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IMPLICATIONS OF NUCLEAR WEAPONS  
 IN TOTAL WAR  
  
 Bernard Brodie  
  
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Approved for OTS release

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NOTE

The following paper is practically identical with RAND Research Memorandum, RM-1842, of the same title. The present version, which differs from the original mainly in the deletion of some footnotes, has been prepared for publication in the 1957 issue of the Royal Canadian Air Force Staff College Journal, which will appear early this coming autumn. There will be in the published version a disclaimer indicating that the "views which Dr. Brodie expresses here are not necessarily those of the United States Air Force."

People often speak of atomic explosives as the most portentous military invention "since gunpowder." But such a comparison inflates the importance of even so epoch-making an event as the introduction of gunpowder.

The people who lived through the first military use of gunpowder sometime in the early part of the fourteenth century seem to have been quite unexcited about it, and actually failed to record the occasion. Not until a century later, at the siege of Orleans in 1428-1429, do we find firearms, in this case siege guns, playing a major part in battle, though still an indecisive one. In leading the final storming of that city, Joan of Arc was wounded by an arrow.

Gunpowder is often said to have established the superiority of the infantryman over the armored knight, and thus to have helped spell the death of feudalism. But the ascendancy of the infantryman, even without firearms, was in fact demonstrated effectively by English archers at Crecy (1346), Poitiers (1356), and Agincourt (1415), and during the same period by other peasants elsewhere in Europe.

A shrewder interpretation has held that it was not firearms but the reintroduction of discipline on the battlefield -- lost since Roman times -- that caused the demise of the armored, mounted knight.

When, in 1605 -- three centuries after the introduction of firearms -- Cervantes published the first part of the

great novel that buried the Age of Chivalry in mockery, the flintlock had not yet been invented.<sup>1</sup> Field artillery was still to prove its worth; it did not become important until the Seven Years War, in the middle of the eighteenth century. As late as the American Revolution, so sensible a man as Benjamin Franklin was able seriously to consider the wisdom of arming the Continental soldiers with bows and arrows rather than with the cumbersome, slow-firing, unreliable, and grossly inaccurate muskets. Not until the middle of the nineteenth century -- five centuries after the first military use of gunpowder -- did we enter the age of modern firearms, with the perfecting of breech loading and rifling and, in artillery pieces, of explosive projectiles.

#### Evolution -- Gunpowder and Other Weapons

When we speak of the revolution wrought by gunpowder, therefore, we are talking about something that required centuries to accomplish, and centuries of perspective to discern. Yet the gradualness of the development, with all the opportunities it permitted for doctrinal adjustment in the military arts, is still not the crux of the matter. The gun and its relatives remained from first to last strictly

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<sup>1</sup>However, the art of the armorer for man and horse had only recently come into its greatest glory. One especially magnificent specimen of a full suit of armor in the collection of the Metropolitan Museum of Art in New York City is dated 1590. Rather more intriguing is one, dated 1527, made for Caliot de Genouilhac who was Master of Artillery to Kings Louis XII and Francis I.

tactical weapons, gradually displacing weapons such as the battering ram, the arrow, the sword, and the lance, but only by proving superior in exactly the same functions that those weapons had exercised on the battlefield.

At least until World War I, which for the first time produced the phenomenon of nationwide continuous lines that could not be outflanked, the study of military strategy, and frequently even of the grand tactics of battles, both on land and at sea, could proceed profitably from the study of campaigns going back to antiquity. The thesis that "methods change but principles are unchanging" had much to justify it, because methods did not change very much, or at any rate not too abruptly. The application of lessons of the past to current and predicted military problems always required a proper appreciation of changed technological conditions, but to the more reflective and objective students of war such adaptation offered no great difficulty, at least until the advent of nuclear weapons.

Even before the atomic bomb the airplane threatened to take war away from the battlefield, and Douhet and his followers proclaimed that it had done so. But because of the limitations of the high-explosive and incendiary weapons fired a. ' dropped from aircraft in two world wars, it took time to achieve decisive results. During that time aircraft had to fight for command of the air, and land and naval campaigns unfolded in their old accustomed fashion, profoundly affected

by the new arm as they had always been by each other, but nevertheless retaining their essential and distinctive characteristics.

