign Secretary</i> said that the dismantling and withdrawal of Soviet missiles from Cuba appeared to be proceeding smoothly. It had been accepted that the International Red Cross should exercise some form of general supervision over this process. CAB128/36 CC(62) 66th Meeting</p>	
<p>1962 14 / 15 November</p>	<p><i>C-in-C Bomber Command's Conference</i> held at RAF North Luffenham, was attended by C-in-C, SASO, AOA, STSO, AOCs 1 and 3 Gp, their SASOs, Cmndt CRE, 5 other Air Cdres, 36 Gp Cpts, 27 Wg Cdrs (including 20 Sqn Cdrs) and 2 Civilian Officers (C Res O and CE HQBC) 'In his review of the events of the past year, AOC-in-C said that on the Operational side, the introduction of QRA on 1st February had led</p>	

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
	<p>to an integration with SAC rather than mere co-ordination. During the year, Operational Readiness Platforms had become available and by the end of 1963 there will be ORPs for 100 aircraft at 36 airfields. Medium Bombers now carried Yellow Sun Mk II, whilst Blue Steel would be in service at Scampton in December, it was depressing to note that Victor Blue Steel programmes had slipped some 6 to 9 months. Valiants in the low level role would be fully operational by March 1963.</p> <p>Turning to the Cuban Crisis, AOC-in-C said that it had been amply demonstrated that what really counted was the number of aircraft at readiness. SAC maintained a 50% readiness and although it was unlikely that Bomber Command could achieve this figure there ought to be a method by which the percentage of aircraft at readiness on main bases could be changed as necessary. With this in mind, 'Exercise MICK' had been redesigned so that readiness percentages could be changed unobtrusively. [see above Friday 2 November]</p> <p>Speaking about <i>Thor</i>, the AOC-in-C said that the Cuban crisis had really shown the value of this missile; without visible change 59 of the 60 missiles had been made serviceable simply by use of the telephone. It was regrettable that, starting on 1st April 1963, <i>Thor</i> was to be withdrawn.</p> <p>As to the future, the AOC-in-C regarded it as inevitable that there would be a progressive increase in the readiness state over the years to come, but he thought that whatever was done in the years before <i>Skybolt</i> arrived would be against an unfavourable financial background.' (Air2/16435)</p>	<p>The experienced Vulcan pilot (now a retired Air Commodore) who took the conference minutes recalled that, as an Air Staff Officer at HQBC and not on the Operations Staff, he 'was not aware of what the Ops people were doing down the hole during the crisis'.</p> <p>[The next <i>Exercise MICK</i> (increased alert states with aircraft remaining on main bases and not dispersing) was called on 11 December]. (Various sources including AIR28/1563)</p>
1962 20 November		US naval blockade of Cuba lifted.
1962 30 November	Letter from AOC-in-C to CAS 'The phase out of <i>Thor</i> commencing in April 1963 will progressively reduce the number of	

Date	Occurrences as Recorded in Official Papers held at The National Archives of the UK, Kew (cont'd)	Occurrences from Other Sources and Survivors' Memories (cont'd)
	<p>weapons systems normally held at immediate readiness (15 minutes) from 68 (54 <i>Thor</i> and 14 aircraft), unless measures are taken to increase the number of aircraft at immediate readiness in the meantime ... I think you will agree that in the deterrent role it is systems at readiness that count, and if this needed emphasising then undoubtedly the Cuba crisis did it. We have therefore been examining ways and means of increasing the number of aircraft at readiness as from next April ... I will shortly be submitting proposals to the Air Ministry ...' (Air2/16435)</p> <p>Follow up letter from AOC-in-C BC to CAS, 10 January 1963: Detailed studies have now been completed and from April 1st I propose increasing the QRA force to 17 Victors and Vulcans (plus the four Valiants of the SACEUR force) raising to 20 Victors and Vulcans from 1st July when the Blue Steel squadrons will be able to make their contribution. This plan will enable me to maintain approximately 20 per cent of the force at permanent readiness and will go some way to compensate for the run-down of the Thor. (Air2/16435)</p>	<p>In reply to AOC-in-C Bomber Command's proposal to increase the QRA (force), ACAS (Ops) (Smallwood) wrote on 10 June 1963 'VCAS decided that for the time being, no further action should be taken on this matter and that the QRA arrangements written for the V-force should remain as currently planned.' (Air2/16435)</p>

Bomber Command and the Cuban Missile Crisis: At the Brink of Armageddon?

In its original form this article was first published in the RAF Historical Society Journal, 2011 and in its revision Professor Scott has drawn on his published work in *An International History of the Cuban Missile Crisis: A 50-year Retrospective*, 2014.

By Professor Len Scott

Biography: Len Scott is Emeritus Professor of International History and Intelligence Studies at Aberystwyth University. He is a Fellow of the Royal Historical Society and a Fellow of the Learned Society of Wales.

Abstract: In October 1962, the world stood on the brink of nuclear war. This article examines the role of nuclear weapons in the crisis and how new evidence and interpretation has changed our understanding of both high-level political decision-making and the actions of subordinate commanders. The risk of inadvertent nuclear war, arising from incidents at the tactical level, is assessed. The analysis provides context for studying British nuclear preparations. In 1962, the UK could attack the USSR with a nuclear force comparable to that with which the Soviets could attack the USA. The role of Bomber Command is scrutinised, and the significance of its activities and the UK's nuclear deterrent are explored.

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Introduction

The Cuban missile crisis was the closest that the world has come to Armageddon. In October 1962 the prospect of cataclysmic nuclear war was very real.

Unsurprisingly, the crisis remains one of the most intensively studied events in modern history. Equally unsurprising, the role of nuclear weapons looms large in such enquiries. Historians nevertheless disagree on key issues and many questions about the risk of nuclear war cannot be answered beyond informed speculation.

This essay provides context for the study of nuclear weapons in the crisis and explores the British role. There were three nuclear weapons-states in October 1962: the USA, the USSR and the UK. The RAF's Bomber Command, which at that time served as the principal component of the UK's nuclear forces, posed a threat to the Soviet Union comparable to the threat that the Soviets posed to the United States. While Washington and Moscow were self-evidently the key players in October 1962, the role of the British government and the activities of Bomber Command raise interesting issues for students of the crisis as well as for students of British nuclear weapons.

Debate remains about why Khrushchev decided to deploy Medium Range and Intermediate Range Ballistic Missiles (MRBMs and IRBMs) in Cuba. When the MRBMs were discovered there was immediate discussion within the Kennedy administration about their significance. The US Joint Chiefs of Staff believed that the Soviet deployment would have a significant effect on the strategic nuclear balance. Whitehall reached a similar assessment. Defense Secretary McNamara, however, believed that they would have no affect whatever on the nuclear balance. McGeorge Bundy, then Kennedy's Assistant for National Security, later recalled that the majority of JFK's senior advisers agreed with McNamara, whose analysis reflected the potency of Soviet InterContinental Ballistic Missiles (ICBMs) and long-range bombers to target mainland America.

Yet the nuclear equations of the Cold War were not simple matters of military arithmetic. A successful Soviet deployment in Cuba would have marked a considerable political victory for Khrushchev. The implications for the Cold War were potentially enormous, in particular in relation to West Berlin. Kennedy and Macmillan were deeply exercised over whether Khrushchev's ambitions ultimately lay in Berlin and historians continue to debate whether this was one of his objectives.

Had Khrushchev succeeded in Cuba the implications for NATO could have been extremely serious. If, bolstered by a political victory in Cuba, the Soviets had moved on West Berlin, JFK would have faced a new crisis of much greater proportions. The American commitment to West Berlin was much more problematic than the Soviet relationship with Cuba. The foundation of NATO was that an attack upon one was an attack upon all – its enduring Article 5 commitment to collective defence. The American 'extended deterrence' that lay at the heart of NATO strategy represented both an enormous commitment and a huge risk once the Soviets could strike the United States with nuclear weapons.

The more immediate threat of war created by the Soviet missiles was that their mere presence could provoke an American attack. Indeed, Kennedy's initial response, on 16 October, was that military action was necessary. JFK's subsequent choice of a partial naval blockade (or 'quarantine') was communicated to key NATO allies and then announced to the world on 22 October. The President had been briefed that an air strike would destroy 90% of known missiles, which would risk leaving some means of Soviet retaliation from Cuba intact. No evidence has emerged of any consideration in Washington of using nuclear weapons against the Soviet missiles to prevent such retaliation. The Joint Chiefs consistently advocated military action against Cuba, yet they did not suggest using nuclear weapons pre-emptively (or preventively) against the MRBMs.

What if Soviet missiles had been fired at the United States? In his televised speech of 22 October, Kennedy threatened 'a full retaliatory response' if any missiles were launched from Cuba against the US (or indeed other countries). In retrospect, however, McNamara dismissed the idea that JFK would have acted in this way and suggested that any response would have only involved 'one, two or maybe ten - something like that' (Blight and Welch 1989: 195).

The most obvious risk of escalation lay in Europe, which Kennedy recognised even as he decided to mount a blockade. West Berlin was the principal concern. The 1961 Berlin crisis had brought home the stark options available to the President if conflict broke out. Kennedy like Macmillan recognised that Berlin was militarily indefensible. If the Soviets had moved on West Berlin, Kennedy would face the choice between watching NATO disintegrate and crossing the nuclear threshold.

Questions of whether, or how, either Kennedy or Khrushchev would have used force are as speculative as they are necessary in exploring the risk of war. There remains debate about whether Kennedy would have resorted to military action against Cuba if diplomacy had not succeeded, though many are persuaded that the President would have 'gone the extra mile for peace'. The closer political leaders neared the brink, the more determined they were to draw back. It is now evident that Khrushchev was also increasingly determined to avoid escalation, and, for example, angrily dismissed the suggestion that Moscow should retaliate against West Berlin in response to the blockade of Cuba.

Macmillan travelled a similar trajectory. At the start of the crisis he was minded to recommend an invasion. By 24 October, when Kennedy asked his advice, the Prime Minister counselled diplomacy not force. On 22 October, he had told General Norstad, the Supreme Allied Commander Europe (SACEUR), that mobilisation sometimes caused war. Norstad shared his concerns. The Prime Minister was strongly opposed to taking action in Europe that risked the equivalent of August 1914. At the same time he supported the mobilisation of American forces for an invasion of Cuba as an appropriate instrument of crisis management.

Under what circumstances would political leaders have seriously considered initiating nuclear attacks against the territory of their adversaries? In 1961 Kennedy sought advice from the Joint Chiefs on the feasibility of a first strike against the USSR. Nikita Khrushchev used nuclear threats to bluster and to signal Soviet commitment to Cuba's security. Yet neither contingency planning nor political hyperbole reflected how the two leaders saw the prospect of nuclear war, especially as that prospect grew tangible. For some students of the crisis this reinforces the view that the events of October 1962 were not as dangerous as believed and that mutual restraint was the sturdy twin of mutual devastation.

Tripping Over the Brink

Yet if the risk of a political decision to initiate nuclear war diminished during the crisis, we now know much more about events and incidents at the operational level, including the command and control of nuclear weapons. In the 1990s, new studies examined problems in US command and control, and critically evaluated organisational safety in the American nuclear state (Sagan 1993). Revelations about Soviet tactical nuclear deployments in and around Cuba also appeared (Blight, Allyn and Welch 1993; Gribkov and Smith 1994). Unbeknownst to US intelligence, the Soviets deployed some one hundred tactical nuclear weapons in Cuba. Subsequently, it became known that, as the crisis reached its climax, Soviet nuclear-armed cruise missiles (which American intelligence had failed to recognise) were moved to firing positions within range of the US naval base at Guantanamo Bay (Dobbs 2008).

Assessing the risk that tactical nuclear weapons would be used against an American invasion begs questions about authority to use them and whether they could have been used without authority (as well as whether they would have survived an American attack). Khrushchev did consider giving his commanders in Cuba pre-delegated authority to use tactical nuclear weapons, but eventually decided against. As the crisis progressed he became increasingly exercised about the Soviet military. The decision of subordinate commanders in Cuba to shoot down a USAF U-2 on 27 October reinforced his concern that their action could precipitate disaster.

The fortieth anniversary of the crisis in 2002 also revealed dramatic events concerning deployment of Soviet Project 641 (NATO designation: Foxtrot) diesel-electric submarines (Burr and Blanton 2002; Savranskaya 2005). Each carried a nuclear torpedo with an explosive yield of 15 kilotons, equivalent to the bomb that destroyed Hiroshima. Testimony from Soviet submariners suggested that, on at least one boat, the captain may have considered firing his nuclear torpedo at American warships that were dropping hand grenades and practice depth charges to persuade him to surface.

When that procedure was approved by President Kennedy on 24 October, no-one considered that the submarines might be carrying nuclear ordnance. Kennedy and McNamara were both greatly exercised about the need for political control over military forces. McNamara was clear that any action should be designed as a means of communication with the Soviets.

Yet some Soviet submariners were unaware of the signalling procedures and believed they were under attack.

Much has been made of how Kennedy's own wartime experience equipped him to understand the proclivity of military organisations to malfunction. Yet, here, Kennedy and McNamara set in motion a train of events that could have led to inadvertent nuclear war. The incident that may have generated the greatest risk of nuclear use in October 1962 may also provide the best example of the huge gap between political leaders and those who actually operated nuclear weapons. Here, as in other episodes in October 1962, crisis management looks like a dangerous oxymoron.

Siberian Skies

One of the most potentially dangerous moments came on 27 October when an Alaskan-based USAF U-2, sampling the atmosphere for radio-active debris from Soviet nuclear tests, strayed off course into Soviet air space. There was fear in Washington that Moscow might mistake this as reconnaissance ahead of a nuclear first strike and decide to launch their ICBMs pre-emptively. It is unknown whether the Pentagon took this risk seriously and considered 'pre-empting pre-emption'.

Scott Sagan identified a more immediate risk, arising from the fact that, as Soviet MiGs scrambled to shoot down the U-2, US F-102 fighters took off to defend the aircraft (Sagan 1993: 135-42). Unbeknownst to political leaders in Washington, the prevailing DEFCON alert state meant that the Alaskan-based fighters were armed with air-to-air missiles with sub-kiloton yield nuclear warheads. Sagan maps out five scenarios in which the nuclear threshold might have been crossed.

