Air Power and the Origins of Deterrence Theory before 1939

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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 a 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.

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 pre-dated 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 forseeable 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 tob 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 be 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.