Instead of taking war away from the battlefield, in other words, the airplane only added a new area of battle behind the fronts, and a third dimension to those already prevailing on land and at sea. The science of strategy, which had always been divisible into two parts, was now divisible into three. For the two traditional forms of war, the basic treatises had been written and needed only to be modified. Air strategy still awaited its Mahan -- for Douhet's philosophy, however farsighted, had proved critically deficient -- but the early appearance of the new air philosopher could be confidently expected. The air experience of World War II was sufficient in bulk and variety to provide him with the necessary materials. But instead the atomic bomb came and changed everything.

### The Atomic Revolution

Few people were unexcited or unimpressed by atomic weapons. That something tremendously important had happened was immediately understood by almost everyone. Interpretations of the military significance of the new weapons naturally varied, but even the most conservative saw nothing inappropriate or extravagant in such extraordinary consultations and decisions as resulted in the Truman-Attlee-King Declaration of

November 15, 1945, or the Baruch Proposals before the United Nations in the following year. Then the MacMahon Act set up the Atomic Energy Commission, a separate and markedly independent government agency hedged about by all sorts of special provisions, for the manufacture and development of atomic weapons. Nothing of the sort had ever happened before; but photographs of the destruction wrought at Hiroshima and Nagasaki had been spread across the land, and few persons were unaffected by the thought that the damage had in each case been done by a single aircraft.

This was the response evoked by the explosion of two atomic bombs over Japan (plus the simultaneously released news of the test shot at Alamogordo) at a time when few if any more were known to exist. In retrospect it is apparent too that the more conservative of the opinions then expressed on the implications of atomic weapons were in the main wedded to presumptions that were soon to be disproved: for example, that the bomb was fated to remain scarce, extremely costly, bulky and therefore difficult to deliver, and limited to about the same power and spatial effectiveness as the Nagasaki bomb.

In an age that had grown accustomed to rapid advances in military technology, how remarkable was this immediate and almost universal consensus that the atomic bomb was different and epochal! Equally striking was the fact that the invention caused the greatest forebodings in the hearts of the people

who first possessed it and benefited from it. The thought that it represented a fabulous and mostly American scientific and engineering accomplishment, that it had apparently helped to end World War II, and that the United States had for the time being a monopoly on it seemed to cause no exhilaration among Americans.

Subsequent events neither undermined the early consensus on the importance of the new weapon nor qualified the misgivings. On the contrary, the first decade of the atomic age saw the collapse of the American monopoly, of the myth of inevitable scarcity, and of reasonable hopes for international atomic disarmament. It saw also the development of the thermonuclear weapon in both major camps. If at the end of that decade one looked back at the opinions expressed so voluminously at the beginning of it, one found almost none that had proved too extravagant. Only the conservative guesses had proved to be the nopelessly wrong ones.

It is no longer possible to distinguish between the new weapons on the one hand and the "battle-tested" or "tried and true" ones on the other, because in this new world no weapons are tried and tested. The hand rifle, the field gun, and the tank, as well as the infantry division or combat team that uses them, are at least as much on trial in the age of atomic warfare as is the atomic bomb itself; indeed, they are much more so.



### The Thermonuclear Age

Since we are now well launched in the thermonuclear age, we might first ask what differences, if any, the thermonuclear or hydrogen bomb must make for our strategic predictions. We have been living with the fission bomb for more than a decade, and it may well be that the fusion type introduces nothing essentially new other than a greater economy of destruction along patterns already established. Unfortunately that is not the case.

No doubt the strategic implications of the first atomic bombs were radical in the extreme, and it was right at the time to stress the drastic nature of the change. The utility of strategic bombing as a way of war could no longer be questioned. It at once became, incontrovertibly, the dominant form of war. A strategic-bombing program could be carried through entirely with air forces existing at the outset of a war, and at a speed which, however variously estimated, would be phenomenal by any previous standard. Also, it could be carried out successfully over any distance that might separate the powers involved. These conclusions represented change enough from the conditions of World War II.

Nevertheless, fission bombs were sufficiently limited in power to make it appear necessary that a substantial number of them would be required to achieve decisive and certain results. That in turn made it possible to visualize a

meaningful (though hardly satisfactory) air defense, both active and passive. It was therefore still necessary to think in terms of a real struggle for command of the air in the old Douhet sense. It was also still necessary to apply, though in much modified form, the lore so painfully acquired in World War II concerning target selection for a strategic-bombing campaign. Finally, the functions of ground and naval forces, though clearly and markedly affected by the new weapons, still appeared vital.