Khrushchev was greatly worried by the straying U-2 and raised it directly with Kennedy. It has been suggested that the Soviet leader was advised by his generals that the aircraft could be on pre-strike reconnaissance (Lebow and Stein 1994: 139-40). If there was a risk that the Soviets might 'use rather than lose' their limited numbers of ICBMs by launching pre-emptively in the face of what they erroneously believed was an American first strike, then this was the moment when decision-makers came closest to using nuclear weapons against the mainland of their adversary. How seriously Khrushchev considered such a decision is unknown. Had the Soviets launched their ICBMs on the mistaken assumption that they were about to come under nuclear attack, this would have been the ultimate intelligence failure.

Assessing Nuclear Risks

There are those who believe that the 1961 Berlin crisis was more dangerous than the 1962 Cuban crisis and that American regional superiority in the Caribbean mixed with strategic nuclear superiority meant the risk of war was nugatory. At root, this is an argument that American deterrence was robust and successful. It resonates with the view expressed directly to Kennedy by the Chief of the US Air Staff, General Curtis Le May on 19 October, that if

Kennedy moved against Cuba (as Le May wanted), Khrushchev would not act against Berlin through fear of an American nuclear response. How we assess Le May's views now that we have a clearer understanding of Khrushchev's desire to avoid war and his willingness to retreat over Cuba is an interesting issue.

The foundation of what became known as 'mutually assured destruction' was that it could never be rational to strike at the adversary knowing that retaliation was certain. Yet questions remain about whether an American nuclear first strike in 1962 could have crippled the Soviet capacity for retaliation against the United States (though Soviet bombardment of Western Europe would have been far more assured and utterly devastating).

The argument that mutual deterrence prevented war is persuasive for some. Other factors, however, need consideration. First, political leaders drew back from conflict as they found time to manoeuvre and empathize. Time and political space were potentially crucial. If JFK had believed that a decision was necessary on 16 October, for example, military action could well have ensued.

Second, not all political leaders were deterred by the prospect of nuclear war. As the crisis reached its climax on 27 October, a message from Castro to Khrushchev was interpreted as a call for a pre-emptive nuclear attack on the United States. And in 1992 Fidel Castro declared that if he had had control of tactical nuclear weapons he would have used them, even if this invited annihilation of Cuba. Castro's statement seems reckless, if not irrational, in retrospective, and raises worrying questions about how some leaders (and their followers) see national sacrifice in pursuit of ideological causes – it is an issue that has contemporary resonance. Yet initiating nuclear attacks in a conventional conflict remained at the heart of NATO strategy during the Cold War, and certainly underpinned America's commitment to its European allies in 1962.

Third, and most important, is that the risk of nuclear use in 1962 most likely arose from the decisions of subordinate commanders. Scenarios in which the nuclear threshold could have been crossed are, as discussed above, readily imaginable.

Fourth, while nuclear deterrence may have helped resolve the crisis, nuclear deterrence (or at least the deployments, force structures and perceptions of capabilities) helped create the crisis. Soviet strategic inferiority (and American realisation of Soviet strategic inferiority) was clearly a key factor in Khrushchev's decision to throw his hedgehog into Uncle Sam's pants, as he put it. The dynamics of the nuclear relationship between East and West (and, of course, Khrushchev's 'hell of a gamble' as Kennedy described it) helped generate the missile crisis.

Yet it is also worth noting that assessment of the risk of nuclear war in 1962 often takes escalation to a global strategic exchange for granted. But would escalation have inexorably followed? Was the nuclear threshold a Rubicon? Any answer is speculative but nevertheless necessary in assessing risks or drawing lessons.

When lethal force was used in the crisis - when a U-2 was shot down over Cuba on 27 October - Kennedy held back retaliation against Soviet surface-to-air missiles sites. If nuclear weapons had been used by subordinate commanders would there have been a similar response? Imagining a world beyond the nuclear threshold is difficult. Proportionate and discriminate responses would have depended on assessments of what had happened and why. Yet the trajectory of Kennedy's and Khrushchev's behaviour surely points to what would have been desperate attempts to prevent Armageddon, even as the risks of escalation grew.

So where does the third nuclear-weapons state fit into these contexts? The British Defence Secretary at the time, Peter Thorneycroft, later opined that Britain had been nothing more than a 'bystander at the brink' (in contrast to the view of Harold Macmillan). There remain gaps in our knowledge about a range of issues, including the roles of the Royal Navy and of British tactical and theatre nuclear deployments in Europe. Some archival disclosure and testimony from former members of Bomber Command nevertheless provide fascinating insights that generate important questions.

By 1962 the relationship between the USAF's Strategic Air Command (SAC) and Bomber Command was an intimate one, encompassing co-ordinated targeting, the dual-key Thor IRBM deployment, integrated Quick Reaction Alert (QRA), and the provision of American nuclear weapons for British bombers (Twigge and Scott 2000). The pattern of communications between SAC and Bomber Command remains unclear; Air Marshal Cross, Commander-in-Chief (C-in-C) of Bomber Command, revealed, for example, that SAC made no attempt to contact him during the crisis (Madelin 1995: 223-5). It is known, though, that 24 SACEUR-assigned Valiants at RAF Marham were loaded with American Mark V weapons (at variance with the constitutional proprieties of US custodial requirements).

By 27 October, 59 of the 60 Thors, deployed under dual-key UK-US control, were at 15 minutes' readiness. So too were 37 of the 45 Jupiter IRBMs in Turkey and Italy. In practice, the Thors could be launched within 13-14 minutes of the order to fire, although there is evidence that a number of missiles were erected at "Phase-2 hold" of "T minus 8" (Wilson 2008; Scott and Twigge 2000; Wilson 2012). The V-bomber force had an estimated 120 Valiants, Vulcans and Victors available for combat readiness in October 1962, which were moved to higher alert states during the crisis.

Black Saturday

Saturday 27th October 1962 was almost certainly the day when the world has been closest to nuclear war. In Washington, Kennedy grappled to find a diplomatic solution as Khrushchev upped the ante by demanding withdrawal of Jupiter IRBMs from Turkey and as news arrived that the U-2 had been shot down over Cuba. As noted above, another U-2 had strayed into Soviet air-space, American warships dropped explosive devices on nuclear-armed Soviet submarines, Soviet nuclear-armed cruise missiles were forward-deployed within range of Guantanamo Bay and nuclear warheads arrived at one of the MRBM sites. American forces world-wide stood at DEFCON-3 and SAC was at the unprecedented state of DEFCON-2, with

66 B-52s on airborne alert. At the height of its deployment, the US had nearly 1,500 SAC bombers and some 300 Intercontinental and Submarine Launched Ballistic Missiles combat-ready, as well as a panoply of over 4,000 other nuclear weapons including those on aircraft carriers and across NATO Europe.

Harold Macmillan remained opposed to any military action that risked escalation. At 11 am on Saturday 27 October, he summoned the Chief of the Air Staff, Sir Thomas Pike, and was adamant that overt preparations should be avoided. 'He did not wish Bomber Command to be alerted, although he wished the force to be ready to take appropriate steps should this become necessary.' (Scott 1999, 146). What Macmillan understood of Bomber Command's alert and readiness states and what he knew of its subsequent actions remain unclear.

The Chief of the Air Staff subsequently contacted C-in-C Bomber Command and then, at 2.30pm, briefed the other Chiefs of Staff on his meeting with the Prime Minister. At 1pm Cross had ordered Alert Condition 3, the Precautionary Alert state. This involved unobtrusive measures and did not include dispersal of the V-force. By contrast, in the United States SAC B-47 bombers (and nuclear-armed interceptors) were dispersed at the outset of the crisis. The whole of the V-force was brought to a state of fifteen-minute readiness.

Cross' actions were within the scope of his authority and consistent with the Prime Minister's wishes. At some point, however, on the afternoon of 27 October Bomber Command moved to '05 Cockpit Readiness', which ensured that the aircraft would be airborne within five minutes of being ordered to start their engines (Woolven 2014). This was maintained during the afternoon of 27 October.

As the Cuban missile crisis reached its climax, Macmillan and his senior colleagues considered what action to take. The Prime Minister later described 'the frightful desire to do something' (Macmillan 1973: 216). He decided on a diplomatic initiative that would offer to 'immobilise' the Thors to help Kennedy's negotiations with Khrushchev. Macmillan was unaware that Kennedy secretly offered Khrushchev to remove the Jupiter missiles from Turkey after the Cuban crisis was resolved, providing that NATO learned nothing about the arrangement. In fact, Khrushchev had already decided to withdraw and told the Presidium on Sunday 28 October that, 'in order to save the world, we must retreat' (Fursenko and Naftali 1997: 284).

On Sunday morning, Moscow Radio broadcast Khrushchev's declaration that the missiles would be withdrawn in return for American assurances not to invade Cuba. In Washington there was huge relief, save amongst the Joint Chiefs who continued to argue for invasion until there was irrefutable evidence of the removal of the missiles. SAC remained at DEFCON-2 until 20 November when formal diplomatic agreement with Moscow was reached (Bomber Command remaining at Alert Condition 3 until 5 November). As political leaders digested the diplomatic breakthrough, there was no attempt to reinstitute 05 Readiness, although on Sunday afternoon it was decided to increase the number of bombers on Quick Reaction Alert the following morning.

Various issues await further clarification though some questions will almost certainly remain unanswered. First, were senior ministers (and particularly the Prime Minister) fully cognisant of what the RAF was doing? The decision not to disperse the V-bombers (which greatly exercised Bomber Command) complied with Macmillan's wishes to avoid any overt action.

In normal peacetime conditions, 65% of the Thors and one V-bomber in each squadron on QRA were kept at fifteen minutes' readiness. Alert Condition 3 therefore only changed the numbers involved, not the configuration of the bombers and missiles. Cockpit Readiness, however, was more problematic, as was erection of Thor missiles that could presumably have been observed by Soviet base-watchers (assuming these were in place).

The more important question is how the Soviets saw British action. Here we know very little. Yevgeny Ivanov, erstwhile Soviet military attaché and military intelligence officer in the London embassy in 1962, provided an amusing vignette of when he claimed to have secretly toured British and American bases and saw, 'pilots mindlessly drinking beer and flirting with local girls. I did not detect any alarming signals, and duly reported this to Moscow Centre' (Ivanov 1992: 147).

We do not know what Soviet intelligence picked up during the crisis. Nor do we know how information was evaluated back in Moscow. More broadly, our understanding of Soviet threat perceptions during the Cold War remains one of the principal aspects of the Cold War where our knowledge and understanding is severely limited. In September, Bomber Command conducted a major training exercise that included dispersal of the V-force. If Moscow had sound intelligence on Exercise 'MICKY FINN' they should have better understood that Bomber Command's actions in October 1962 did not signal preparation for war.

We do not know how Moscow assessed the relationship between the British and American air forces, or command and control arrangements such as the dual-key system on the Thors. At the diplomatic level, Khrushchev made no attempt to raise the Thors with either London or Washington at a time when the Jupiters in Turkey were a major issue in the denouement of the crisis.

One important rationale for a British nuclear deterrent, articulated later in the 1960s, was that a second centre of decision-making within NATO could be an additional deterrent to Moscow. There is simply no evidence from 1962 on which adjudication of this idea can be made. Likewise, it is impossible to assess how far, or indeed whether, Moscow considered the notion that Britain might use its nuclear forces when the Americans did not. What if JFK foreswore nuclear retaliation against a Soviet seizure of West Berlin? Robert McNamara stated in 1983 that his advice to President Kennedy (and later to President Johnson) was that they should, 'never initiate, under any circumstances, the use of nuclear weapons': an extraordinary statement that undermined the central foundation of NATO strategy (McNamara 1983: 79).

If Kennedy chose humiliation rather than holocaust over Berlin, would Macmillan have chosen differently? Was the security of West Berlin and the cohesion of NATO more of a vital

national interest for the British than it was for the US and one that was worth inviting nuclear annihilation?

Conclusion

Had war come in 1962, the United Kingdom would have been in the front-line of nuclear warfare. Whatever the relative Soviet inferiority in strategic forces (which nevertheless amounted to an estimated 42 ICBMs and 160 strategic bombers), they possessed a formidable panoply of nuclear-armed bombers, MRBMs, IRBMs and sea-based weapons that could have wrought devastation on the UK and Western Europe (Norris 2012). What role, militarily and politically, Britain might have played in American counsels of war had diplomacy failed, is a speculative question of considerable importance in debates about the special relationship and about Britain's nuclear weapons.

The argument that deterrence came close to failing, and that there was a largely unrecognised risk of inadvertent nuclear war has grown over the last two decades as the focus of inquiry has extended to operational and organizational levels. Assessing nuclear risks in 1962 involves delving deep into the minds of political leaders to understand how they would sanction the use of weapons of mass destruction on an all but unimaginable scale. Global nuclear war in October 1962 would have killed scores, if not hundreds of millions. Indeed, if theories about the climatic effects of nuclear attacks on cities are correct, life itself could have been extinguished across the northern hemisphere.

The lesson that the best way to manage a nuclear crisis is to avoid having one and that unfettered competition in nuclear armaments breeds mutual insecurity were obvious lessons to draw from October 1962. Subsequent increases in the number of nuclear weapon-states and the continuing (and in places growing) political instability in which future crises may occur raise the fear that reason and, and more importantly, luck will not serve humankind as well as they did in October 1962.

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Section 3:

Air and space power as current and future instruments of deterrence

Deterrence at Distance: Air Power and Conventional Deterrence in the Emerging Global Environment

By Squadron Leader Stu Patton

Biography: Squadron Leader Stu Patton is a tactical air transport pilot who is currently serving as the Executive Officer on LXX Squadron, the RAF's first frontline A400M Squadron. He has completed operational tours in Iraq, Afghanistan and Libya, and holds an MA in Air Power in the Modern World from King's College, London.

Abstract: Successful deterrence offers the compelling promise of strategic effect with minimal recourse to the application of hard force. With Western actors eager to retain global influence despite resource constraints and a diversifying threat, this article seeks to examine the role of air power in achieving strategic deterrence through conventional means. Squadron Leader Patton explores deterrence theory, identifies the role of air power in the evolution of deterrence concepts and considers the influence of air power on modern actors, including the challenges presented by hybrid warfare and anti-access strategies.

