15 The Cold War, II

The nuclear revolution

Reader's guide: The shock of the nuclear revolution. Nuclear weapons. The meaning of the nuclear revolution. Nuclear strategy. The nuclear arms competition.

Introduction: the strategic challenge

On reading the *New York Times*' report on the atomic bombing of Hiroshima on 6 August 1945, America's leading scholar of naval strategy, Bernard Brodie, is reported to have lamented, 'everything that I have written is obsolete' (Kaplan, 1983: 10). Today, it is difficult to recapture the shock, bafflement and sense of the vastness of the strategic challenge felt by strategists in 1945 when confronted for the first time with the demonstrated fact of the atomic bomb. Nuclear weapons can be bracketed with air power, space power and now cyber-power as comprising a clutch of wholly new means of warfare. Each has required its users to understand what it can and cannot do. It is unprecedented in strategic history for a century to produce four essentially technological revolutions in military affairs. But the nuclear revolution was distinctive, in good part for reason of the unprecedented menace that it brought to international relations. Air power, space power and cyber-power all arrived over a period of years, though the pace of air power's development was accelerated by the Great War of 1914–18. That relatively slow arrival meant that each was subject to much speculation and debate prior to its being accorded major importance in strategic affairs. Not so the nuclear weapon.

Because of the secrecy surrounding the Manhattan Project (1942–5), there was no strategic theory, military doctrine or policy ready and waiting for the new weapon. It was developed initially for the major purpose of pre-empting a possible German bomb, and later for the immediate purpose of substituting for a potentially bloody invasion of the Japanese Home Islands. The atomic programme was not pursued for its possible coercive effect in Moscow, but that was regarded by Washington as a useful bonus. The best minds among America's strategic thinkers in the mid-1940s were suddenly (and one must emphasize the unexpectedness of Hiroshima and Nagasaki) confronted with the need to make strategic and therefore political sense of a weapon whose very existence had been unknown to them shortly before. Ironically, the historical context for meeting this

challenge was America's 'strategic moment'. In 1945, the United States – with help from its allies, of course – had triumphed simultaneously in two wars on opposite sides of the globe. Moreover, America was the superpower: its economic strength placed it in a class of its own. Indeed, throughout the Cold War years it is appropriate to think of the United States as the first-class superpower and the Soviet Union as the second-class one. That real distinction was to have black consequences for Soviet competitive prospects.

This chapter comments on the apparent autonomy of the nuclear arms competition of the Cold War. For several decades there was little genuine political dialogue between Moscow and Washington. The two dared not compete directly by force of arms. As a consequence, the arms race and discussion of its limitation became a – perhaps *the* – prime avenue of communication between the protagonists. From the 1960s to the 1980s, the convening of, and positions in, Soviet–American arms control negotiations took diplomatic centre-stage. This did not mean that the weapons competition was driving the foreign policies of the superpowers, but it did reflect the contemporary reality that Washington and Moscow could not talk productively about settling their political differences. Instead, they could possibly ease political tensions and improve mutual understanding by engaging in highly technical discussions on the limitation of arms. To quote Marshall McLuhan's popular maxim of the late 1960s, 'the medium is the message'. The world found it reassuring that there was an ongoing, albeit on–off, arms control discussion/negotiation process. Its very existence was talismanic. 'At least the superpowers are talking' was the popular judgement.

There may have been some utility for international security in Soviet–American, and other East–West, arms negotiations, but agreements of strategic significance were impossible until the political context was changed beyond all recognition by the domestic revolution in the Soviet Union effected by Mikhail Gorbachev after 1985 and by Boris Yeltsin in 1991. While the Soviet Union was in business as an ideological antagonist to the world of democratic capitalism, useful progress towards better relations could not be made by means of arms control. Politics could not be evaded by technical agreements. The ABM Treaty of 1972 was not an exception to this rule. In Soviet eyes, though not in most American, that treaty denied the United States the option of pursuing a technological advantage in defensive systems. When the Soviet Empire was dissolving in the late 1980s, its extensive nuclear and conventional armaments, and the vested interests in their future, proved not to pose obstacles to what amounted to a political revolution.

It would be difficult to exaggerate the scale of the strategic challenge that the United States, its allies and the Soviet Union had to meet with the dawning of the Nuclear Age. Blessed with the wisdom of hindsight, there is some basis for confidence in beliefs concerning nuclear weapons. But in the 1940s and 1950s, policy-makers, soldiers and hostage publics were moving into, and they hoped safely through, unknown strategic terrain.