Even these tenuous ties with the past were threatened when it became known that thermonuclear bombs were not only feasible but apparently also inexpensive enough to justify manufacture in very substantial numbers. Possibly the feeling that the H-bomb was distinctively new and significantly different from the A-bomb argued in part an underestimation of the A-bomb. But when one has to confront a basic change in circumstances, it helps if it is unequivocal.

The "Mike" shot of the Operation IVY series, set off on November 7, 1952, caused the complete disappearance of the small island of Elugelab on which the thermonuclear device was placed. In its place was left an underwater crater over one mile across and about 175 feet deep at the center, or, as was later publicly stated, large enough to hold fourteen buildings the size of the Pentagon. It was announced that the amount of energy released was over five million tons (or five "megatons") of TNT equivalent, and the fire-ball

itself was about three and one-half miles across (as compared to about one-sixth of a mile for a "nominal" 20 K.T. bomb).

At the time this information was released, almost a year-and-a-half after the event, at least one other American thermonuclear explosion had taken place (The "Bravo" shot in the CASTLE series on March 1, 1954), and it was reported to be several times more powerful than "Mike." Small wonder that the AEC Chairman, Rear Admiral Lewis L. Strauss, stated on that occasion that the H-bombs that the United States could build and deliver would be individually capable of wiping out any city in the world! Subsequently the world learned that the March 1954 shot had also produced an unexpectedly large amount of radioactive debris, which was deposited as "fallout" of dangerous and even lethal intensity over thousands of square miles and up to distances of 200 miles or more downwind from the explosion.

#### Target Selection in Thermonuclear War

It became apparent that certain controversial military questions that had remained pertinent in the fission-bomb era were no longer worth carrying over. Chief among these were the questions inherited from World War II concerning the appropriate selection of industrial target-systems. Industrial concentrations are usually associated with cities and vice versa, and since a thermonuclear bomb exploded near the center of a city would as a rule effectively eliminate the

industrial activities associated with that city, there is hardly much point in asking which industries should be hit and in what order, or which particular facilities within any industry.

Once the question whether to attack the enemy's economy or "mobilization base" is answered affirmatively, that is, once we are embarked upon an unrestricted nuclear war, the question of what to hit is all too simple to answer. We simply select the enemy's cities, which constitute the easiest targets to find anyway. Of course the enemy's strategic air force must be the top-priority target in terms of time, and possibly also in weight of bombs, but destroying the enemy's air force (if it can be done) is essentially a defensive move, and as such demands some kind of sequential action.

Perhaps there is nothing in logic to make such a sequence inevitable, but it is very likely to be considered a practical necessity. The attacker could rarely count with high confidence on fully eliminating the enemy air force, even if he struck first. He would, therefore, probably feel obliged to begin the counter-economy competition before he knew the results of the counter-air force strike. In any case, decisions of the sort we are implying would have to be made well before hostilities began, which is to say only that emergency war plans intended to cover the opening phases of possible future hostilities are, and should be, prepared in

peacetime and periodically revised. As a matter of practical strategic planning, one would naturally expect that even where a counter-air force attack was given top priority in the relevant war plan, a counter-economy attack would to some degree be integrated with it.

In fact, since many major enemy airfields are bound to be near cities, the distinction in priority is in such instances likely to be an academic one. It is idle to talk about strategies being counter-force strategies, as distinct from counter-economy or counter-population strategies, unless we actually find ourselves taking deliberate measures to refrain from injuring cities. It can hardly matter much to the populations involved whether the destruction of cities is a by-product of the destruction of air fields or vice versa.

No doubt there would be a significant difference in ultimate results between a strategy that was aimed primarily at the enemy air force and one aimed chiefly at population, even if a lot of people were killed in both. However, it must be remembered that in striking at an enemy strategic air force, an attacker will normally be obliged to hit a great many more airfields than those indicated to be major strategic air bases; because he must assume in advance that a good deal of dispersion of enemy aircraft will have taken place as a result either of warning or of routine operating procedures. And in striking at airfields near cities, he might choose to use some quite large thermonuclear weapons, especially if he

tended to regard as a "bonus" any damage achieved in addition to that primarily sought after.