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Introduction

‘Defence and protection start with deterrence, which has long been, and remains, at the heart of the UK’s national security policy...We will use the full spectrum of our capabilities to deter adversaries and to deny them opportunities to attack us.’¹

- National Security Strategy and Strategic Defence and Security Review 2015

The 2015 National Security Strategy asserts Britain’s enduring intent to pursue a role as a figure of political and economic influence in the world, and presents deterrence as an integral component of defence policy. Such aspirations reflect the economic realities of a small yet ambitious nation: potentially cheap in blood and lost treasure, deterrence offers the compelling promise of strategic influence with minimal recourse to the application of hard power. This approach appears all the more appealing in light of emerging global trends, with fundamentalist-driven instability and a resurgent Russia offering little succour to the resource-constrained strategist. These developments, alongside the rising nuclear capabilities of North Korea, have placed western deterrent capabilities into sharp focus. Away from direct threats to national sovereignty, the inherent limitations of a nuclear deterrent to nuclear proliferation have been reaffirmed, and the requirement for flexible conventional deterrent capabilities have been emphasised.

As the hard edge of such strategies, Britain’s armed forces are integral to its deterrent ambitions. However, after more than a decade of intensive counter-insurgency and stabilisation operations in the Middle East, UK military capability has become heavily tailored towards meeting the demands of recent conflicts. Air power has not been immune to this: the operational imperative has frequently shaped both procurement and the in-service development of air power capabilities. In the aftermath of the Afghanistan withdrawal, UK Defence faces a diversifying threat against a backdrop of global austerity, with demands for a rapid, flexible and global response capability despite limited resource placing a firm emphasis on air power and conventional deterrence. Accordingly, the ability of modern air power to deliver deterrent effect merits further examination.

This paper examines the extent to which air power can contribute to conventional deterrence in the emerging global environment. It begins by establishing a definition for conventional deterrence, before examining deterrence theory and the key concepts of capability, credibility and communication, and the challenge of rationality on deterrent actions. The relevance of air power in deterrence is then outlined, situating air power within deterrence activities and exploring its role in the evolution of modern deterrence concepts. This forms a baseline for discussion of future challenges to conventional deterrence, and air power’s roles within such a capability. Air power’s contribution to conventional deterrence is then examined to identify enduring themes for deterrence activity today, and to critically examine the challenges faced by the UK and her allies in conducting conventional deterrence in the modern world. This will initially focus on technology and deterrent capability, exploring the revolutionary potential demonstrated by air power during the 1991 Gulf War and its consequences for the subsequent

deterrence of Iraq. Finally, the implications for conventional air power's ability to deter modern actors are considered. It is contended that air power is fundamental to achieving global influence with limited resource. Advancing technology increases air power's ability to threaten at reduced risk and increased range, particularly when applied in concert with land and naval forces, but there are significant air power constraints and geopolitical frictions that limit the feasibility of translating such military threats into effective deterrent outcomes.

Conventional Deterrence

Although well explored in deterrence literature, it is worth outlining the fundamental concepts of deterrence and to identify key issues facing deterrence strategies. Freedman suggests that deterrence is an influence activity and a subset of coercion; it concerns the maintenance of inaction and the *status quo* through the generation of fear in an adversary.² More specifically, it is the art of threatening an actor – the 'deterree' – to dissuade them from a course of action they would otherwise wish to pursue through the manipulation of their cost-benefit analysis and decision-making processes. These threats may be targeted to a particular situation and actor – specific deterrence – or they may equally reflect stated policies, capabilities and behaviours intended to influence the routine decision-making of others, with this latter approach representing general deterrence. The effectiveness of either approach is tied to two fundamental principles. First, that deterrence can only succeed when an actor chooses to be deterred, rendering the objective nature of the threat secondary to its perception by the deterree. Moreover, that deterrent success is by its nature difficult to measure, as the desired inaction may be falsely attributed to effective deterrence when in fact wider or externally invisible forces are influencing the deterree.³ It is also evident that the concept of conventional deterrence is tied to the capabilities of the threatening actor. For nuclear nations, the term inherently implies a degree of restraint and limited commitment, while for actors without access to nuclear capabilities, conventional deterrence represents the highest military threat available, although non-nuclear Weapons of Mass Destruction (WMD) complicate this consideration significantly.⁴

Capability

Capability lies at the heart of successful deterrence strategies – actors aim to influence those they would seek to deter by placing something of value under threat. In a military context, this reflects the ability to project hard power with sufficient range, precision, timeliness and destructive force to achieve a desired outcome, regardless of the countermeasure capabilities available to the deterree. In the absence of the destructive certainty of nuclear weapons, achieving deterrent outcomes with more conservative force is the central challenge for conventional deterrence strategies.⁵ This is evident in both key sub-divisions of deterrent strategies: denial and punishment. Denial strategies seek to prevent an actor from realising the perceived benefits of their potential action, with such concepts often associated with defeating fielded forces in a military context. In contrast, punishment strategies seek to impose unacceptable costs upon an actor without necessarily denying an actor the specific benefit it is pursuing, epitomised by reprisal or pre-emptive strikes on strategic assets. Measured in raw capability and outcome alone, conventional force has traditionally reduced both the likelihood

of immediate military success and the impact of punitive action when compared with nuclear intervention, necessarily diminishing the gravity of associated threats.⁶

Credibility

The threat of military action, however capable, can therefore only deter if it is credible that such action could, and would, be brought to bear against a transgressor. As previously asserted, this assessment rests in the perception of the deterree and therefore renders the outward behaviours of the deterrer central to the success of such an approach.⁷ Accordingly, proportionality is an important theme within credibility; here, the apparent readiness of leading nations to engage in limited wars offers renewed opportunities for conventional deterrence, where nuclear action would represent a disproportionate and non-credible response to most situations. However, more so than in the case of escalatory nuclear warfare, conventional deterrence exists within a continuum where military action may be feasible without major strategic disruption. Thus the relative employability of conventional capability comes at a cost: future credibility is shaped by both an actor's observable resolve and its performance once in action.⁸

Such credibility is inevitably staked to internal and international political cohesion and influence, with recent crises exposing the difficulties Western powers may face in exerting military power, not least with regard to casualty aversion in conflicts of choice.⁹ Political frictions also present challenges for the timeliness of deterrent credibility, where would-be deterrers must have a demonstrable ability to achieve the threatened outcome before the deterree can take measures to mitigate the threat or to increase the risk to the deterrer. Inadequacies here may also afford the deterree time to implement *fait accompli* changes to the strategic landscape in their favour which may prove difficult to reverse, with enduring consequences for the credibility of the deterrer.¹⁰

Communication

The possession of the technical means and political resolve to act remains insufficient to deter if the threat is not clearly communicated to targets of deterrence. Accordingly, those seeking to deter must contend with fundamental issues surrounding the articulation of the threat itself: what are the criteria that will trigger a retaliatory response, and what will the nature and effect of that response be upon the transgressor? Such communication was scarcely straightforward even when confined to leading Cold War nations and with the relative clarity of assured destruction as a candidate outcome. The increasingly disparate and non-existential nature of security threats facing major nations in the post-Cold War environment therefore presents a significantly greater challenge for those seeking to practice conventional deterrence. Here, political posturing, international diplomacy and the risk of enduring strategic consequences from local and limited action can render hard lines of transgression difficult to draw. Moreover, diversifying interest areas risk diluting a deterrer's understanding of the strategic and cultural values of its candidate deterrees, increasing the challenges of messaging and targeting alike.¹¹

The difficulties surrounding clear and effective threat communication are compounded by issues regarding the deterree's perception and interpretation of such messaging. Amidst the noise of international posturing and the strains of pre-conflict escalation on organisational behaviours, all but the most explicit threats may be misconstrued or underrepresented.¹² Indeed, prominent deterrence failures post-World War II, including Korea and the Falkland Islands, have occurred despite evident military capability to contest aggression. Ensuring the threat has been understood as intended thus forms a problematic yet central component of effective deterrence.¹³

Rationality

Even if the above three criteria are rigorously observed in the application of a deterrent threat, successful deterrence nevertheless requires the intended target to respond in the manner sought by the deterring party.¹⁴ Here, imperfections in the perceptions of both the deterrer and deterree expose a deeper weakness in the practical application of deterrence regarding the rationality of actors. At the heart of deterrent threats is the concept that the deterree will make decisions based upon a cost-benefit analysis, and that such analysis can be manipulated by the deterrer. Successful manipulation thus depends upon a degree of awareness of both the values and logic of a target actor; imperfections in this awareness are inevitable, and it appears reasonable to assume that as an actor's appreciation of the deterree diminishes, so too does its potential for successful deterrence.¹⁵

Compounding this issue is the tendency for such threats to treat the deterree as a homogenous actor that is both capable of making, and willing to make, such cost-benefit decisions based on the interests of the state or organisation as a whole. Such homogeneity poorly reflects the organisational realities of even the most hierarchical state, but is increasingly unrepresentative of failing and non-state actors who may nevertheless form targets of deterrence. Difficulties in discerning the underlying values of key figures in such cases may increase the risk of unexpected responses in the deterree, particularly if these values reflect the intangible ideals of dogma, religion or pride. Such uncertainty may challenge the feasibility of deterrence strategies in cases where the deterrer is working to limited objectives amongst broader strategic interests.¹⁶

Air Power and Conventional Deterrence

Current Royal Air Force (RAF) doctrine defines air power as '[the use of] air capabilities to influence the behaviour of actors and the course of events'.¹⁷ This definition places influence activities, including deterrence, at the heart of modern UK air power thinking. Such thought is not confined to current doctrine. Air power's deterrent capacity is directly reflected in American General Omar Bradley's assertion that '[a]irpower has become predominant, both as a deterrent to war and, in the eventuality of war, as the devastating force to destroy an enemy's potential and fatally undermine his will to wage war'.¹⁸ The flagship air power attributes of speed and reach speak plainly to those previously identified core components of deterrent capability and credibility, particularly given the geographically disparate and rapidly evolving threats characteristic of recent Western focus areas.¹⁹

Deterrent capabilities are evident across the full spectrum of air power roles as defined within RAF doctrine. Of these, perhaps most directly associated is Attack, whose hard power capabilities underpin the explicit and implied deterrent threats within both punishment and denial strategies. Control of the Air enhances attack capabilities by providing freedom of action, while directly augmenting denial strategies through its defensive capabilities. Both functions are supported by Intelligence and Situational Awareness, which may support deterrent communications, particularly with regard to gaining insight into the behaviours of target actors. Finally, Air Mobility is central to the timely force projection and sustainment of air power and wider forces.

Evolution of Modern Concepts

The first significant steps in the evolution of modern concepts occurred after World War I, which served as a proving ground for air power in great power conflict. For many, air power's potential to reach beyond the surface battle, and to directly target strategic assets, offered an alluring antidote to the enormous materiel and human cost so evident in the war.

At the forefront of this emergent thinking was General Giulio Douhet. Central to Douhet's concepts was the utility of air power as an offensive weapon, capable of ending war quickly through the destructive might of strategic bombing.²⁰ This vision was not primarily as a deterrent capability; nevertheless, Douhet and others' understanding of strategic bombing in the interwar years underpin many of the enduring concepts of deterrence. One such concept was the notion that a concentrated and determined bomber offensive would overwhelm any defensive capabilities available to an opponent, enshrined in Stanley Baldwin's assertion that 'the bomber will always get through'.²¹ This was rooted within a deeper understanding that future wars would be total wars, in which firebombing and chemical attack on the civilian populace represented necessary and appropriate objectives. Appearing both unstoppable and devastating, it was assumed that such attacks would break the will of the civilian populace and that subsequent resistance at state-level would swiftly become unviable.²²

The apparent threat posed by this capability initially underpinned lobbying for disarmament and the suppression of strategic bombing through arms control. However, the inherent challenges of assuring compliance amongst adversaries, and the perceived impact of an unforeseen first strike, soon led air power advocates to pursue credible deterrent capabilities, eschewing disarmament strategies. The significance of maintaining a relative capability advantage swiftly became evident, particularly against a backdrop of demonstrably rapid capability evolution. This was all the more so in light of the fact that no nation had yet developed the air power capability to deliver the mass devastating effect as theorised.²³

Despite this gap in technical capability, interwar theories based on largely conventional force had identified many of the capstone issues to emerge within deterrence theory. Within a framework of expected total war, foremost was the imperative of targeting strategic centres in preference to fielded forces, placing countervalue strategies ahead of counterforce alternatives.

Directly supporting this objective was the concept and threat of using unstoppable destructive force to break a state's capacity to resist.²⁴ In this regard, the punctuation of such strategic posturing by World War II offered an important if ironic lesson, ably demonstrating the fallibility and consequences of imperfect deterrence.²⁵

The bombing of Germany and Japan, culminating with atomic raids on the latter, demonstrated the massive firepower available to major powers, offering newfound credibility to deterrence in the post-World War II period. Air power remained at the heart of these developments, both in its classic role of bombing and the emergence of intercontinental missile warfare, fuelled by the exponential increases in capability offered by thermonuclear weapons. Despite increasing emphasis on nuclear deterrence as the Cold War intensified, conflict in Korea and Vietnam illustrated the continuing relevance of conventional power diplomacy and influence activity between major powers.²⁶ Deterrence took on a distinctly nuclear aspect after the Soviet Union's acquisition of atomic weapons in 1949, and this has obscured the utility of conventional deterrence during the period of the Cold War. Such deterrence activity was relatively limited, but examples can be found during the period, both of failure and success. Attempts at conventional deterrence failed in Korea (1950) and the Falklands (1982), although how vigorous those efforts were is open to debate. Conversely, British deterrence of Iraqi designs on Kuwait in 1961 through the vehicle of a defensive plan for the newly-independent Kuwait known as Operation *VANTAGE*, and the use of both the RAF and the Fleet Air Arm to deter Guatemalan ambitions against British Honduras/Belize in 1959, 1972 and 1975 have been heralded as success stories.²⁷ Perhaps most significantly in terms of recent examples of air power and conventional deterrence, the US-dominated build-up of forces in Saudi Arabia in 1990, Operation *DESERT SHIELD*, designed to deter Saddam Hussein from any temptation to extend his activities beyond the invasion of Kuwait, was heavily dependent upon air mobility, both to place forces in theatre early and, through air refuelling, to permit the despatch of combat aircraft from the United States to Saudi Arabia in short order.²⁸

Equally, it is not hard to discover commentators questioning whether the Iraqi leader Abd Al-Karim Qasim²⁹ in fact intended to invade in 1961, or whether Saddam had any intention of extending military operations into Saudi Arabia – both of which illustrate the point that it is far easier to demonstrate when conventional deterrence failed, as opposed to when it succeeded.³⁰ Nonetheless, both relied heavily upon air power, offering a clear illustration of its integral role in any efforts to deliver conventional deterrent effect, and it is thus worth considering them briefly.