The bomb

The Cold War and nuclear weapons are connected inextricably. The strategic history of the period 1945 to 1989 seemingly was driven, assuredly was shaped, by what became a shared realization of the danger that lurked in the nuclear arsenals. This was strategic history in its most literal sense. Some commentators, scholars and policy-makers, in the

West at least, came to believe that the real enemy was not the Soviet Union, but rather the awesome nuclear engines of mass destruction that both sides constructed and maintained. Although those weapons and the political context of the Cold War were vitally linked, neither depended on the other for its existence. As was explained in Chapter 14, the Cold War was the product of the clash between Soviet and American ideologies, the struggle for advantage between two very great powers, the historical context of the course and outcome of World War II, and the personality of Joseph Stalin. The competition in nuclear arms was an expression of ideological and geopolitical rivalry; it was not its cause. Over time, however, the scale of the threat posed by the nuclear arsenals did seem to many people to overshadow and even dominate the political context, while it largely ordered the strategic context of the struggle.

The story of 'the bomb' may be quickly told. The atomic bomb, in two variants (uranium and plutonium), was developed in an Anglo-American crash programme, the Manhattan Project, between 1942 and July 1945. Thanks to its agents in place, especially Klaus Fuchs, seconded to the project from Britain, the Soviet Union knew what was going on. But Moscow was too heavily committed to its war of survival against Germany to devote desperately scarce resources to a serious nuclear weapons programme until the end of the war.

The political impetus to attempt to weaponize nuclear physics was initially strictly precautionary. In the years 1939–42, and even residually thereafter, there were some good reasons to fear that Germany might succeed in building an atomic bomb. Politically and strategically, that possibility simply could not be ignored, although it receded as the war proceeded. Had Germany built the first atomic bomb, the strategic and political consequences most likely would have been catastrophic, certainly for its enemies and possibly, ultimately, for itself.

Germany had been the world leader in physics, at least before the Nazis caused an international elite of German and Hungarian Jewish scientists to emigrate. Typically, they moved to Britain initially, and then on to the United States, where their research was better supported. However, Germany did harbour a native son of acceptable ethnicity in the person of the world-famous mathematician and theoretical nuclear physicist Werner Heisenberg. Allied knowledge of his leadership of the German nuclear programme provided reasonable grounds for concern.

The origins of the Nuclear Age that is still with us can be traced through 100 years of progress in physics, chemistry and mathematics. Until World War II the Republic of Science was truly international, with the partial exception of those working in the Soviet Union. Discoveries and theories were shared across frontiers without political restriction. There was no military demand for the atomic bomb. The impulse to weaponize nuclear physics was entirely political, and therefore strategic. Because the British and American governments recognized the appalling probable consequences should Nazi Germany be the first to construct an atomic bomb, they were obliged to find out whether such a venture was scientifically and technically feasible. The only way to do that was to try to build a bomb themselves: hence the Manhattan Project.

Box 15.1 **The scientific and technological feasibility of atomic weapons**

The scientific trail to Hiroshima and Nagasaki is clear enough. The neutron was discovered in 1932. The following year, that discovery sparked realization that the neutron could be employed to trigger an explosive chain reaction. An even more significant scientific breakthrough was achieved in January 1939, when Otto Hahn and Fritz Strassmann managed to achieve nuclear fission, the splitting of uranium atoms. They demonstrated that the atom could be split by means of neutron bombardment, and a self-sustaining process, a chain reaction, of atomic fission might be achieved. But theoretical physics and an isolated experiment were not remotely the same as bomb building. The crucial step towards a practicable bomb was taken when two German émigré physicists, Otto Frisch and Rudolf Peierls, working at the University of Birmingham in Britain in March 1940, calculated the critical mass of fissile material required for a self-sustaining fission chain reaction. They were amazed to discover that the necessary critical mass of the isotope of uranium (^{235}U) that had to be extracted from natural uranium (^{238}U) was a mere eleven pounds. Prior to their research, it was widely believed among nuclear physicists that as much as 30,000 pounds of ^{235}U would be needed. Apart from the impracticality of extracting that much of the isotope from ^{238}U, any bomb that resulted would be so large and heavy that it could be delivered only by ship. In other words, it was thoroughly impractical as a weapon. Frisch and Peierls's calculations changed all that, and impressed first the British government and then the American. Now it seemed, in theory at least, that the atomic bomb should be technically feasible. Another fissionable element was discovered – or rather made, since it did not occur in nature – on 28 March 1941 in the form of plutonium (^{239}Pu). The atomic bomb that devastated Hiroshima 6 August 1945 was made with a critical mass of ^{235}U; the Nagasaki bomb, dropped three days later, used ^{239}Pu.