### Cities as Thermonuclear Targets

The number of cities that account for the so-called economic war potential of either the U.S. or the U.S.S.R. is small: possibly fifty or less, and certainly not over 200. The range in these figures is the result of the varying weight that can be given to certain tangible but difficult-to-measure factors, such as that of interdependence. The leading 54 American "metropolitan areas" (as defined by the Census Bureau) contain over 60 per cent of the nation's industrial capital, and a population of 65,000,000, including a disproportionate number of the people whose special skills are associated with large-scale production. The Census Bureau lists altogether 170 metropolitan areas in the United States, which contain over 75 per cent of industrial capital and 55 per cent of the nation's population. We must note that by far the greater portion of these cities are concentrated in the eastern and especially the northeastern part of the United States, where most of the non-urban population is also gathered, and where urban and non-urban populations alike may be subject to overlapping patterns of radioactive fallout. The concentration of industry in Russian cities, and the concentration of cities and populations in the western part of their national area, make of the Soviet Union a target area roughly comparable to the United States.

The great Hamburg raids of July 1943, which were so tremendous a shock to the whole German nation, caused the destruction of about 50 per cent of the city's housing and resulted in casualties amounting to about three per cent of the population. A single H-bomb of anything above one megaton yield bursting within the confines of a city such as Hamburg would cause a degree of housing destruction much higher than 50 per cent; and unless the city had been evacuated in advance the proportion of casualties to housing destroyed would certainly be far greater than it was at Hamburg.

The latter fact underlines one of the distinctive features of nuclear weapons. There are at least four reasons why casualty rates with nuclear weapons are likely to be far greater in relation to property destroyed than was true of nonatomic bombing: (1) warning time is likely to be less (or nonexistent) unless the attacker deliberately offers it before attacking; (2) the duration of an attack at any one place will be literally a single instant, in contrast to the several hours' duration of a World War II kind of attack; (3) shelters capable of furnishing good protection against high-explosive bombs might be of no use at all within the fire-ball radius of a large ground-burst nuclear weapons, or within the oxygen-consuming fire-storm that such a detonation would cause; and (4) nuclear weapons have the distinctive effect of producing radioactivity, which can be lingering as well as instantaneous, and which causes casualties but not property injury.

No doubt there are a few very large metropolitan areas in the United States and in other countries which are wide enough in area to be able to escape complete destruction by a single thermonuclear weapon. But even two or three bombs for each such area is still a small number. And so far as concerns choosing the size of bombs for smaller cities, we must remember that the difference in cost between a thermonuclear bomb of, say, ten megatons yield and a fission bomb of 200 kilotons yield will usually not be great enough to be the critical factor in determining the choice between them for distant targets. The cost difference will almost certainly be small relative to the entire cost of the sortie.<sup>2</sup> There may be a significant weight difference between the two bombs, but for aircraft large enough to possess the ranges needed in strategic bombing, even that difference may not be important. What all this means is that "overkilling" will be cheap and therefore, according to the military considerations normally brought to bear, no longer to be shunned.

Moreover, an amount of force-yield that would be grossly excessive for any accurately-aimed bomb would make possible methods of delivery -- such as the long-range ballistic

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<sup>2</sup>We are here using the cost index as a gauge of availability, and doing so presupposes some reasonably intelligent planning decisions in the past. Naturally, once the shooting begins the dollar cost of a weapon in the stockpile is in itself an absolutely irrelevant historical datum in determining the use of that weapon.



missile -- much less accurate, though superior in other ways, to those currently available. In these, however, the weight of the bomb or warhead is likely to be a much more critical factor than in aircraft, at least in the earlier phases of missile development.

No doubt the problem of getting nuclear weapons delivered to 50, 100, or 200 widely spaced points does not look as simple to those who have to plan the operation as it does to laymen. And since enemy strategic airfields must as a rule also be hit, the total number of targets is multiplied, perhaps by several times, over the figures just suggested. But, to repeat, the bombing of enemy strategic airfields or missile-launching sites is a strictly defensive mission, and the existence of such a requirement (which is by no means inevitable or absolute under all conceivable circumstances) should not be permitted to obscure the fact that with the new nuclear weapons the number of individual targets that have to be struck in order to put any nation out of business as a producing or even functioning organism is extremely small. It is ridiculously small when measured against the standards of a period as recent as World War II. This is obviously the central fact to consider when appraising the apparently still-disputed "decisiveness" of strategic bombing with nuclear weapons.