During Operation *VANTAGE*, offensive air assets were rapidly deployed from both regional bases and Germany to deter Iraqi ground and air threats, while air mobility assets deployed large numbers of reserve forces from deep rear locations. All were informed by air intelligence. With no invasion forthcoming, deterrence success could therefore be claimed, offering credibility to influence strategies dependent on rear basing and the responsive capabilities of air power. However, closer inspection exposes marked complexities and limitations here.

A stand-off presence proved too uncertain for the defence of a strategic interest, drawing Britain into a resource-intensive deployment that ultimately failed to project forces either within operational timelines or with sufficient capability to counter a determined response. The risks presented by the unexpected denial of overflight rights for transport aircraft added complexity.³¹ Moreover, the causality between this posturing and Iraqi inaction remains decidedly unproven. Given these constraints, Britain's pursuit of air power-led deterrence in the region in subsequent years appeared to speak more strongly to the political appeal of apparent influence than the military capabilities underpinning it.

The US-led deterrence of Iraq in 1990 reprised many of these challenges, most prominently exposing the strategic difficulties of realising the deterrent capabilities of air power amidst intense geopolitical frictions. Here, US reluctance to react decisively to an uncertain threat, and its inability to secure a credible foothold, fatally undermined its deterrent messaging in terms of defending Kuwait; ultimately, deterrence failure proved the galvanising force that enabled more assertive coercive posturing. Following this failure, the military ability to underwrite such threats remained limited by the speed of projection of suitably equipped forces, highlighting a key vulnerability to the deterrence of opponents less patient than Saddam. Moreover, despite the robust influence activity that ensued, military threats failed to compel an Iraqi withdrawal, leaving the deterrence of an Iraqi invasion of Saudi Arabia as the sole and uncertain successful influence outcome.

Technology, Air Power and Conventional Deterrence

We should also consider the potential of non-nuclear weapons to strengthen deterrence. Advancing military technologies that merge the capabilities of information systems with precision-guided weaponry and real-time targeting and other new weapons systems may provide a supplement or alternative to the nuclear arsenals of the Cold War.³²

- US, Report of the National Defense Panel, December 1997

The end of the Cold War and the decisive victory of the US and its allies in Iraq in 1991 had profound consequences for Western military thinking. During Operation *DESERT STORM*, capabilities developed to counter the Soviet threat had been dramatically brought to bear against the very equipment that had shaped European security concerns, with profound results. This striking battlefield performance appeared to vindicate concepts of the previous decade regarding the rising ability of conventional capabilities to influence the balance of power amongst nuclear nations. These concepts, clearly evident in the 1997 US Defense Panel Report, continue to shape Western defence thinking and procurement; the consequences of such developments for air power within strategies of deterrence are worth exploration.³³

The transformational potential of these pronounced technological advances for military security fuelled declarations amongst senior strategists that a Revolution in Military Affairs (RMA) had taken place. Such theories asserted that rapid developments in the technical capabilities and associated operational concepts of a military power could combine

synergistically to produce a discontinuous, order of magnitude increase in military potential.³⁴ From the outset, RMA concepts were staked to concepts of strategic balance and deterrence: the potential for sophisticated sensors and precision-guided Western munitions to subdue a Soviet armoured advance was a significant concern to Soviet strategist Marshal Ogarkov in the 1980s.³⁵

The deterrence potential of conventional force thus held new prominence in the aftermath of the Gulf War, underpinned by two key principles.³⁶ Firstly, it was recognised that the destructive power of conventional US capabilities appeared to be approaching the effects sought by limited nuclear strikes without the nuclear stigma. Secondly, the end of the Cold War allowed increased resource and focus to be dedicated to regional instability in areas of strategic interest, given the reduced emphasis on great power nuclear stand-off. It was evident that nuclear deterrence in the limited conflicts foreseen in President Bush's 'New World Order' offered at best limited plausibility, rendering conventional force central to credible threats.³⁷

The Appeal of Revolutionary Air Power

Prominent in the Gulf War, air power appeared immediately central to these ideals. Now decoupled from wider Cold War forces, candidate intervention areas had increased, while pressure to reduce the footprint of the armed forces had also risen in line with aspirations for a Cold War peace dividend.³⁸ Such competing principles suggested that ground forces were increasingly unlikely to be present in credible volume at the outset of a regional crisis; moreover, *DESERT SHIELD* had reaffirmed the major challenges associated with the timely projection of forces sufficient to deter or confront a significant military power.³⁹ Taken together, the credibility of early threats was therefore increasingly staked to the force projection capabilities of air power, particularly in regions beyond the littoral. Offering the ability to intervene without a significant deployed footprint, air power appeared a prominent tool for hard power diplomacy.⁴⁰

At the heart of such promise were the dramatic increases in information warfare capabilities displayed during the Gulf War. Here, advances in satellite technologies offered enhanced intelligence capacity, largely immune to the political restrictions and military threats that had stymied earlier air reconnaissance. These and wider communication developments offered two key deterrent benefits. The first concerned improvements in early warning, increasing the likelihood of detecting undesirable behaviours in time to issue deterrent threats, with particular potential to stymie the *fait accompli* often sought by weaker actors.⁴¹ Moreover, these developments offered further enhancements in targeting, dynamic re-tasking and battle damage assessment. All such capabilities offered clear force multiplying benefits, decreasing the force size required to achieve a given effect and thus increasing the feasibility of bringing such a force to bear. These developments held direct consequences for deterrent credibility.⁴²

Beyond credibility, *DESERT STORM* also shed new light on deterrent capability, where the apparent step change in military potential was nowhere more tangible than for the *attack*

elements of air power. Here, the effects were most apparent on the battlefields of Kuwait itself, with air power significantly depleting Iraqi fielded forces in advance of the coalition ground invasion and accelerating the advance once underway. Separately, the rise in prominence of stealth aircraft and stand-off munitions appeared to have dramatically increased the viability of conventional munitions delivery into the strategic heart of an adversary's territory. Here, advances in precision-guidance also demonstrated that such munitions were increasingly likely to strike their target. Taken together, such developments offered a marked increase in the probability of mission success for a given force size, enhancing the potency of threats and further re-enforcing the concept of technology as a force multiplier.⁴³

In addition to information and attack, the proven ability of the US and its allies to secure control of the air also shaped the future of air power within deterrence. Iraqi air defences had been largely suppressed within hours, enabling the air campaign to be conducted almost at will and with minimal casualties. This freedom had been obtained without inflicting catastrophic losses upon the Iraqi air force: of Saddam's 700 air force aircraft, only 35 were downed through air engagement.⁴⁴ Accordingly, tactical deterrence success underpinned much of the freedom of manoeuvre enjoyed by the coalition; Hussein seemingly preferred to tolerate the impact of unopposed Western air power rather than risk his air assets in combat. This apparent reluctance to expose assets critical to Iraq and Saddam's security over a less than existential threat holds clear consequences for future deterrence, in which mid-tier powers may face a stark choice when confronting modern air forces: whether to expose highly-valued air assets in a bid to raise the risk of engagement beyond thresholds acceptable to the deterrer, or to accept the consequences of operating without control of the air. The performance of air power in this campaign offered tangible evidence to inform such risk-reward estimates.⁴⁵

Overall, *DESERT STORM* offered compelling evidence of the potency of air power, particularly when applied in concert with land forces. Here, capabilities proven in Kuwait offered clear evidence of the military effects modern technology could achieve on the battlefield. With the ability to deny an adversary a quick win and force attritional warfare cited as 'the bedrock of conventional deterrence', this development has important consequences for RMA-led deterrence in isolation.⁴⁶ However, *DESERT STORM* also enabled RMA advocates to identify significant potential within deterrent punishment strategies. In this regard, by suggesting the ability to strike strategic targets without credible opposition, the employment of air power against Iraq appeared to vindicate the promise of strategic bombing as envisioned by the early theorists. Indeed, the influence of Douhet is clearly evident within US Colonel John Warden's 5-ring system of strategic targeting that informed attacks against Iraqi power and command and control systems.⁴⁷ When coupled to the notion that such strikes could be conducted at minimal loss to both the deterrer's forces and non-combatants, these developments appeared to fuel confidence of success at minimal risk. Diminishing the barriers to intervention, this appeared to increase the deterrent credibility of high-technology powers in cases of marginal or peripheral commitment.⁴⁸

Enduring Barriers to Conventional Deterrence

Despite the undeniably significant air power capabilities within the RMA narrative, its status within deterrence is not without grounds for questioning. Indeed, many limitations are evident in the very campaign that showcased such capabilities. One key limitation remains the ability to identify effective deterrence in action, with both *VANTAGE* and *DESERT SHIELD* suffering from unsatisfactory and inconclusive evidence regarding the influence of Western actions on Iraqi intentions. It appears unlikely that developments in information capabilities will remove the Clausewitzian fog sufficiently to provide deterrent practitioners with proof of intent, much less with the motives underlying apparent changes in strategy. Accordingly, the risk remains that deterrence practitioners may draw inaccurate conclusions about the success of their strategies, with attendant consequences for subsequent deterrent attempts.⁴⁹

Secondly, there is room for doubt regarding the ability of these emergent munitions and delivery methods to achieve the capabilities claimed of them. Many have questioned the credibility of extrapolating military outcomes in Iraq to wider deterrence scenarios: advanced capabilities were employed against an inexperienced opponent operating the hardware it had been designed to counter, in an uncluttered and sparsely populated environment, in favourable weather and with the support of a broad coalition. Such favourable conditions are unlikely to offer a reliable benchmark for future engagements, with the confused battle lines, allegiances and target sets of Syria exposing the potential complexities facing current strategists. Moreover, deterrence failed even in the Iraqi case despite such conditions and deterree acknowledgement of the threat of high technology.⁵⁰

In addition to issues with the military performance of high technology, the validity of deterrence strategies staked to their success are also worthy of consideration, specifically with regard to punishment strategies. Of particular note is the ability of air power to target or destabilise enemy leadership, and to achieve deterrence through threats of the same. Despite the evident appeal of victory without major military confrontation, there remain fundamental flaws in the practical pursuit of such aims. Leaders can prove hard to locate and harder to strike, with little guarantee of a meaningful or desired change in a regime's action even following successful targeting. Similarly, there remains little evidence that air power is an effective tool to undermine regime support through punishment strikes on key infrastructure. Civilians have repeatedly withstood substantial bombardment and degraded circumstances without being driven to rebellion, while nations pursuing the delivery of even limited strikes of this nature invite accusations of targeting the innocent. These difficulties are likely to introduce doubt in the deterrer and encourage optimism in the deterree, with such forces inevitably weakening the strength of related deterrent threats.⁵¹

Beyond deterrence by punishment, the promise of precision strike has also created further challenges for nations sensitive to public opinion. Indeed, the media narrative of *DESERT STORM*

itself fostered impressions of weapon accuracy and military potency such that civilian casualties and friendly losses could seemingly be held to a negligible minimum. But mistakes and malfunctions are inevitable, and thus even the best weapons will miss, or accurately strike the wrong location. Moreover, while high technology can reduce human exposure on the battlefield, either through by multiplying the potency of smaller forces or through unmanned platforms, losses remain all but impossible to rule out. Accordingly, casualty sensitivity, whether non-combatant or friendly force oriented, creates an exploitable weakness in the deterrer. As deterrence outcomes rest in the calculus of the deterree, even a perception of such vulnerabilities may drive deterrence failure; Saddam's perception of US vulnerability prior to *DESERT STORM* is a powerful example.⁵²

Such exploitable weaknesses extend beyond casualty sensitivity, however, including a significant issue surrounding deterrent communication. Here, threatening actors may be reluctant to overtly state the capabilities of new or newly combined technologies, in conflict with the imperative to ensure the deterree accurately understands the threat and consequences of non-compliance. In consequence, the deterrer may face the unpalatable option of disclosing sensitive detail about offensive capabilities and targeting if the deterrent threat is to be adequately communicated. All such disclosures increase the opportunity for the deterree to take action to negate the deterrent outcome sought.⁵³

A final consideration in this area concerns the sustainability of deterrent threats. Technological developments have greatly increased the potency of small force packages, and have in parallel improved the force projection and stand-off capabilities available to military planners. However, a theme of rising unit cost and diminishing overall force size has accompanied these developments, leaving fewer assets available to meet the disparate demands they are faced with.⁵⁴ Such constraints are significant for enduring deterrence: in seeking to preserve the *status quo*, the war fighting capability of the deterree will likely remain undisturbed unless impaired by wider diplomatic activity. In consequence, while the *status quo* may be permanently unacceptable and a singular priority for the deterree, major actors may be unable to deter consistently amidst competing and changing priorities. Over time, therefore, deterrence may fail, with any such failure threatening significant consequences for an actor's subsequent deterrent credibility.⁵⁵

RMA Air Power in Action: Conventional Deterrence After *DESERT STORM*

There is much promise apparent in the deterrent capability of sophisticated air power, and yet much to weaken its viability amidst real world frictions. This inherent conflict exposes an interesting dilemma for leading nations. Advanced capabilities may sufficiently lower the perceived risk of engagement and increase the feasibility of mission success so as to tempt such nations to issue deterrent threats against lower priority concerns. Given the identified barriers to successful deterrence, it is therefore credible that such attempts may fail to deter, staking an actor's credibility to intervention. Thus, the deterrent promise of such capabilities may in fact be a destabilising influence.⁵⁶

In order to understand how the technological advances evidenced in *DESERT STORM* shaped the employment of air power within conventional deterrence, it is useful to briefly examine deterrence in the years that followed this engagement. This principle reflects the concept of *graduated* deterrence, whereby future credibility can be re-enforced through a determined response to unheeded threats.⁵⁷ A logical entry point for such an investigation concerns the deterrence of Iraq itself: roundly defeated yet with its senior leadership intact, few nations could so assuredly be taken as understanding the potential military outcomes underpinning US-led threats. However, in spite of this apparent clarity, Iraq proved willing to test US resolve within two months of the ceasefire of *DESERT STORM*, with a study by Harvey and James identifying six major coercive interactions between US-led forces and Iraq between 1991 and 2003.⁵⁸ Deterrent air power was at the heart of these US responses from the outset, but despite this prominence, the ensuing deterrent attempts offer a cautionary example of the potency of air power when applied in isolation.