There were several reasons why Nazi Germany made little progress towards the development of an atomic bomb, notwithstanding the understandable anxieties of British and American leaders and their scientific advisers. First, Hitler had little or no interest in physics. In fact, he actively disliked the discipline, regarding it as a 'Jewish science'. Second, the atomic bomb, even if it should prove feasible, was believed to be strictly a long-term project, capable of producing useful results, if at all, only years after the current war had reached its conclusion. In 1942–3, Nazi Germany was not much interested in heavy investment in the next war. Third, Germany's premier scientist, the aforementioned Werner Heisenberg, advised Minister of Armaments Albert Speer, who duly advised the Führer, that the atomic project faced all but insuperable technical difficulties. In particular, he said, it would be almost impossible to gather or create the necessary critical mass of fissionable ^{235}U. Heisenberg did not claim that a bomb could not be built, but he did say that it could not be built for many years, and only then at very great expense. After the war, Heisenberg claimed that he deliberately sabotaged Nazi bomb research by misinforming Speer about the scale of the technical difficulties; there has been a long-running debate among scholars over whether he lied in that matter

(Powers, 1993; Cornwell, 2004: 406–10). The balance of scholarship today favours the view that Heisenberg, for all his undoubted brilliance as a theorist, was not a gifted experimental physicist. Furthermore, despite being a mathematical genius, he was notoriously casual in his calculations. In short, it seems he misinformed his government inadvertently. He had not correctly calculated the necessary critical mass for a self-sustaining chain reaction, and he had no practical idea of how to build a bomb; he was no sort of engineer. When one considers the scale and diversity of effort, and therefore the cost ($1.9 billion in 1945 dollars, which equates to approximately $25 billion today), of the Manhattan Project, it is evident that the Germans never even approached the level of resource commitment that would have been necessary. But it is worth noting that, had Hitler been captivated by the prospect of an atomic bomb, he probably could have achieved it in the three years taken by the Manhattan Project. That claim can be made because, from 1942 to 1945, Nazi Germany did undertake a Manhattan-scale project: the strategically futile programme to mass-produce the V-1 and V-2 long-range rockets. These were mighty technological accomplishments but, in marked contrast to atomic bombs, they carried no near-term potential to change the course of strategic history.

The nuclear revolution

What was revolutionary about atomic fission (and later hydrogen fusion) weapons? Note that the nuclear revolution occurred in two stages, with the better part of a decade between them. Stage one was the development in 1945 of the atomic bomb (A-bomb), a weapon whose energy was produced by fission. Stage two, accomplished in 1952 and 1953, was the development of the hydrogen bomb (H-bomb), whose energy was generated by the process of fusion, albeit with a fission trigger (see Box 15.2). The vital difference between the A-bomb and the H-bomb is that the explosive energy yield of the former is strictly limited by the nature of the materials, their dynamic interaction, and consequently there can be a problem in keeping the weapon stable. The H-bomb has no theoretical limit to its energy yield. Americans were shocked by their BRAVO hydrogen (thermonuclear) bomb test of 1 March 1954, which produced fifteen megatons instead of the design yield of five. Control of the energy yield failed. In 1961, as an act of intended political intimidation, Nikita Khrushchev announced the intention to test a thermonuclear weapon of 100 megatons. In practice, the yield was restrained to 50.7 megatons. This monstrous explosion was the largest test to be carried out during the Cold War.

Box 15.2 Two kinds of nuclear weapons

Atomic weapons

- Atomic weapons derive their energy from the process of nuclear fission.
- Nuclear fission is achieved by breaking up the nuclei of uranium (^{235}U) or plutonium (^{239}Pu) through bombardment by neutrons.
- The splitting of the atomic nuclei creates a self-sustaining chain reaction that releases explosive energy.

- The nuclear weapons dropped on Hiroshima and Nagasaki had explosive yields, respectively, of 15 kilotons and 20 kilotons (15,000 and 20,000 tons of TNT equivalent, respectively).
- Atomic weapons are limited in their explosive yield by the relative inefficiency of the fission process, when compared with fusion, as well as by constraints imposed by physical size and safety considerations.

Thermonuclear weapons

- These weapons require the nuclear fusion of two lighter (than ^{235}U or ^{239}Pu) elements, usually deuterium and tritium (isotopes of hydrogen) to form helium.
- A thermonuclear weapon employs a fission explosion as a trigger to compress the deuterium and tritium together by implosion sufficiently for them to fuse.
- These weapons are generally called hydrogen bombs. There is no theoretical or practical limit to the explosive yield that can be achieved by such bombs. Typically, strategic nuclear weapons have been deployed with yields ranging from several hundred kilotons to the low megatons (a megaton is 1,000,000 tons of TNT equivalent).