### The Concept of "Broken-backed War"

The British in their 1954 Defence White Paper used the expressive phrase "broken-backed war" to describe what presumably would happen after the first huge exchange of thermo-nuclear weapons, assuming the exchange itself failed to be decisive.<sup>3</sup> Various Americans have adhered to the same conception without necessarily using the phrase.<sup>4</sup> The essential feature of the idea is the insistence, usually implicit, that war resources, human and mechanical, will continue to be drawn from the national "mobilization base" and that the margin of advantage that one side or the other enjoys in this

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<sup>3</sup>"In this event [global war], it seems likely that such a war would begin with a period of intense atomic attacks lasting a relatively short time but inflicting great destruction and damage. If no decisive result were reached in this opening phase, hostilities would decline in intensity, though perhaps less so at sea than elsewhere, and a period of broken-backed warfare would follow, during which the opposing sides would seek to recover their strength, carrying on the struggle in the meantime as best they might." Statement on Defence, 1954, Presented by the Minister of Defence to Parliament... February 1954 (London: Her Majesty's Stationery Office, Command Paper #9075), p. 5.

<sup>4</sup>"Presumably massive blows would continue as long as either side retained the capability....With the passing of that initial phase, and if the issue is still unresolved, tough people would carry on across the radioactive ashes and water, with what weapons are left. Sea control will be an elemental consideration in accomplishing either the follow-through phase of atomic war or the better appreciated chores of a prolonged nonatomic war." Admiral Robert B. Carney, then U.S. Chief of Naval Operations, in a Cincinnati speech of February 21, 1955, as reported in the Washington Post and Times Herald for the following day.

respect is what will prove decisive in the end. Although the conception of "broken-backed war" appeared to be entirely abandoned in the Defence White Paper for 1955, which tended instead to rest everything on "deterrence," it has nevertheless continued to underlie and to confuse the basic structure of American and Allied defense planning.

One can easily conceive of conditions in both contending camps so chaotic, following the opening reciprocal onslaughts, that the war issue will not be immediately resolved and hostilities not formally concluded. One can also picture surviving military units, including some possessing thermonuclear weapons and means of delivering them, continuing to hurl blows at the enemy to the utmost of their remaining though fast-ebbing capacity. But it is difficult to imagine such intensive continuing support from the home front as would enable "conventional" military operations to be conducted on a large scale and over a long enough time to effect any such large and positive purpose as "imposing the national will on the enemy," or, to use the words of our own former Chief of Staff, General Matthew B. Ridgway, "Carrying the fight to the enemy and defeating him."<sup>5</sup>

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<sup>5</sup>In his speech before the National Press Club in Washington, D. C., March 19, 1954. This speech was reproduced in full in the Congressional Record -- Appendix; March 24, 1954, pp. A2254-6 (under "Extension of Remarks of Hon. Dewey Short"). It is noteworthy that at that time General Ridgway still found himself able to conceive of a future war in which we would "reduce the other side's industrial potential and military

The major premise of the "broken-backed war" conception was that the result of the initial mutual nuclear violence would be something like a draw. Otherwise it could not fail to be decisive. The second premise (we cannot call it a minor one) was that the level of damage on both sides following the strategic nuclear bombing phase would be limited enough to permit each to equip and sustain air, ground, and naval forces of sufficient dimensions to be able to execute noteworthy military operations. These would, presumably, be conducted at some distance from home, and would therefore require facilities, such as ports and associated railway terminals, which are generally found only in those larger coastal cities which would certainly be among the first targets hit in the nuclear phase! Implicit also was the further dubious assumption that somehow the nuclear phase would end cleanly, or diminish to a trivial magnitude, early in the hostilities, and at about the same time for both sides!

Another and perhaps more practical reason for questioning the "broken-backed war" conception is that no one seems to know how to plan for such a war. There are special psychological reasons why official war planners have always in times

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bases" but would nevertheless succeed in carrying out on our own side "not merely the mobilization and training of men but also the conversion of industry to full war production." In other words, General Ridgway was imagining not so much a "broken-backed" war as a war marked by an essentially one-way strategic air attack. One might well question, under such premises, the necessity for a full mobilization of national resources!

past found it almost impossibly difficult to predicate a war plan on the assumption of national disaster at the outset. But in this case, even if the spirit were willing, the data and the imagination would be much too weak.

### The Problem of Survival

There are, of course, numerous examples in recent history of magnificent improvisation following upon disaster, or rather upon what used to be called disaster. But in each of those cases the means of making war, including such vital intangibles as established governmental authority operating through accustomed channels of communication, remained intact. A few battleships sunk, a few armies defeated and lost, even large territories yielded, do not spell the kind of over-all disaster we have to think about for the future. There are limits to the burden that can be placed on improvisation. The improvisation which the survivors of thermonuclear attack may find it within their capacities to come up with will surely have to be largely occupied with restoring the bare means of life.