Efforts to deter Iraq formally re-commenced in April 1991 with the establishment of a No Fly Zone (NFZ) above the 36th parallel, intended to protect Kurds in Northern Iraq in accordance with UNSCR 688. However, within seven days of this resolution, Iraq had defied the threat of air power, conducting attacks on Kurdish forces within this NFZ. Critically, deterrent success even in this early case appears to have been achieved only following the emphasis of US commitment through the deployment of 500 troops into the region. Moreover, the deterrent efficiency of air power in Iraq deteriorated steadily beyond this point. Little more than a year later, US resolve was again tested in response to Iraqi aircraft strafing civilians in Southern Iraq. Responding with a further NFZ south of the 32nd parallel, deterrence proved insufficient to curb Iraqi transgressions on this occasion. Here, US-led forces resorted to three punitive air strikes against Iraq, securing temporary compliance.⁵⁹

Perhaps underpinned by air power's promise of influence at low risk to friendly forces, the US increasingly resorted to such coercive strikes to re-enforce deterrent messaging as Iraqi-US relations deteriorated. Notably, the escalatory deterrent posturing of Operation *VIGILANT WARRIOR* in 1994 did appear to achieve deterrent success without recourse to action, albeit with air power embedded within a substantial land and naval response. However, Operations *DESERT STRIKE* in 1996, and *DESERT FOX* in 1998 both repeated the pattern of deterrence underpinned by coercive strike, with the return to war in 2003 epitomising the collapse of deterrence despite the presence of a capable air power threat. Thus, of the six deterrent interactions identified by Harvey and James, only two can claim deterrent success without combat intervention, with both achieved within a combined arms response.⁶⁰

There are key challenges evident in the above employment of deterrent air power. First in this regard is that the employment of air power in isolation may be interpreted as a sign of limited commitment, weakening deterrent credibility and rendering it increasingly vulnerable to marginal or deniable violations by the deterree. Moreover, such probing transgressions may be perceived quite differently amongst international stakeholders, increasing the

likelihood of discord surrounding forceful intervention. Within a coalition, therefore, this presents the lead deterrer with a stark choice of risking deterrent credibility through inaction, or deterrent capability through diminished coalition cohesion and support. Given the increasing significance of coalitions to legitimacy and freedom of action, this carries significant consequences for protracted deterrence: repeated transgressions are likely in a determined actor, with Iraq demonstrating the corrosive potential for such iterations on international consensus. Recognising Saddam as a difficult but nonetheless potentially deterrable actor, the historical record in Iraq suggests caution in the ability of air power to successfully deter even in the presence of high technology.⁶¹

Air Power in the Emerging Global Environment

The Allies' conventional forces...make indispensable contributions to deterrence of a broad range of threats. ... By their nature, they can be employed in a flexible fashion. ... [They] must be able to successfully conduct and sustain a range of operations for *collective defence and crisis response*, including at strategic distance.⁶²

North Atlantic Treaty Organisation (NATO)
- Deterrence and Defence Posture Review 2012

Much of the previous discussion has centred on the ability of air power to provide influence in conflicts of choice and limited commitment. Indeed, given the nuclear capabilities of leading nations, it is perhaps logical that conventional deterrence would feature most prominently in consideration of matters of less than existential interest to these actors. Nevertheless, the influence of conventional capabilities is not confined to such activities, with NATO's 2012 assertion attracting new significance in light of Russian resurgence in the Ukraine and the rising prominence of non-state and irrational actors in international affairs. Accordingly, the deterrent influence of air power at these extremes of deterrence will now be considered.

Deterring Nuclear Powers

The potential to deter a nuclear-capable actor with conventional force is necessarily shaped by the feasibility of using such force to credibly threaten that actor's strategic interests. In this regard, developments in conventional firepower have yet to match the destructive force of nuclear munitions, with the most powerful conventional Western weapon remaining an order of magnitude less powerful than its lowest nuclear equivalent.⁶³ Accordingly, the conventional deterrence of nuclear actors has traditionally focused on achieving the strategic *effect* of nuclear munitions. Here, much of the argument has centred on whether the fusion of sophisticated precision delivery and advanced intelligence-led targeting methods has enabled conventional firepower to achieve the same disabling military effect previously demanded of nuclear munitions.⁶⁴

Precision strike at extreme range represents an integral component of such strategies. Already leading in this field, the US is vigorously pursuing further enhancements, notably including the Conventional Prompt Global Strike (CPGS) concept. Seeking to strike a target

anywhere on the globe within an hour, this concept would offer the US the ability to threaten and attack high-value targets in distant and contested areas with little warning in most cases. Against certain target sets, therefore, CPGS could narrow the boundary in achievable effects between conventional and nuclear capabilities, a point emphasised by the consideration of conventionally-tipped ballistic missiles within this program. Re-visiting the promise of RMA precision strike, such a capability may suggest renewed credibility in punishment techniques, particularly for decapitation strikes against transiently exposed leaders. Moreover, at the extreme, CPGS hints at the potential for conventional precision munitions to hold the strategic arsenals of an adversary at threat, such that a nuclear retaliatory response would be denied. Promising global influence without forward presence or the stigma of nuclear warfare, the appeal is immediately evident.⁶⁵

However, while CPGS suggests the ability to reduce the division between nuclear and conventional deterrent threats, a number of key problems remain unsolved, foremost of which are issues of perception within the deterree. Here, a perceived conventional first strike threat to a nation's nuclear capability may in fact prove de-stabilising, encouraging a pre-emptive nuclear response in the deterree. Indeed, Russian President Dmitri Medvedev's 2009 assertion that '[it] is unacceptable to compensate nuclear reductions by developing strategic systems which are equipped with conventional weapons' speak plainly to such concerns.⁶⁶ The issue of de-stabilisation is also compounded by ambiguity concerning both the nature of the warhead and the target given the ballistic and hypersonic delivery vehicles required to meet the proposed one-hour response time. Here, actors may be uncertain as to whether they are being targeted, and moreover, whether they are under nuclear attack. When coupled to significant time pressure, the potential for inadvertent escalation fuelled by misunderstanding is significant. Conversely, deterree threat perception may also be suppressed given the inability of conventional weapons to inflict violence and suffering on the scale of nuclear weapons. Both diminished threat perceptions and the potential for escalation beyond the conventional threshold therefore suggest hard limits to the deterrent potential of conventional weapons against nuclear powers.⁶⁷

Russia and Hybrid Warfare

The above constraints expose difficulties in deterring the core interests of nuclear actors through conventional threats. Nevertheless, these issues need not negate the potential for the conventional deterrence of major actors over more peripheral interests, accepting that such strategies must accommodate the asymmetric and evolving responses evident in candidate deterrees. Here, the basic threat of rapid escalation holds without the prospective CPGS capability: Russia has long held the use of tactical nuclear weapons as a 'de-escalatory' mitigation to the inferiority of its own conventional forces.⁶⁸ Indeed, the presence of such a lowered threshold for nuclear response was clearly evident in Russian President Vladimir Putin's rhetoric to NATO during the Ukraine crisis.⁶⁹ This posturing presents a significant challenge to Western deterrence, as their ability to threaten and deliver more severe outcomes than could be inflicted in return – the principle of *escalation dominance* – is less assured. This issue

is exacerbated in matters of reduced or asymmetric commitment in the deterrer, where the escalatory risks may encourage inaction or *self-deterrence*.⁷⁰

Self-deterrence is a key concern for NATO credibility in the face of Russian expansionism, with the challenges of asymmetric commitment and asymmetric tactics amply evidenced in the current Ukraine crisis. Here, Russia appears to be pursuing a newly reprised variant of hybrid warfare, exploiting unmarked and irregular forces to achieve State interests while maintaining plausible deniability. Such an approach has evidently challenged Western commitment beyond the boundaries of NATO, and holds greater concern for deterrent posturing at NATO's Eastern extremes, particularly regarding the Baltic States. With Russian speakers representing more than a quarter of the population of Latvia and Estonia, the potential for Russian intervention on the pretext of protecting Russian speakers cannot readily be dismissed.⁷¹

US concern and commitment on this matter are both evidenced in President Obama's assertion that NATO will ensure that the Baltic States 'will never lose [their independence] again', firmly staking NATO credibility to its continued defence of the region.⁷² Notably, air power has been prominent in NATO's ensuing escalation of its presence in this area: 2015 has seen marked increases to the air defence, intelligence gathering and early warning capabilities deployed in support of Baltic air policing alongside a wider tripling of the NATO Response Force.⁷³ These capabilities tangibly re-assert NATO's commitment to Baltic defence, and in consequence offer direct military and deterrent utility. However, this combination of elevated NATO posturing and Russian hybrid manoeuvring heightens the risk of escalation, placing renewed emphasis on credible deterrent posturing if stability is to endure. Assuming large-scale conflict in defence of the Baltics would test US and NATO resolve to its limits, great care is required to reduce the necessity for such an intervention.⁷⁴

In a bid to confine and contain any required intervention to credible levels, RAND analysts have recently examined options to deter Russian expansionism in the Baltics. Their wargaming analysis offers undeniable cause for concern: repeated simulations of a Russian invasion of the Baltics resulted in Russian forces reaching the capitals of Estonia and Latvia within 60 hours. Here, the challenges facing Western defenders as identified by RAND continue to reflect those observed in the preceding Iraqi case studies: a robust forward presence is expensive and politically difficult, yet absent this presence, the challenges of rapidly deploying armoured brigades are profound. Therefore, RAND's proposed mitigation centres upon a strategy to deny Russia rapid territorial gains, identifying limited credibility in deterrence by punishment given the likely requirement to target mainland Russia. Notably, this strategy places a clear emphasis on air-land integration, utilising air power to support the deployment and manoeuvre of mobile and light forces while offsetting the firepower shortcomings of such forces against Russian-sponsored armour.⁷⁵

China and Issues of Anti-Access

Beyond Russia, developments in Chinese doctrine have also sought to circumvent US dominance in long-range precision strike. Here, despite US CPGS rhetoric, China has maintained

a policy of 'no first use' as regards their nuclear arsenal, seeking instead to challenge US influence in the Asia-Pacific through Anti-Access/Area-Denial (A2/AD) strategies.⁷⁶ These capabilities seek to deter the intervention of external actors by raising the costs of close-in intervention to intolerable levels. In so doing, they seek to force such actors to operate at ranges that limit their sensor, targeting and delivery options, reducing their ability to disrupt Chinese intent. The emerging development of the Chinese DF-21D anti-shipping missile epitomises these trends, with a potential capability to strike aircraft carriers at ranges in excess of 1,000 miles.⁷⁷ Such and similar capabilities would extend the radius of operational hazard for high-value assets in particular, complicating the challenge of force projection and diminishing the operational capacity available to potential adversaries in areas of Chinese interest.⁷⁸ Moreover, China has also identified the necessity of disrupting US satellites, with the successful interception of its own weather satellite in 2007 demonstrating China's capabilities in this area.⁷⁹

As a direct challenge to regional influence, Chinese A2/AD capabilities present a significant problem to Western deterrent threats in isolation. However, of wider concern is the ready availability of this concept, if not the absolute capability, to a broadening actor base, particularly as basic technologies proliferate. Increasingly, therefore, the conventional deterrent credibility of Western actors is staked to a demonstrable ability to project influence in such contested environments, and to operate in the renewed fog of information denial.⁸⁰ In consequence, the US has been at the centre of developments focused on negating these challenges, with the resulting concepts, including the Joint Operational Access Concept (JOAC), repeatedly emphasising a focus on service jointery more recently evident within RAND's Russian deterrent recommendations. However, particularly evident in the JOAC is an emphasis on *cross-domain synergy*, which recognises profound barriers to achieving lasting dominance in any given domain. Accordingly, this concept calls for sophisticated capabilities to be developed in each domain, fused with a high degree of service interoperability – both human and technical – to maximise the military effects achievable during temporary periods of military advantage. In other words, the solution to the proliferation of advanced technologies is a combined services approach underpinned by cutting edge technologies.⁸¹

With seemingly few military alternatives, there remain a number of problems inherent in this approach to the A2/AD problem. Perhaps foremost remains the enduring challenge of deterrence by punishment, given the JOAC emphasis on strategic strike to disrupt lines of communication and disable long-range offensive capabilities.⁸² The inherent limits of this approach have been previously explored; however, they are likely to be particularly keenly felt in the China case in light of the complexities of conflict escalation and the challenge of extreme-range targeting against an opponent known to employ concealment and underground operations. Moreover, JOAC's emphasis on cutting-edge technology and interoperability is also likely to drive cost and exacerbate issues of diminishing force size, challenging both sustained forward presence and the ability to deter concurrent but

geographically separated threats.⁸³ All such forces challenge deterrent communication and perceptions of credibility.⁸⁴

Held at range and with a ready path to escalatory conflict, the US could face deeply unpalatable choices should China employ a hybrid or plausibly deniable 'quick win' approach to advance its interests. Allied to the challenges concerning the deterrence of Russia, clear bounds are evident within the utility of air power as a tool for the conventional deterrence of nuclear actors. Success appears most likely within a joint approach intended to deny these actors quick gains away from their core interests, with more profound challenges to deter action in pursuit of their strategic concerns. Here, the risk of conflict escalation is significant, posing fundamental credibility problems given that any such threat would require escalation to be perceived as tolerable for the deterrer.