(Bernstein, 2008: *passim*)

The hydrogen fusion bomb radically changed the strategic context. From atomic weapons in the tens of kilotons, the Cold War protagonists were able, after 1953–4, to field fusion weapons in the megaton range. Until the H-bomb was deployed in large numbers in the mid- to late 1950s, it was just possible to argue that a World War III would be like World War II but with the addition of precursor bilateral atomic campaigns. Those campaigns were not expected to conclude the war. But once the H-bomb was deployed, such an argument could no longer be advanced and sustained. The H-bomb was so destructive that a new set of strategic ideas and a new policy were required to fit the changed strategic context.

Now it is necessary to return to a thus-far unanswered question: what was revolutionary about nuclear, and especially fusion, weapons? Five answers command attention.

First, these novel weapons seem to fracture the link between means and ends which is the instrumental essence of strategy itself. Nuclear weapons appeared to be, indeed may be, too powerful and too destructive, if used, to serve any political ends. Whatever their utility as a threat, nuclear weapons are commonly not really seen as weapons at all, while 'nuclear strategy' is a contradiction in terms. The problem was, and is, that the weapons exist. Governments and the armed forces of nuclear-armed states have had no choice but to devise policy, strategy and doctrine for these fearsome devices.

Second, if nuclear weapons are held by both sides in a war, they should render decisive military victory impossible. Provided a fraction of both nuclear arsenals are secure against attack, nuclear retaliation could, and almost certainly would, follow any nuclear attack. Even decisive military victory in a conventional war between nuclear-weapon

states should be improbable. The belligerent facing such defeat would be strongly motivated to resort to its nuclear arms rather than suffer conventional defeat.

Third, a nuclear-armed state can defeat an enemy without first defeating its armed forces, but if that enemy were also nuclear armed the net result would be bilateral defeat. This condition renders the prospect of high-intensity conflict distinctly unattractive.

Fourth, as the Cold War probably illustrated, nuclear weapons raise the threshold for the resort to force. Nuclear-armed states are, or ought to be, much more reluctant to fight each other than are non-nuclear states. One must add the caveat that this claim for the revolutionary effect of nuclear weapons rests uneasily on negative evidence, which is to say on events that did *not* happen. There is no way to be certain why possible wars did not occur. For a further caveat, the extant body of nuclear lore still derives overwhelmingly from the Cold War. It is entirely possible that the twenty-first century will witness nuclear-armed polities behaving with less restraint than did protagonists in the twentieth.

Fifth, nuclear weapons have the effect of freezing conditions of political confrontation. It is not only war that is too perilous to contemplate as a policy option. Even dangerous behaviour short of war is likely to be judged irresponsibly risky. Nuclear weapons appear to have deprived war of its prime traditional rationale. It can no longer be regarded as an instrument of policy to solve a problem that cannot be settled in any other way, at least not in conflicts between nuclear-armed rivals.

These points comprise the strategic core of the nuclear revolution. That revolution appeared to have consequences that were anti-strategic; antipathetic to the possibility of victory; potentially mutually suicidal; encouraging of super-cautious behaviour by nuclear-armed rivals; and promoting of geopolitical immobility. But the nuclear narrative of the Cold War was not quite that simple and certain.

Nuclear strategy

If nuclear weapons cannot serve political purposes as weapons in military use, they can certainly serve policy by the threat of their employment. Eventually, both superpowers recognized that large-scale nuclear use would be self-defeating, since a disarming first strike ceased to be militarily feasible by the mid- to late 1960s. Until that time, the United States might have succeeded with a surprise attack upon Soviet nuclear forces. The rival nuclear arsenals were dynamic in quantity and quality. Not until the 1960s were both the United States and the Soviet Union able to deploy long-range nuclear-armed forces in the diversity of basing modes that should render a successful surprise attack against them impossible. The now-familiar strategic forces triad – comprising ICBMs (intercontinental ballistic missiles), SLBMs (submarine-launched ballistic missiles) and manned bombers – appeared only early in that decade.

Irrespective of whether nuclear strategy was a futile pursuit, it was an inescapable necessity. As their nuclear arsenals grew from the tens to the thousands, and eventually to the tens of thousands, the United States and the Soviet Union, followed by others, had to develop nuclear strategies (see Table 15.1). Furthermore, those strategies had to be tailored to the unique geopolitical and therefore geostrategic situation of each state. Also, they were in constant need of amendment as the technologies of weapon design and delivery evolved. Most particularly, by the close of the 1950s, the Nuclear Age had been joined (with synergistic effect) by the Missile Age.