No one who has studied the German military, economic, and even social performance under strategic bombing can fail to be impressed by it. But the German capacity to absorb the blows and to take compensatory measures for the damage received depended, among other things, on their having both the time and the incentive to organize those measures. When the main

weight of our strategic bombing descended upon them in the spring of 1944, they had had at least three years of serious attacks, including the terrible warning of the Hamburg raids of July 1943. Even so, the campaign waxed only gradually to its climax, and never, even when the British-American strategic bombing forces were at the height of their power, were they able to inflict in six months of bombing the scale of destruction that would lie easily within the capability of the U.S. Air Force on Day 1 of a new war. The differences in circumstance that accounted on the one hand for the French resistance in 1914 and, on the other, for the collapse in 1940 were of trivial magnitude compared with the differences between pre-atomic and present-day strategic bombing.

No one, of course, can specify how many nuclear bombs it would take to "knock out" (assuming we know what we mean by that term) a country as large as the Soviet Union or the United States, and analytical studies of what happens under attack can do little more than suggest upper limits to the broad range of figures that might be considered reasonable. Such studies almost inevitably work with individual targets rather than with a whole national complex. They must depend on what are little more than educated guesses for various critical planning factors, including even those pertaining to the physical effects of bomb explosions. They must work with quite wide ranges of assumptions concerning such things

as the size and the positioning of bombs delivered, the length of warning time, etc. Such studies cannot even touch the imponderables, such as popular panic and administrative disorganization, which might easily govern the end result. Those who do such work are as a rule interested in the results from the offensive or targeting point of view, and they therefore deliberately try to be conservative in the estimates they make. One of the ways to be conservative is to dismiss consideration of all imponderables as unmeasurable.

At the other end of the scale, methodologically speaking, is a judgment such as the following one by Marshal of the Royal Air Force Sir John Slessor:

I have the perhaps somewhat unenviable advantage of an experience, which fortunately has been denied to most people, of being in a city which was literally wiped out, with most of its inhabitants, in fifty-five seconds by the great earthquake in Baluchistan in 1935, a far more effective blitz than anything laid on by either side in the late war, except Hiroshima and Nagasaki. When people talk light-heartedly about that sort of thing on a widespread scale not being decisive, I have to tell them with respect that they do not know what they are talking about. No country could survive a month of Quetta earthquakes on all its main centres of population and remain capable of organized resistance.<sup>6</sup>

And Slessor is describing a catastrophe that is free of the additional terrible menace of lingering radioactivity.

It must be repeated that Sir John's intuitive conviction, which in fact accords with the average layman's judgment, reflects at least one tacit assumption concerning defenses. In general, the assumption is that the prospects for the

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<sup>6</sup>Sir John Slessor, Strategy for the West (New York: William Morrow, 1954), p. 111.

radical improvement of both active and passive defenses against nuclear weapons are not bright.

### Defense and the Thermonuclear Weapon

First we must recall the fantastic degree to which the coming of the A-bomb itself gave a lead to the offense over the defense; subsequent developments in nuclear weapons have tended to further that advantage. A proposed system of defense which looked interesting one year against fission bombs looked altogether useless and wasteful the next, when thermonuclear weapons also had to be taken into account. This movement favoring the offense has by no means run its course so far even as manned aircraft are concerned, but we are told also that the advent of the long-range ballistic missile with nuclear warhead is only a matter of time. And there seem to be very few ideas afloat about how to erect effective active defenses against that.

So far as concerns passive defenses, such as dispersion or "hardening," the problem is to discover and adopt measures that are not easily neutralized simply by some modest increase in the quantities or yields of the bombs delivered by the enemy. The growth of national nuclear stockpiles is practically irrepressible, and while delivery capabilities do not normally expand with the same exuberance, it is nevertheless likely to be far easier and much less costly for one side to double the



number of bombs-on-target than for the other to double by dispersion, the number of targets that the enemy must hit.

On the other hand, hardening targets by putting shelters around them may be very expensive, but they may also be at the same time effective over a wide range of bombs-delivered figures. Human casualty rates may also be very much reduced by resort to deep shelters, provided there is sufficient warning time, and provided also that there has been sufficient preparation beforehand to sustain life during and after immurement in those shelters.