Deterring Non-Nuclear Actors

With substantial limits to the influence of conventional air power on nuclear actors, the ability of air power to deter non-nuclear states is also worthy of consideration, particularly those states at or nearing the transition to nuclear power status. Here, conventional force is particularly relevant given Western determination to limit this proliferation despite the profound barriers they face to pre-emptive nuclear intervention. Encouragingly, therefore, there is evidence to underpin conventional threats of this nature, with one study suggesting that determined states are capable of employing air power to significantly disrupt such programmes. Here, the greatest likelihood of success appears during development, where both infrastructure and national understanding remains limited; Israeli strikes against nascent Iraqi and Syrian sites in 1981 and 2007 respectively appear to have successfully delayed nuclear development through both direct technical, and indirect political effects.⁸⁵

However, with deterrent capability feasible, deterrent credibility is presented as a prominent issue for such strategies. North Korea is a leading example, with recent US estimates identifying the state as likely to possess a fledgling if unproven ICBM capability in defiance of US appeals.⁸⁶ Echoing the strategies of Russia and China, North Korea's ability to avoid conventional intervention also appears in part based on an ability to deny the US escalation dominance; North Korean artillery has long held the ability to place the South, and Seoul in particular, under conventional and chemical threat. Readily concealed and rapidly deployable, this capability would be an extremely complicated threat to negate, raising the risk of initial US intervention markedly. Moreover, the North's bilateral relationship with China would doubtless complicate a wider or sustained US response. Such forces fundamentally weaken the credibility of deterrent threats.⁸⁷

The challenges of North Korean deterrence also emphasise that deterrence is difficult to achieve where a deterrer's commitment is less than absolute and a credible counter-deterrent capability exists. In consequence, strategies to raise the cost of intervention are of clear interest to states at risk of Western intervention. Saddam Hussein's 1991 strikes on Israel, and

subsequently, Iranian efforts to assert its A2/AD capability in the Straits of Hormuz would appear to epitomise such counter-deterrence strategies.⁸⁸

The difficulties of achieving deterrence with limited commitment are evident throughout the above examples, carrying a firm cautionary note for strategies seeking to apply air power in this way. However, a notable counter-example would seem to be offered by the 2011 Libya campaign. Here, Western air power working in concert with indigenous and Special Forces successfully toppled the Qadhafi regime. Consequentially, this campaign may suggest a degree of credibility in low footprint punishment and decapitation strategies that have often appeared impracticable as deterrent threats. Unfortunately, the ability to use this military success to enhance the validity of subsequent deterrent threats already appears limited: in Syria, the Assad regime has successfully defied repeated US deterrent threats surrounding the Syrian employment of chemical weapons. It appears that very specific conditions in both international consensus and the escalatory capacity of the deterree are required for deterrence to be practicable.⁸⁹

Finally, it is useful to briefly consider the deterrent prospects of air power against non-state actors, an issue that epitomises the challenges of protecting national interests at range in the face of uncertain and disparate threats. Here, the diversity of this subset poses a particular challenge to the measurement of success, leaving deterrence most apparent as an issue in the wake of visible failures. This carries particular consequences for punishment strategies, where the lack of targetable hierarchy and infrastructure significantly limits the prospect of translating retaliatory military action into political success. Such strategies are further weakened by the risk of feeding a narrative that pits a determined few against Western hegemons, rendering punishment threats difficult to communicate or enact.⁹⁰

However, with inaction risking undermining the credibility of a State's deterrent posture against these actors, the appeal of denial and limited reprisal capabilities remains evident. In this regard, unmanned platforms acting as both sensor and shooter would seem to represent the epitome of intervention at low commitment. Here, if the limited range, legal and state overflight constraints surrounding such platforms can be overcome, they are likely to be able to raise both the risk and complexity of non-state actor operations significantly, lending limited credibility to denial approaches. However, effective deterrence, rather than pure military intervention, requires the deterree to understand that they are threatened and moreover, what behaviour is intended to be deterred. Both are greatly complicated by dislocations in cultural paradigms and limited opportunities for deterrent dialogue. Given such limitations and the determination common to non-state actors, doubt must remain as to whether these challenges can be translated from organisational disruption into denial and deterrence.⁹¹

Conclusion

From its earliest employment, air power has been identified as a means of achieving strategic influence with reduced human commitment. Successive developments have edged military

capability closer to realising this conceptual promise, epitomised by the rise of nuclear warfare. However, this transition has not negated the desire of nations to exploit conventional force to deter other actors. With reductions in resource traditionally exceeding contractions in Western ambitions, air power has increasingly been presented as a means to retain global influence amidst declining forward presence.

Britain's desire to pursue such ideals was evident within Operation *VANTAGE*, with air power at the heart of Britain's deterrent response. Nearly 30 years later, *DESERT SHIELD* was similarly reliant upon air power, yet the results are difficult to define absolutely. Both case studies demonstrate significant practical limitations within conventional deterrence strategies, with the difficulties of deploying high-volume forces at appropriate speed prominent in these examples. However, compellence failure in 1991 resulted in the dramatic demonstration of new potency in the military capabilities of air power. These developments suggested the increasing feasibility of exerting influence at range, with fewer assets and at lower risk to coalition forces and civilians. Such capabilities represented a compelling antidote to the diversifying challenges facing Western interests in the post-Cold War landscape, particularly in light of the force reductions sought by these powers. Within this, the ability of air power to support fielded forces added tangible weight to denial strategies, with less certainty surrounding the resurgent concept of punishment through conventional strategic strike. However, many barriers stymying the translation of military capability into effective deterrent threats remained despite this progress. Both Western faith in the promise of air power, and the limitations of conventional deterrence in practice are apparent in US-led efforts to influence Iraq in the following decade.

Iraq may offer only a limited foundation from which to explore modern conventional deterrence. Nevertheless, the identified themes hold enduring relevance in the emerging global environment. Here, US desire to retain competitive advantage through sophisticated technology is plainly evident, with CPGS epitomising the potential for air power to influence through long-range precision strike. However, Russian nuclear rhetoric, hybrid warfare and the A2/AD strategies of China appear credible methods to raise the cost and complexity of Western intervention beyond tolerable levels, exposing limits to the conventional deterrence of such actor's core interests. Moreover, these responses identify a fundamental challenge to air power-led deterrence strategies that is apparent at all levels: sophisticated capabilities cannot be used as a singular substitute for commitment, with Western will to risk life and political capital remaining essential to effective deterrence. In this regard, North Korea, Iran and Syria all lend weight to the argument that where Western commitment is low, threatened actors are likely to be able to employ counter-deterrence strategies to offset even marked disadvantages in military capability.

Acknowledging such limitations, the ability of modern conventional air power to threaten the strategic interests of global actors would seem difficult to challenge. Indeed, developments in air power may be approaching ever closer to the capabilities foreseen by the early air power

theorists. Given the resource constraints facing Western strategists, the substantial force projection and force multiplication capabilities of air power are therefore likely to ensure that it remains a central element within Western deterrent threats. However, significant barriers will continue to challenge the translation of these military threats into successful deterrence outcomes, rendering conventional deterrence an inherently fallible practice. Despite an evident focus on advancing capability, strategies to enhance observable Western commitment may prove more fundamental to achieving deterrent success.

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Viewpoint

Conventional Prompt Global Strike: Enhancing Deterrence?

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Abstract: The desire in the US to increase the role of conventional weapons in providing strategic deterrence has existed for some time. Maturing technologies enabled the process of developing a long-range hypersonic precision strike weapon - termed Conventional Prompt Global Strike – to begin fifteen years ago. While not conceived to contend with peer competitors, these weapons have produced fierce debate over the impact on the nuclear balance with Russia and China. While advocates maintain that these weapons will enhance deterrence by offering escalatory flexibility, critics argue they will instead undermine deterrence and stability by introducing the possibility of 'disarming' non-nuclear strikes, thereby unsettling the equilibrium of mutually assured destruction. The potential impact of these weapons on deterrence requires careful consideration before their introduction.

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Introduction

The concept of nuclear deterrence is firmly rooted in strategic thinking. Though there exists no way of testing or validating the theory, it remains the cornerstone of the security policy of nuclear weapons states. Nonetheless, despite the contribution that nuclear deterrence was perceived to have made, throughout the Cold War (and particularly at its end) there was a desire, most notably in the US, to increase the role of conventional weapons in providing strategic deterrence. The origins of these efforts have profound and manifold origins, though more recently they were driven by the increasingly important regional crises that were unfolding, alongside the concern that more states may acquire nuclear weapons, and conflicts may need to be fought against states with limited or nascent nuclear arsenals. With this in mind, the US began the process of developing and building a long-range precision strike weapon - termed Prompt Global Strike - fifteen years ago.

While not conceived to contend with peer competitors, it is the ramifications of the nuclear balance with Russia and China that has emerged as the focus of debate over these weapons. While advocates maintain that these weapons will enhance deterrence by offering further escalatory steps, and an option between inaction and a nuclear response, critics argue that they will instead undermine deterrence and stability as they introduce the possibility of a 'disarming' non-nuclear strike, which may serve to unsettle the equilibrium intrinsic to the concept of nuclear deterrence: mutually assured destruction. China, and particularly Russia, consistently state their concerns publicly and through their own doctrine about the development and implications of these weapons.

An extended debate is needed on the strategic consequence of Conventional Prompt Global Strike (CPGS), and this should cover the full range of risks and advantages that these weapons may bring. How valid are the concerns from states such as Russia and China, or are they based on political motivations, or perhaps perceptions and strategic sensitivities? If the latter, will that impact on the prospects for further nuclear reductions? Do these weapons serve to eliminate vulnerability, an element that is considered vital in establishing trusting relationships? The impact that CPGS have on general, extended and immediate deterrence, against nuclear and non-nuclear opponents, as well as their impact in crisis situations are all factors that need to be carefully considered.

Rationale

Within the nuclear era, the objective of developing conventional capabilities for deterrence is not new. The evolution of this thinking began early in the Cold War, with the US rethinking a deterrent policy based exclusively on nuclear weapons. The concept of nuclear deterrence sat awkwardly within US military and policy circles, due to the difficulty in reconciling moral virtue with the use of force, while it also rendered the notion of victory a moot point. The doctrine of Massive Retaliation in the 1950s was inflexible and unsuitable for the wide range of threats that faced the US. Thus began the search for a more nuanced form of deterrence.

In the post-9/11 period, while some of the drivers and dynamics had changed, the desire for a conventional deterrent was further amplified. The notion of nuclear deterrence was deemed inadequate to deal with the threats emanating from non-state actors and rogue states, and the maturation of precision strike capabilities made the prospect increasingly compelling. After the demise of the Soviet Union, the financial and political cost of forward basing also encouraged an investigation to long-range force projection. Thus, in 2003, the mission of Prompt Global Strike (PGS) was established, describing a precision conventional capability with global reach, capable of striking independently within a very short timeframe – within an hour.¹ The missions and targets for such a weapon could include elements of a potential nuclear proliferator's programme, an armed missile or an anti-satellite weapon being readied for launch, overcoming anti-access/area denial (A2/AD) capabilities through to eliminating key terrorist figures – targets that are of strategic value and time sensitive, but for which even a limited nuclear strike would be inappropriate.

The majority of scenarios for which these weapons are conceived are not against peer competitors, but rather smaller states or non-state actors, although their potential against A2/AD capabilities could have utility against more sophisticated threats. Nonetheless, it is Russia that has been most outspoken against the US programme, due to the perception that such precision global strike capabilities would allow Washington to deliver a crippling non-nuclear blow to Russia's nuclear forces. These concerns are shared by others who predominantly consider that the benefits of CPGS are outweighed by their potential to undermine global nuclear stability and thereby the basis of nuclear deterrence.

Though the basic logic behind CPGS weapons is straightforward, the arguments supporting them strengthened further under the last US Administration. The 1991 START agreement expired in 2009, and with it went certain limitations that would apply to CPGS weapons. Furthermore, CPGS capabilities were viewed as supporting the central objectives of the 2010 Nuclear Posture Review.²

While not seen as a replacement for nuclear weapons (as they lack the psychological component of a nuclear strike), it was held that CPGS could support these objectives in a number of ways. CPGS could support the deterrent posture while reducing the emphasis on nuclear forces, and providing decision-makers with a strategic weapon that offers a far less problematic response in terms of ethics and escalation. From a regional perspective, CPGS may provide a response to defend allies against a nuclear-armed regional state, where the nuclear option would risk immediate escalation. This would then increase the reliability of Washington's extended deterrence and its commitment to its allies. CPGS would not preclude the use of nuclear weapons subsequently, but they offer a significant offensive capability in their own right and an escalatory step to the use of nuclear forces.

Such a vision sees CPGS as increasing the US deterrence hand overall. They would also have the indirect benefit of revitalizing research, technical and industrial capability in a number

of areas that are also crucial to the country's nuclear arsenal, therefore supporting the final objective of the 2010 NPR. Areas such as guidance and delivery systems are central to the ongoing development of nuclear missiles as well as CPGS, and the CPGS programme can therefore bolster the industrial base and skills common to both, aspects that are at risk of decline otherwise. Thus, under the Obama Administration, CPGS seemed to support its broader policy objectives and those set out in the 2010 NPR very effectively. As President Obama stated to the *New York Times* in 2010, the focus on such weapons was part of an effort "to move towards less emphasis on nuclear weapons" while ensuring "that our conventional weapons capability is an effective deterrent in all but the most extreme circumstances."³

Programmes

The confidence expressed by the last Administration on CPGS contrasts with some early controversy in the development of these weapons, controversy which provides an indication of an intrinsic issue with CPGS: ambiguity. Many early conceptions centred around the use of existing ICBM and SLBM designs, with the nuclear warheads swapped for a conventional one.⁴ Such designs could meet the requirements, and would need very little modification for their re-role. The leading candidate for the mission was a conventionally armed Trident – the Conventional Trident Modification (CTM). However, Congress shut off its funding in 2008 primarily due to concerns about the potential for misunderstanding in a crisis or conflict regarding the payload. A conventionally armed ICBM or SLBM would be difficult, or impossible, to distinguish from a nuclear armed version, whether in terms of its basing or segments of its flight path. Russia is the state with the most sophisticated missile detection and warning, and thus this is the scenario where ambiguity had the most significant consequences.

In response to these concerns, the US began investigating boost-glide designs. These follow trajectories that are distinct from ballistic designs, and reduce the level of ambiguity significantly. The booster rocket would take a hypersonic glide vehicle to its altitude, and the glide vehicle would then travel at hypersonic speeds towards its target at high altitude in the atmosphere, with the ability for aggressive manoeuvre. Such vehicles have characteristics distinct from ballistic missiles, and so address the concerns raised about CTM. The booster flight would be at a different angle, and the glide vehicle would follow a non-ballistic trajectory. The latter of course makes them harder to track and intercept, raising concerns again with other states, but it would clearly offer a military advantage.

To date, the US has tested three different designs – two of the boost-glide variety, and one of a scramjet powered hypersonic cruise missile design. Of the boost-glide designs, the USAF and DARPA fielded the Lockheed Martin Hypersonic Technology Vehicle (HTV), which became the HTV-2, and the Army tested a shorter-range Advanced Hypersonic Weapon (AHW).⁵ The scramjet design was the USAF X-51 Waverider. The achievements and obstacles will not be examined here, but the most successful and thus preferred option at this time is the AHW.