Table 15.1 Nuclear stockpiles* during the Cold War, 1945–89

Year	*United States*	*Russia*	*UK*	*France*	*China*
1945	2				
1946	9				
1947	13				
1948	50				
1949	170	1			
1950	299	5			
1951	438	25			
1952	841	50			
1953	1,169	120	1		
1954	1,703	150	7		
1955	2,422	200	14		
1956	3,692	426	21		
1957	5,543	660	28		
1958	7,345	869	31		
1959	12,298	1,060	35		
1960	18,638	1,605	42		
1961	22,229	2,471	70		
1962	25,540	3,322	288		
1963	28,133	4,238	394		
1964	29,463	5,221	436	4	1
1965	31,139	6,129	436	32	5
1966	31,175	7,089	380	36	20
1967	31,255	8,339	380	36	25
1968	29,561	9,399	394	36	35
1969	27,552	10,538	433	36	50
1970	26,008	11,643	394	36	75
1971	25,830	13,092	309	45	100
1972	26,516	14,478	309	70	130
1973	27,835	15,915	387	116	150
1974	28,537	17,385	457	145	170
1975	27,519	19,055	492	188	180
1976	25,914	21,205	492	212	180
1977	25,542	23,044	492	228	180
1978	24,418	25,393	492	235	190
1979	24,138	27,935	492	235	195
1980	24,104	30,062	492	250	205
1981	23,208	32,049	492	274	225
1982	22,886	33,952	471	274	235
1983	23,305	35,804	450	279	240
1984	23,459	37,431	380	280	249
1985	23,368	39,197	422	360	243
1986	23,317	45,000	422	355	230
1987	23,575	43,000	422	420	230
1988	23,205	41,000	422	410	240
1989	22,217	39,000	422	410	238

Note: * These figures refer to total numbers of nuclear devices possessed by the various countries. In any given year, some of these may have been effectively useless, as atomic weapons degrade over time and lose their utility.

Source: Adapted from Norris and Kristensen, 2010: 81–2.

Nearly everyone in the Western Alliance agreed on deterrence as the master concept for the new weapons, but there was scant agreement on how best to deter and how to keep a relationship of mutual deterrence stable. Strategic stability, regarded technically strictly in military terms, was deemed to reside in a context where neither side could secure a major advantage by striking first. In the contemporary jargon of defence analysis, a stable context was one in which the first-strike bonus was low or negligible. Such a context was said to be 'crisis stable'. The most popular thesis in the West was that strategic stability was ensured by the mutual ability of the superpowers to inflict unacceptable damage upon each other in any and all circumstances. This strategic – perhaps anti-strategic – condition came to be known as mutual assured destruction (MAD). The roles of society were to pay for the nuclear armed forces and to serve uncomplainingly as hostage to the prudent and sober behaviour of its political leaders.

The previous paragraph is the standard characterization of the Soviet–American nuclear stand-off during the Cold War. It is not so much untrue as misleading. Two aspects to superpower nuclear strategy need to be distinguished. First, there was declaratory policy and strategy, or what officials claimed to be the purpose and methods that would guide their nuclear forces in action. Second, both sides had operational nuclear strategies which might not bear much relationship to declaratory policy. Mutual assured destruction almost certainly would have been the result of an East–West nuclear war in the 1960s, 1970s or 1980s. Politicians may have spoken about the MAD context as though it were strategy, but of course it was not. Assured destruction, let alone mutual assured destruction, is a denial of strategy and, in action, could serve no conceivable political purpose (unless revenge for the sake of a destroyed country's honour can be so characterized).

It is reasonable to comment that the primary, possibly the sole, function of nuclear forces was to deter, and that issues of nuclear strategy were therefore all but irrelevant. Whatever the merit in that argument, it does leave open the question of the relationship between declaratory policy and operational strategy. How did states plan to employ their nuclear forces in the event of war? The evidence of deeds in defence preparation in the arms competition is overwhelming in pointing to the fact that neither the Soviet Union nor the United States was content with a context of mutual assured destruction. They may have struggled in vain to escape its logic and prospective reality, but struggle they did. Neither side was willing to abandon all hope of being able to employ nuclear weapons in search of strategic advantage. Politicians and commentators during the Cold War might characterize the contemporary nuclear stand-off in terms of MAD, and they were probably correct to do so, but defence professionals could not responsibly settle for a strategic context that guaranteed mutual suicide (Gray, 2006d: ch. 6; Jervis, 1989).

Mutual assured destruction was the reality of the superpowers' strategic nexus after the mid-1960s, but neither side selected it as strategy. Its public airing and explanation by Secretary of Defense Robert S. McNamara was declaratory, not action, policy and strategy. He presented it publicly for the purpose of capping America's build-up of long-range ballistic missiles and thereby limiting the size of the US nuclear arsenal. The policy had nothing worthy of note to do with actual strategy.