Let us, however, finally note the fact that there are enormous impediments -- psychological, political, economic, and above all doctrinal -- to the adoption of sufficiently drastic measures for defense. The proof of that lies in all we have conspicuously failed to do after eleven years of living with the atomic bomb. New and effective stimuli to action may yet turn up, but some exceedingly powerful ones have failed to move us.

As for the offensive-defensive, the so-called blunting mission of our own Strategic Air Force, its success must depend not only on a national initiative which is largely out of military hands, but also on surprise (which is impossible without initiative yet not guaranteed by it) on intelligence, on the character of enemy base-utilization patterns, and on the various measures he may adopt for the protection of his long-range air force.

From all this one would seem justified in drawing the following conclusion: barring revolutionary and presently unforeseen advances in air defense, an unrestricted strategic air campaign in a war in which the United States is engaged is bound to be decisive. It does not matter greatly whether the number of nuclear weapons-on-target required to guarantee decisiveness is a few score or a few hundred, because we are, even in the latter case, in realms of figures that are well within the capabilities at least of the United States (the critical factor being, of course, delivery capability rather than size of the nuclear stockpile). And it is equally certain that these figures are now or soon will be within the capabilities of one or more other powers.

Possibly our basic conclusion would be in jeopardy if the figures for required bombs-on-target went into several thousands, which would bring into question the adequacy of existing delivery systems. But since we are talking about a mix of nuclear weapons that includes a fair proportion of thermonuclear bombs, figures for a strategic-bombing campaign running into the thousands of bombs-on-target are likely to be either morbidly fanciful or pointed toward a campaign aimed not merely at a simple military decision but at complete national obliteration.

### Surface Operations in Thermonuclear War

On the other hand, when we say that strategic bombing will be decisive, we are not using that term in its traditional sense, that is, in the sense that something is achieved which predetermines a clear victory for one side or the other. We mean instead that if strategic bombing occurs on the grand scale that existing and certainly future forces make possible, other kinds of military operations are likely to prove either unfeasible or superfluous or, most likely, both. The Red Army, if poised to spring, could perhaps have a certain brief career as a disembodied force even if its homeland were laid entirely waste behind it, though in such a case it would itself also be the target of nuclear weapons of all sizes; and such an independent career would be possible only for the Red Army, since it has the advantage, denied to the ground forces of Britain and the United States, of having its main potential spheres of operation in areas contiguous to its homeland.

The point just made cannot be proved except negatively, that is, by throwing the burden of proof on those who would show us how modern armies and navies can operate effectively, and to a useful purpose, when their home territories, and certainly the larger towns thereof (including all naval bases and ports) are masses of rubble and radioactive dust. Discussions in professional military journals of the operations of armies and navies (and even air forces) in a major war of

the future almost always tacitly assume an intact home front, or at least one where the damage is so minimal as to be irrelevant to offensive plans.

We should not discount the importance of the fact that for countries as large as the United States or the Soviet Union, the number of human beings and the amount of equipment that may escape destruction even after heavy thermonuclear attack could, in absolute terms, be quite large. Much that is valuable (e.g., our highway network) is hardly even exposed to risk. Besides, we must remember always how much we do not know about this entire subject, and how many different contingencies have to be accounted for.

Nevertheless, from a sober appreciation of the possibilities in this field of dismal speculation, it seems quite safe to assume that the number of people and the kind and quantity of capital that may survive strategic attack will be important far more for determining the character and degree of national recovery following the hostilities than for controlling the subsequent course of the hostilities themselves. The minimum destruction and disorganization that one can reasonably expect from any unrestricted thermonuclear attack in the future must almost inevitably be too high to permit further meaningful mobilization of war-making capabilities, certainly over the short term, and may well prevent effective use of most surviving military units already in being.

It should also be recognized once and for all that so far as predicting human casualties is concerned, we are talking about a catastrophe for which it is essentially impossible to set upper limits appreciably short of the entire population of a state. It is not only those in cities and in towns who will be exposed to risk, but, in view of the fallout effect, practically all. And it is simply not true that the fallout effect, where the attacker is determined to exploit it, is something that is easily met and contained. What we are in effect saying is that although the uninjured survivors of attack may indeed be many, it is also all too easily conceivable that they may be relatively few. The latter contingency is the more likely one in the absence of large-scale protective measures such as neither we nor any other people have yet shown ourselves prepared to mount. But whether the survivors by many or few, in the midst of a land scarred and ruined beyond all present comprehension, they should not be expected to show much concern for the further pursuit of political-military objectives.