It is notable that since the last tests (2011 for the AHW, 2013 for the X-51) there has been little progress. The financial constraints that came to pass have slowed progress, and limited the ambition. The policy of the new Trump Administration remains unclear to date – statements have been made of improving the US nuclear deterrent, though some technologically advanced programmes have been questioned.

Undermining stability and deterrence

While past US Administrations have viewed CPGS as enhancing deterrence, these weapons have provoked intense debate, in particular how they will impact crisis stability. One of the most significant concerns is that Russia will view such weapons as a direct threat to its Strategic Nuclear Forces. Indeed, this outlook appears in Russian doctrine, and in policy statements in various international fora. For instance, at the 2015 Nuclear Non-proliferation Treaty Review Conference, the head of the Russian delegation stated that US policy hinders further nuclear reductions through its ‘intransigent course’, undermining strategic stability by pursuing, among other things, a missile defence system and the “prompt global strike” concept.⁶ This is a consistent mantra. However, some argue that Russia overstates the danger to its forces. Russia is the only state beyond the US with a warning system that is capable of detecting a missile launch. Its over-the-horizon and space-based capabilities should be easily capable of discerning the difference between an ICBM and a CPGS weapon. And while a greater proportion of its deterrent is land-based than that of the US (and clearly that of Britain or France), Russia maintains a significant second-strike capability with its SLBM force. Russia’s willingness to introduce nuclear weapons at a lower threshold than other powers is also clearly established. Therefore, a disarming strike by the US against the Russian ICBM force, or perhaps even its command and control structure, would seem highly risky, and therefore unlikely. Nonetheless, Russia’s sensitivity over their nuclear deterrent cannot be underestimated. The nuclear deterrent is seen as integral to Russia’s claim to be a great power. In addition to this, Russian policy makers are keenly aware of the inferiority of their conventional forces to the US, which acts to magnify both the symbolic and strategic value of nuclear weapons to the Kremlin. Any perceived threat, real or otherwise, will serve to create significant concerns in Moscow.

The perceived threat from these weapons is further amplified when CPGS is allied to missile defence systems. There are numerous statements by Russian and Chinese officials as to the combined effect of these conventional systems, and their capability of a disarming first strike. Such fears have driven Russia to increase its reliance on tactical nuclear weapons, and to upgrade the robustness of its nuclear systems, while also hastening aerospace defence capabilities. The reliance on tactical nuclear weapons in particular brings negative consequence in terms of security and control. They are widely held to be highly destabilizing, and change the metrics of deterrence.

Further concerns are created by the ambiguities that are inherent in CPGS designs. These relate to the type of warhead, the country targeted, and the type of target. The points relating to the

ambiguity of whether a weapon carried a nuclear or conventional warhead has been discussed above. The withdrawal of funding for the CTM has probably eradicated this as an uncertainty, at least as far as the US programme is concerned. Basing options and inspections would serve to eliminate the vestiges of any further doubt. However, the latter two concerns are more persistent. The ability of CPGS platforms to manoeuvre means that their destination cannot be determined until late in the flight envelope – perhaps not until the final moments. Thus a strike on a third party could be interpreted by Russia (and perhaps China in the future if it builds a missile warning system) as a strike on itself, and trigger a response. The likelihood of such a scenario is slim, but cannot be discounted entirely. Similarly, a state detecting an incoming strike (again, only Russia currently) may incorrectly assume that the strike is targeting its nuclear capabilities, rather than conventional forces. The fear would be that it would result in a serious escalation of tension, or even a nuclear retaliation. However, it is worth noting that the current costs of CPGS technologies would mean that such strikes would involve very limited number of weapons. Such numbers may not be considered sufficient for Russia to retaliate, though they might present a greater concern for China and its smaller nuclear force. Thus it is unlikely that a CPGS strike would be overwhelming. Once more, however, it may be perceptions that matter most. The cost and complexity of US CPGS systems make it hard to persuade Moscow or Beijing that they are designed for much less capable states, and there appears an assumption that ‘orthodox’ nuclear deterrence may be ineffective against conventional counterforce threats.

Thus there is concern that CPGS could have significant impact on the global nuclear order, and perhaps also nuclear proliferation. Even though the US ties these to nuclear reductions, the increased emphasis on conventional weaponry may do very little to allay security concerns in other states. In a scenario of decreased nuclear weapons numbers, conventional weapons will only increase in salience. The consequences could reduce the prospects for future nuclear reductions, and possibly increase tendencies towards proliferation.

Beyond the potential effects on escalation dynamics, questions remain as to how well these weapons would perform their mission. As CPGS rely on precision for their effect, an important consideration is exactly how precise such a weapon would be, given range and manoeuvring, particularly in environments where navigational signals are degraded or denied. Related to this, the timeliness of information is critical. How the requisite ISTAR assets can be brought to bear in non-permissive environments to provide this information, and indeed if they can, whether they wouldn't be a more effective delivery platform themselves, are further issues that need resolving. Stealth platforms, or future armed reconnaissance Remotely Piloted Air Systems (RPAS) could be more effective in this role.⁷

Competing programmes

While the focus here is on the US programme, primarily because most is known about their development and rationale, it is important to note that both China and Russia also have active

hypersonic design programmes. With these programmes, parallels to the US programme cannot be assumed.

Of the two, China seems to have the most momentum behind their programme. In January 2014 came the first public news of a Chinese hypersonic weapon test. In April 2016, they carried their 7th test of the WU-14 boost-glide vehicle, now termed the DF-ZF. This equals the number of tests of the three different US designs over a much longer period. China is also reported to be developing a hypersonic, scramjet powered vehicle that can take off independently or be launched from a bomber. Details are scarce, and it is unclear if the intended payload for these is conventional, or, as some translated scientific papers suggest, nuclear. Even without the development of a boost-glide vehicle, China has a number of intermediate range missiles and the most active ballistic missile development programme of any country, one that is unconstrained by the Intermediate-Range Nuclear Forces Treaty (INF) unlike the US and Russia. Many of these designs are nuclear capable, and these missiles could serve as a prompt global (or regional) strike option.

Less is known about the equivalent Russian programme. Referred to variously as Yu-72 or Project 4202, it is a glide vehicle designed to be deployed by the latest RS-28 Sarmat heavy ICBM. It is considered highly likely that these will be nuclear delivery devices, or at least nuclear capable. Further down the scale (for instance in the anti-shipping role) a number of hypersonic missile designs are under development, illuminating Russia's significant investment in these designs. Indeed, the pace and scope of both the Chinese and Russian programmes is such that the US National Academies of Science warned this year that America was falling behind in the hypersonic weapons race.⁸

With the development of these weapons systems gathering pace, driven by prospective military potential and, no doubt, national symbolic pride, the full spectrum of implications, both positive and negative, must be clearly understood. Certainly, from the singular perspective of warfighting, CPGS would provide a useful addition to current US long-range strike options. However, given the costs of development, and the likely limited number of platforms that would result, counterpoised with the potential limitations these weapons may have against capable adversaries, CPGS may not prove to be anything other than of minimal benefit. Weighed against the more serious problems related to crisis stability, their value in enhancing the robustness of American deterrent capabilities is questionable.

Increased tension and reduced trust marks the political context in which CPGS programmes are being pursued. Besides the deep divisions in how the US, Russia and China view strategic stability and the role of nuclear weapons within that, are the political fissures over Ukraine, the Korean peninsula and the South China Sea. There is minimal military dialogue between the US and China generally, while dialogue between the US and Russia has been ruptured by Ukraine and Syria. All three states are at various stages of a broad increase in the whole spectrum of their nuclear capabilities. In such an environment, advanced conventional

technologies, such as CPGS amplify the divisions. As Robert Legvold noted, this renewed phase of nuclear modernization is marked by a renewal of a “potential competition between offensive and defensive systems” which include “new destabilizing technologies, such as conventionally armed strategic missiles theoretically capable of striking the other side’s nuclear weapons, thus blurring the firebreak between conventional and nuclear warfare.”⁹ Any advantages that CPGS might provide must be considered in this wider context; failure to understand their impact on these strategic relationships risks further nuclear competition.

Notes

¹ General John Jumper, U.S. Air Force, Final Mission Need Statement, “Prompt Global Strike,” 02 May, 2003.

² The Review’s objectives were: preventing nuclear proliferation and nuclear terrorism; reducing the role of U.S. nuclear weapons in U.S. national security strategy; maintaining strategic deterrence and stability at reduced nuclear force levels; strengthening regional deterrence and reassuring U.S. allies and partners; and sustaining a safe, secure, and effective nuclear arsenal. Department of Defense, *Nuclear Posture Review Report*, (Washington, DC: Department of Defense), April 2010.

³ David E. Sanger and Thom Shanker, “U.S. Faces Choice on New Weapons for Fast Strikes,” *New York Times*, April 22, 2010.

⁴ See for example the 2008 study released by the US National Research Council on Conventional Prompt Global Strike. Much of the analysis is centred on conventional version of the Trident – the Conventional Trident Modification (CTM). See National Research Council, *U.S. Conventional Prompt Global Strike: Issues for 2008 and Beyond*, The National Academies Press, Washington DC, 2008.

⁵ The range of the HTV-2 was projected at 11,000kms, and the AHW 8,000km.

⁶ Statement by Mikhail I. Uliyanov, Acting Head of the Delegation of the Russian Federation at the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (General debate), New York, April 27, 2015.

⁷ Some of these aspects are analysed in depth by James Action in *Silver Bullet? Asking the Right Questions about Conventional Prompt Global Strike*, Carnegie Endowment for Peace, 2013. See Chapter 3, ‘Doing the Job: Can CPGS Weapons Meet the Mission Requirements?’

⁸ Guy Norris, ‘Classified Report On Hypersonics Says U.S. Lacking Urgency’, *Aviation Week & Space Technology*, 14 Feb 2014 <http://aviationweek.com/defense/classified-report-hypersonics-says-us-> This At the 21st International Space Plane and Hypersonic Systems and Technology Conference (March 2017), held in China for the first time, China revealed a number of aspects about its hypersonic programme, cautiously avoiding discussion of the most sensitive defence-related aspects. These revealed developments that surprised Western analysts. A very high number of papers were presented there compared to previous conferences, almost 80% of which were Chinese. See Guy Norris, ‘China Takes Wraps Off National Hypersonic Plan: Major investments, test facilities and swift achievements underpin China’s rapid rise in hypersonics’, ‘Classified Report on Hypersonics Says U.S. Lacking Urgency’, *Aviation Week & Space Technology*, Apr 10, 2017. <http://aviationweek.com/defense/classified-report-hypersonics-says-us->

lacking-urgency.

⁹ Robert Legvold, *Return to Cold War* (Cambridge, UK: Polity, 2016), p. 132.

Deterrence

Further Reading

Introduction by Dr David Jordan

The historiography of the Cold War, and especially the nuclear weapons component of the confrontation, understandably concentrates on the US-Soviet angle. Consequently, as this edition of *Air Power Review* illustrates, the significant contribution played by the UK's nuclear forces (including the Cuban Missile Crisis, which involved a significant British aspect) and has been somewhat under-represented in the history books. When the entirely understandable concern over security of this most sensitive element of Britain's Cold War defences is added to the mix, it is not unfair to say that the coverage of Britain's nuclear deterrent forces during the Cold War can be rather downplayed. This edition of *Air Power Review* has sought to contribute a collection of articles in addition to the Institute for Contemporary British History's witness seminar transcript to further draw out key aspects of Cold War deterrence and Britain's part in it.

In a bid to give an insight into the array of literature available to help illuminate Britain's role as a nuclear power, the following bibliography has been constructed. It is not exhaustive, but an exemplar of some of the best material available on the subject. It covers works addressing the conceptual underpinnings of deterrence – such as the 'classics' by Bernard Brodie, Thomas C Schelling and Sir John Slessor – as well as those which examine the part played by Britain as a nuclear power. The works suggested cover everything from Britain's decision to acquire atomic weapons of its own, through studies of the deterrent made real (first in the V-Force era), which saw aerial delivery as the means through which deterrence was provided, and then into more recent times with CASD provided first by submarine-launched Polaris and latterly Trident missiles.

As ever with air power, much of the bibliographic coverage of the V-Force seems to be dominated by a fascination with the aircraft used, rather than on the more important aspects concerned with their intended role, but there are some useful studies, as noted below. Also, the fact that there was a nuclear weapons capability provided by other parts of the RAF can be overlooked. Again, those interested in the RAF's role in nuclear deterrence both at the time of Cuba and beyond are likely to find more to satisfy their curiosity in books and articles dealing with the aircraft which provided the capability than in any detailed analysis of the nuclear QRA role. There are still gaps, since the picture of the RAF in the nuclear era – with a significant

element of capability being provided by tactical aircraft¹ – remains less clear than is ideal for students of air power. In part, this results from concerns over security, as can be demonstrated by the tantalizing files on the subject which might one day be released to historians at the National Archives.

The sources below represent an introduction for further study into nuclear deterrence and, particularly, Britain's approach to possessing a deterrent capability, closely aligned with, but operationally independent of, the USA. They present a clear picture of an era in which nuclear war was an ever-present possibility, with both sides perhaps deterred only from what the former Deputy Secretary to the Cabinet, Sir Michael Cary, referred to as a 'nightmarish gavotte' by the fear of reprisal and the inevitability of catastrophe if ever deterrence failed.²

Notes

¹ Starting with the English Electric Canberra, and followed by types such as the Vulcan (in a more tactically-focused role), Buccaneers, Phantoms and Jaguars before the Britain's airborne nuclear era ended with RAF Tornado GR1 squadrons holding nuclear QRA.

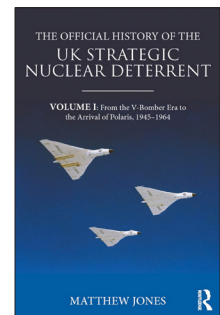
² Sir Michael Cary (1917-76), Deputy Secretary to the Cabinet (1961-63); Chief Executive, MOD Procurement Executive (1972-74); Permanent Undersecretary of State for Defence (1974-76); Peter Hennessy, *The Secret State* (Penguin Books, 2003, p.124).