The Soviet Union would never concede as policy, or in strategy, its total vulnerability to nuclear attack. In fact, despite more than two decades of on–off negotiations on strategic arms control, by the end of the Cold War the superpowers still had not managed to agree on a common definition of 'strategic stability'. That rather telling point suggests

that the Soviet Union was not fully on board for the contemporary US policy goal of a relationship of stable mutual deterrence. The ABM Treaty of 1972 permitted each side to deploy only one defensive site. In effect, it denied the signatories the option of seeking to defend the whole of their homelands actively. That treaty was widely interpreted in the West as proof positive that the Soviet Union had finally recognized the wisdom in Western strategic thinking and had endorsed the concept of mutual assured destruction. On balance, and with the benefit of hindsight and some post-Cold War revelations, it is reasonably clear that the Soviet Union signed up to the treaty not in order to freeze, or just recognize the grim reality of, a MAD condition, but rather to slow the pace of threatening American developments in defensive weapons technology (Odom, 1998: 71, 436 n.25).

To summarize the problems with mutual assured destruction: the Soviet Union never endorsed it, while the United States found it entirely unacceptable, indeed absurd and irresponsible, as strategy. Americans worried that accidents and miscalculations could happen which might lead to nuclear war. In any of those dire events, what sense could there be in a nuclear war plan that offered only the single outcome of guaranteed Armageddon? For that was what mutual assured destruction meant. The threat to destroy Soviet cities and a large percentage of the Soviet people was both politically incredible, though technically easy to accomplish, and strategically valueless. How much destruction needed to be assured for the Soviet Union to be deterred from attacking the United States and its allies? According to McNamara in the mid-1960s, the answer was between 20 and 33 per cent of the population and 50–75 per cent of the industry. The calculation was strictly material, a cost–benefit analysis; it had no basis in strategic theory or logic, let alone in historical experience.

From the moment when the Soviet Union demonstrated an atomic weapons capability in August 1949 until the end of the Cold War, the United States struggled to find a nuclear strategy capable of offsetting the inhibitions implicit in a mutuality of nuclear deterrence. The geopolitical and geostrategic context was classically asymmetrical. Superior Soviet conventional forces menaced America's friends and allies in Western Europe. But the United States extended deterrence to protect those friends and allies by means of technologically superior, and more numerous – until the 1970s – nuclear forces. The story of US nuclear strategy throughout the Cold War is keyed to the twin issues of credibility and, increasingly over time, the possible limitation and control of a nuclear war. The United States was an ocean away from NATO-Europe, and it was believed to be difficult to persuade a determined, perhaps a desperate, Soviet adversary that Americans would be willing to hazard US cities on behalf of foreigners.

For nearly forty years, American nuclear strategy sought to offset the inconvenient facts of strategic geography. The United States needed to persuade the Soviet Union that it might use nuclear weapons first in response to a conventional invasion of Western Europe. Furthermore, it had to appear capable of dominating a subsequent process of nuclear escalation. In the late 1940s the United States enjoyed a nuclear monopoly for four years, and through the 1950s and well into the 1960s it was plainly superior in nuclear forces, notwithstanding periodic alarms about falsely predicted bomber and missile 'gaps'. But how could extended deterrence be maintained once the Soviet Union achieved strategically functional (albeit not numerical) nuclear parity in the late 1960s? What could the United States substitute for its previous nuclear superiority? The condi-

tion of strategic parity was seemingly conceded by Washington on 26 May 1972 with the SALT I Interim Agreement on Certain Measures with Respect to the Limitation of Strategic Offensive Arms.

There were four possible answers to America's, and therefore NATO's, credibility problem with nuclear deterrence. First, the British and especially the French national nuclear deterrents, which admittedly were more (Britain) or less (France) dependent upon US assistance, might take up any slack in the needful quantity and quality of deterrence. It might not be judged in Moscow to be likely that Americans would risk their country for European allies, or even for American forces based in Europe, but the willingness of the French and the British to employ their nuclear weapons if they were threatened with invasion, or with Soviet nuclear use, ought to be high. Unsurprisingly, this logic did not appeal to the United States. Washington was not at all keen on the idea of being precipitated into a nuclear war catalysed by an ally of its own (European) volition.

Second, the United States might seek to restore some credible usability to its nuclear forces by recovering a measure of strategic superiority through the addition of active missile defence of its homeland. This distant possibility was abandoned in the ABM Treaty of 1972, though it did return with maximum political impact when President Reagan surprised friends and rivals alike with his announcement on 23 March 1983 of a Strategic Defense Initiative (SDI), promptly (and pejoratively) labelled 'Star Wars' by the Democratic Senator Edward Kennedy. Effective missile defence was not technically feasible during the Cold War decades. However, it was a plausible technological possibility and, as a consequence, prudent Soviet policy-makers dared not dismiss it out of hand.