Official Histories:

The Official History of the UK Strategic Nuclear Deterrent: Volume I: From the V-Bomber Era to the Arrival of Polaris, 1945-1964

Matthew Jones

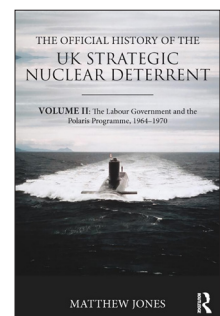
(Abingdon: Routledge, 2017)



The Official History of the UK Strategic Nuclear Deterrent: Volume II: The Labour Government and the Polaris Programme, 1964-1970

Matthew Jones

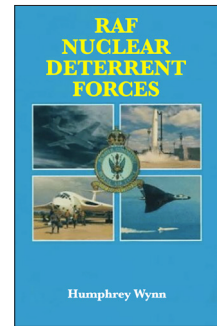
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The RAF strategic nuclear deterrent forces: their origins, roles and deployment, 1946-1969: a documentary history

Humphrey Wynn

(HMSO, 1994)



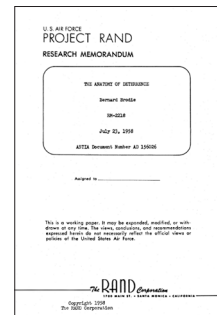
Strategy & Theories of Deterrence:

The Anatomy of Deterrence

Bernard Brodie

(Santa Monica: RAND, 1958)

https://www.rand.org/content/dam/rand/pubs/research_memoranda/2008/RM2218.pdf

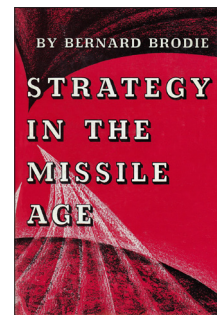


Strategy in the Missile Age

Bernard Brodie

(RAND, 1959)

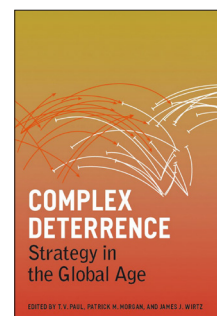
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Complex Deterrence

TV Paul, Patrick Morgan

(University of Chicago Press, 2009)

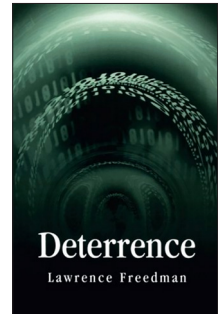


Deterrence

Lawrence Freedman

(Themes for the 21st Century)

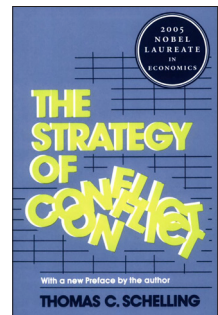
(Polity Press, 2004)



The Strategy of Conflict

Thomas Schelling

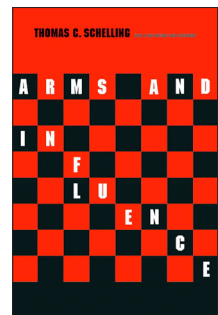
(Harvard University Press, 1960)



Arms and Influence

Thomas Schelling

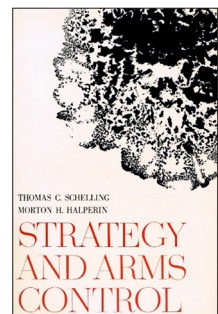
(Yale University Press, 1966)



Strategy and Arms Control

Thomas Schelling & Morton H Halperin

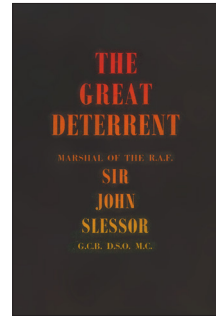
(Twentieth Century Fund, 1961)



The Great Deterrent

MRAF Sir John Slessor

(Cassell, 1956)

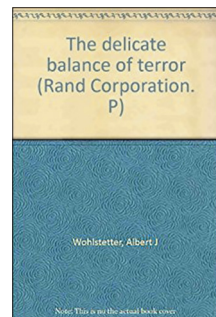


The Delicate Balance of Terror

Albert Wohlstetter

(RAND, 1958)

<http://www.rand.org/about/history/wohlstetter/P1472/P1472.html>

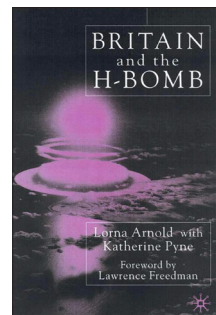


Britain, The Cold War and Nuclear Weapons:

Britain and the H-bomb

Lorna Arnold

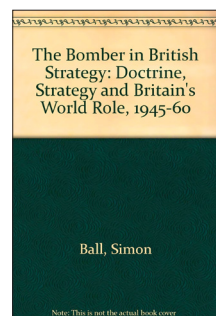
(Palgrave, 2001)



The Bomber in British Strategy: Doctrine, Strategy and Britain's World Role, 1945-60

Simon Ball

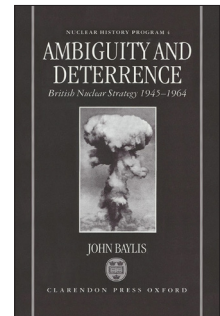
(Westview Press, 1995)



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John Baylis

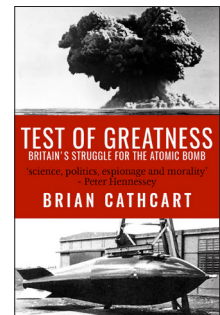
(Clarendon Press, 1994)



Test of Greatness: Britain's Struggle for the Atom Bomb

Brian Cathcart

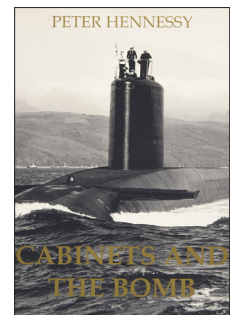
(John Murray, 1994)



Cabinets and the Bomb

Peter Hennessy

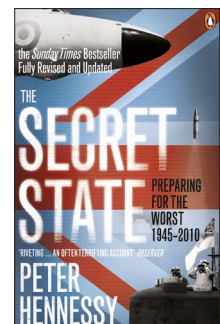
(OUP, 2007)



The Secret State 2nd edition

Peter Hennessy

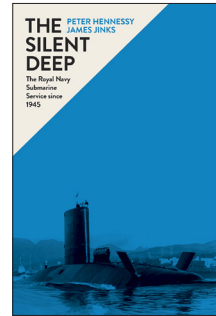
(Penguin, 2010)



The Silent Deep: The Royal Navy Submarine Service since 1945

Peter Hennessy & James Jinks

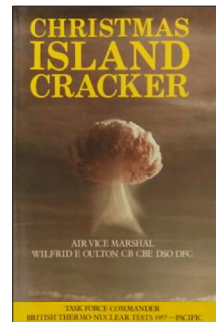
(Allen Lane, 2015)



Christmas Island Cracker

AVM Wilfred Oulton

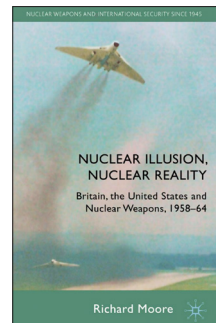
(Thomas Harmsworth, 1987)



Nuclear Illusion, Nuclear Reality: Britain, the United States and Nuclear Weapons 1958-64

Richard Moore

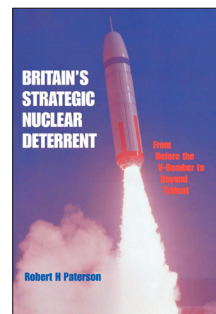
(AIAA, 2010)



Britain's Strategic Nuclear Deterrent: From Before the V-bomber to Beyond Trident

Robert H Paterson

(Abingdon: Routledge, 1997)



The United Kingdom and Nuclear Deterrence

Jeremy Stocker

(Routledge, 2007)

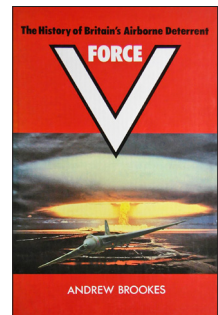


The RAF and the Strategic Deterrent:

V-Force: The History of Britain's Airborne Deterrent

Andrew Brookes

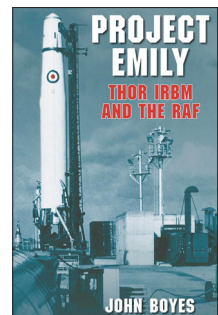
(London: Jane's Book Club Edition, 1982)



Project Emily: Thor IRBM and the RAF

John Boyes

(History Press, 2008)



Thor Ballistic Missile: The United States and the United Kingdom in Partnership

John Boyes

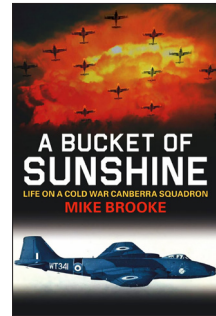
(Fonthill Media, 2015)



A Bucket of Sunshine: Life on a Cold War Canberra Squadron

Mike Brooke

(History Press, 2012)



My Target was Leningrad

Philip Goodall

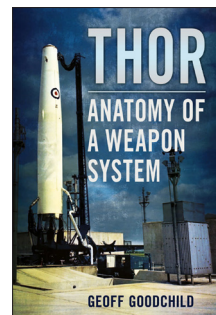
(Fonthill Media, 2015)



Thor: Anatomy of a Weapon System

Geoff Goodchild

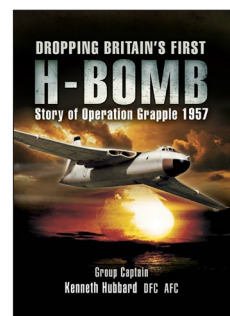
(Fonthill Media, 2016)



Dropping Britain's First H-Bomb: Story of Operation Grapple 1957

Gp Capt Kenneth Hubbard

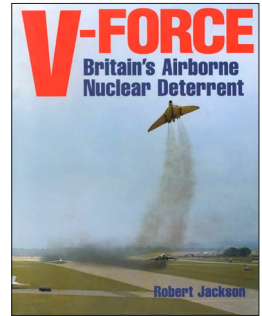
(Pen & Sword, 2008)



V-Force: Britain's Airborne Nuclear Deterrent

Robert Jackson

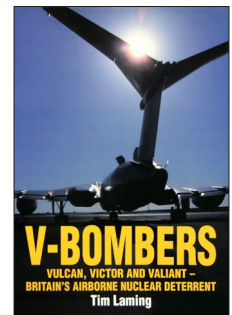
(Ian Allan Publishing, 2000)



V-Bombers: Vulcan, Victor and Valiant - Britain's Airborne Nuclear Deterrent

Tim Laming

(Patrick Stephens Limited, 1997)



RAF Historical Society Call For Papers

Overview

The Royal Air Force Historical Society was established in 1986 to provide a lens through which the study of the history of the Service might be focused. It does this by organising lectures and seminars at which those interested in the history of the RAF have the opportunity to meet those who participated in the evolution and implementation of policy. The Society believes that these events make an important contribution to the permanent record.

Membership

Membership is open to anyone with an interest in RAF history, irrespective of whether they have ever had any direct connection with the Service. By being a member of the Society you will receive the 3 journals produced each year and be invited to attend seminars designed to explore specific themes – all in all, this will give you access to a rich source of information about various studies undertaken by academics, serving personnel and those simply with an interest in RAF history. You will also be invited to the Society's AGM held every year in the RAF Club where you will be given the opportunity to voice your opinions on how the Society is managed. Membership costs £18 per year and application forms can be found on the RAF Historical Society website:

<https://www.raf.mod.uk/history/historicalsocietymembership.cfm>

For more details you can email the Membership Secretary (Wg Cdr Colin Cummings RAF (Retd)) at **colincummings@tiscali.co.uk**

Henry Probert Bursary – call for applications

Air Commodore Henry Probert MBE was one of the most eminent authorities on the history of the RAF, head of the RAF's Air Historical Branch, a founder member of the RAF Historical Society and, whilst serving, the RAF's Director of Education. Following his death, the RAF Historical Society endowed a bursary in Air Commodore Probert's memory to encourage scholarly research which is awarded by the RAF Historical Society Committee on a regular basis to those students who intend to add to the historiography of the RAF through their studies. Enquiries should be directed to the Directorate of Defence Studies, (telephone 01793 314848 or email **enquiries.dds@da.mod.uk**) and the next deadline for applications is 8 January 2018.

Two Air Forces Award – call for papers

In 1996, the Royal Air Force Historical Society established the Two Air Forces Award in collaboration with the United States Air Force Historical Foundation. This is presented annually

in recognition of outstanding academic work by a serving officer or airman adjudged to have significantly contributed to the historiography of air power. Entries are welcomed from any serving military or MOD Civil Service personnel for any air power-related essay to a maximum of 7,000 words). For more details, please contact the Directorate of Defence Studies (telephone 01793 314848 or email enquiries.dds@da.mod.uk). The next deadline for applications is 8 January 2018.

Air Power in an Age of Uncertainty



A One-Day Conference to be held at the Royal Air Force Museum in conjunction with the Air Power Studies Research Group, King's College London at the Joint Services Command and Staff College.

29 September 2017

Keynote Speaker:

Air Chief Marshal Sir Glenn Torpy

Over the past two decades, airpower has become the "Western way of war" [...] because it offers the prospect of military victory without large-scale destruction and loss of life.

John Andreas Olsen (2015)

Since Operation DESERT STORM, air power has increasingly become the tool of choice for Western governments. Air power has played a major role in conflicts since the end of the Cold War as part of state responses to violence in this period. As such, to understand the relevance of air power in this period, this conference, organised by the RAF Museum and the Air Power Studies Research Group of King's College London at the Joint Services Command and Staff College, aims to explore air power developments from the late-Cold War period through to the present day. The conference also seeks to bring together in one forum practitioners and academics, and wider Service, governmental and industry parties interested in the utility of air power. The conference will explore themes such as operations, contemporary air power challenges, air force culture and politics, ethics and perceptions of air operations.

Confirmed speakers:

Paula G Thornhill (RAND)

Dr David Jordan (King's College London)

Dr Peter Lee (Portsmouth Business School at RAF College Cranwell)

Dr Ross Mahoney (Royal Air Force Museum)

If you are interested in attending the conference please email the organisers using the address below. Additional conference details and registration information will be available soon.

Organisers:

Dr Ross Mahoney (RAF Museum)

Dr Bleddyn Bowen (King's College London)

conference@rafmuseum.org

[illegible]

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

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**Centre for Air
Power Studies**