Third, the United States could seek to restore credibility to its ever more evenly matched strategic nuclear forces by refining its nuclear doctrine and operational plans. In practice, this was the dominant US answer to the challenge posed by Soviet strategic parity. From the early 1960s until the end of the Cold War, US nuclear doctrine and plans sought to achieve flexibility in order to provide options for the National Command Authorities (NCA). It might not be credible to threaten total catastrophe, action that must end in mutual nuclear suicide, but, so the reasoning proceeded, it should be possible to restore credibility and retain some control of events by limiting the scope and scale of nuclear strikes. Of course, the control of a nuclear war by flexibility of response would require cooperation on the part of the enemy. On the basis of the admittedly unreliable evidence available, there are grounds for scepticism over the ability and willingness of the Soviet Union to wage a limited nuclear war. After the mid-1960s, damage in a World War III could have been limited only by reciprocated restraint in nuclear targeting. The Soviet Union had both strategic cultural and practical military objections to the American liking for 'limited nuclear options'. If flexible response – or, more accurately, limited first and subsequent use – was the principal safety net against the Cold War concluding with Armageddon, then the world was in a most perilous condition. Unfortunately, when regarded technically, Soviet–American strategic relations were in precisely such a condition in the 1970s and 1980s.

The fourth US answer to the Soviet attainment of strategic nuclear parity would be to return to its policy and strategic logic of 1950. In a high-level study, NSC-68, dated 14 April 1950, American officials had reasoned that in response to the Soviet breaking

of the previous US atomic monopoly, the United States and its allies should build conventional forces capable of defending Europe against the Red Army (Etzold and Gaddis, 1978: 433–4). The burden of nuclear credibility, the credibility of first nuclear use, would be transferred from the United States to the Soviet Union. In practice, if never explicitly in policy, in the 1980s the United States came close to realizing the 1950 vision of a NATO able to withstand a Soviet conventional assault. By exploiting new information technologies, the United States developed, or credibly threatened to develop, 'smart conventional' munitions capable of massacring Soviet armour at a distance. The key technology programme was a project lethal to Soviet armoured fighting vehicles labelled 'Assault Breaker'. Soviet officials were appalled, and suitably worried that their recent massive investment in the comprehensive modernization of their ground forces was about to be negated by NATO's non-nuclear weapons (Barrass, 2009: 338–9).

Fortunately, there is no way of knowing which, if any, of the ideas and programmes outlined above would have fared well under the pressure of wartime events. Also, there is no way of knowing which ideas had more or less utility for deterrence. Although the nuclear revolution and its manifestation in rival arsenals were expressions of political hostility, somehow the political meaning of the nuclear arms competition could all but vanish from sight. The nuclear arms race seemed to take on a life, and follow a logic, of its own. This was not really the case, but it certainly appeared so. How did the nuclear revolution relate to the course and outcome of the Cold War?

The nuclear arms competition

The nuclear arms race, far from being a likely cause of war from the late 1940s until 1989, was a partial substitute for actual hostilities. Since nuclear arms were not obviously usable as weapons, and given that they had the effect of freezing geopolitical lines of demarcation, the arms competition was the principal safe way in which the superpowers could prosecute their rivalry. In times past, even as recently as the 1930s, international competition between great powers could be pursued by the acquisition of allies as well as by the unilateral development and amassing of armaments (Maiolo, 2010). But in the Nuclear Age, with the possible course of conventional warfare inevitably overshadowed by nuclear dangers, the addition or subtraction of allies was of little strategic importance. At least, that is how it seemed during the Cold War. However, this is not to deny the strategic importance of the Chinese defection from the Soviet camp in the early 1960s, and its eventual informal strategic alliance with the United States from 1972 until the end of the 1980s.

Although the nuclear arms race was not dangerous in itself, and on balance may have acted as a safety valve, it was inevitably a source of anxiety to both sides. Politicians seemed to understand that nuclear weapons were radically different from other kinds of armament, and, ironically, that they had strategic utility only in the threat of their use, which is to say strictly in their non-use (Brodie, 1973: ch. 9). But the defence professionals of East and West had no choice other than to assume that nuclear weapons might be used. As the nuclear arsenals grew in number and sophistication, and as the Missile Age joined the Nuclear Age, the rival military establishments were obliged to devise doctrines to guide planning for nuclear use. The fact that nuclear weapons are so destructive that they ought not to be used except as an instrument with which to threaten for

deterrence is no guarantee that they will never be used. Nuclear war was an ever-present, if generally and usually believed to be remote, possibility throughout the Cold War.

Both the United States and the Soviet Union succeeded in designing and implementing systems for the command and control of nuclear forces which accomplished contradictory functions. On the one hand, nuclear forces had to be so ready for use that they could not be destroyed in a surprise attack. This challenge was greatly eased by the allocation of a major fraction of the retaliatory mission to SLBMs carried by SSBNs (nuclear-powered ballistic missile-firing submarines), weapons which need not be launched in haste on warning in order to survive, provided the boats were at sea. On the other hand, the nuclear forces, while always ready to be launched, had to be kept under such tight control that they could never be launched by accident or by unauthorized local military initiative. Although the Cold War years registered many accidents and much miscalculation based on ignorance, the historical record tells us unambiguously that the safety procedures, as well as the good sense of key individuals on both sides were good enough – because there was no nuclear war.

Conclusion

It is tempting to believe that the theory and practice of deterrence as rediscovered, practised and subsequently taught by the United States in the Cold War was a great success. It is hard to contradict such a claim, with its apparent supporting evidence of a no-war outcome to the Cold War. There can be no question but that American and Soviet nuclear doctrines proved to be compatible with an absence of war. But was there a causal relationship? We do not know. An ocean of ink and a small forest of paper were expended in protracted and repeated debates over nuclear strategy (Freedman, 2003; Payne, 2008). However, whether the peace was kept because of US and Soviet mastery and implementation of strategic ideas for the prudent governance of nuclear weapons must forever remain a mystery. It is possible that the human race survived the Cold War without suffering a nuclear cataclysm *despite*, rather than because of, the authoritative strategic theories and doctrines of the period.

The American and Soviet defence establishments were obliged as a matter of elementary prudence to assume that their rival might succeed in developing a weapon or weapons that would yield a militarily useful advantage. Eventually it was clear enough to both sides that nuclear weapons could not be used to threaten for the purpose of gain. Their utility was strictly for defence. However, that strategic revelation did not occur until the 1960s. Before then, neither Washington nor Moscow knew what the limits of nuclear diplomacy were. Only experience could reveal the answer. In the 1950s, with nuclear weapons having been employed in anger as recently as 1945, there seemed good reason to believe that they would be used across a wide range of warfare in the future. The Cold War years, particularly those from 1950 to 1962, provided education in the meaning and implications of the nuclear revolution. But the lessons that could be learned from negative evidence were inherently ambiguous.

Key points

1. Nuclear weapons were developed in an Anglo-American crash programme from 1942 to 1945, out of anxiety lest the Germans should be the first to acquire 'the bomb'.
2. For a long while after Hiroshima and Nagasaki in 1945, the United States did not have a strategy for its slowly growing nuclear arsenal.
3. The nuclear revolution occurred in two stages: first, the development of atomic weapons in the early 1940s; then, the development of thermonuclear, or hydrogen, weapons in the early 1950s.
4. Nuclear weapons raised the political threshold for the resort to force in relations between nuclear-armed states.
5. The Soviets did not agree with the American concept of stable mutual deterrence achieved by capabilities for mutual assured destruction (MAD).
6. The history of US nuclear strategy in the Cold War is the history of the search for credible, or not incredible, nuclear threats and options for use, in order to extend deterrence over distant allies.
7. Strategic history cannot reveal whether World War III was avoided because of nuclear strategy, or despite it.

Questions

1. Is the concept of 'nuclear strategy' a contradiction in terms?
2. What was the strategic value of nuclear weapons in the Cold War?
3. How was nuclear deterrence supposed to work?
4. Did nuclear weapons keep the Cold War cold?

Further reading

J. Bernstein, *Nuclear Weapons: What You Need to Know* (Cambridge: Cambridge University Press, 2008).
B. Brodie, *Strategy in the Missile Age* (Princeton, NJ: Princeton University Press, 1959).
—— *War and Politics* (New York: Macmillan, 1973).
—— (ed.), *The Absolute Weapon: Atomic Power and World Order* (New York: Harcourt, Brace, 1946).
G. J. DeGroot, *The Bomb: A Life* (London: Jonathan Cape, 2004).
L. Freedman, *The Evolution of Nuclear Strategy*, 3rd edn (Basingstoke: Palgrave Macmillan, 2003).
—— *Deterrence* (Cambridge: Polity Press, 2004).
D. Holloway, *Stalin and the Bomb: The Soviet Union and Atomic Energy, 1939–1956* (New Haven, CT: Yale University Press, 1994).
R. Jervis, *The Meaning of the Nuclear Revolution: Statecraft and the Prospect of Armageddon* (Ithaca, NY: Cornell University Press, 1989).
F. Kaplan, *The Wizards of Armageddon* (New York: Touchstone, 1983).
R. Rhodes, *The Making of the Atomic Bomb* (New York: Touchstone, 1986).