#### Ambiguity in Policies

The reader who was prepared to accept as obvious at the outset the conclusion we have labored these many pages to establish will wonder why all the bother? The answer is that in these respects there is a monumental ambiguity in public

policy, which reflects in part the ambiguity in the public pronouncements of relevant officials of the highest rank. Even those who preach the catastrophic decisiveness of nuclear strategic bombing seem to find it almost impossibly difficult to grasp the full significance of what they preach. Sir John Slessor, whose trenchant comment on what to expect from nuclear strategic bombing we have already quoted, furnishes an outstanding example. As a former Chief of Staff of the Royal Air Force, Sir John would have to be taken most seriously (as he unquestionably is in his own country) even if he did not merit it on the general urbanity and breadth of view so amply reflected in his writing. But he could also be abundantly quoted on the other side of the "decisiveness" question from the very same book -- a book that has a special importance as perhaps the most lucid and comprehensive presentation of the "massive retaliation" doctrine to be found anywhere.

Sir John urges, to be sure, that "it is very seldom wise to carry things to their logical conclusions, and the airmen can no doubt rely upon their comrades of the older services to assist them in resisting that temptation."<sup>7</sup> Nevertheless, this distinguished airman, who regards it as "almost inconceivable" that a major war of the future fought with weapons of

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<sup>7</sup>Slessor, op. cit., p. 76.

mass destruction (which he insists must be used) could last "for any length of time,"<sup>8</sup> still considers it very important that navies be able to carry out their traditional functions of convoy protection,<sup>9</sup> which are defenses against attrition warfare and therefore strategically meaningful only over a considerable span of time. One wonders also why he considers it virtuous even now to profess disbelief in the thought "that air power by itself can defeat a first-class enemy."<sup>10</sup>

No doubt one answer is to be found in the only place in the book where Sir John portrays his conception of the United Kingdom under nuclear attack:

When things are really bad the people's morale is greatly sustained by the knowledge that we are giving back as good as we are getting, and it engenders a sort of combatant pride, like that of the charlady in a government office who was asked during the London blitz where her husband was -- "he's in the Middle East, the bloody coward!" We must ensure that defence, as adequate as we can reasonably make it, is afforded to those areas or installations which are really vital to our survival at the outset of a war, or to our ability to nourish our essential fighting strength. Much-Binding-in-the-Marsh and Littleville, Pa., are not in that category unless they happen to contain some utterly indispensable installation, and the inhabitants must steel themselves to risks and take what may come to them, knowing that thereby they are playing as essential a part in the country's defence as the pilot in the fighter or the man behind the gun.<sup>11</sup>

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<sup>8</sup>Ibid., pp. 107, 114.

<sup>9</sup>Ibid., pp. 92, 99, 101. See also Field Marshal The Viscount Bernard Montgomery, "A Look Through A Window at World War III," Journal of the Royal United Service Institution, (Vol. 99, No. 596), November 1954, pp. 507ff.

<sup>10</sup>Glessor, op. cit., p. 106.

<sup>11</sup>Ibid., p. 120.

There is only one thing to be said about such language and imagery: it fits World War II, but it has nothing to do with thermonuclear bombs. It certainly has no pertinence for the United Kingdom, which is both small in area and geographically close to the enemy. One does not have to think in terms of missiles of the future but only in terms of the V-1, the V-2, and the jet bomber to see the strongest possibility of a Britain in shambles at the end of the first hour of nuclear attack.

For countries such as the United States or the Soviet Union it would probably take a little longer. But there is no justification at all for the kind of easy optimism expressed in the following sentence: "But when it is suggested...that the United States could be knocked out as the arsenal of the North Atlantic Alliance, then writing as one who has been concerned for a good many years with air bombardment planning, I beg leave to say that it is nonsense."<sup>12</sup>

It remains to be added that in an article published two years after the book in which these remarks were made, Sir John Slessor was seeing things in a quite different light.<sup>13</sup> Among the events that had intervened between the two publications was the release of a good deal of information about

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<sup>12</sup>Ibid., p. 34.

<sup>13</sup>See his "The Great Deterrent and Its Limitations," Bulletin of the Atomic Scientists, Vol. XII, No. 5, (May 1956), pp. 140-146. It is the emphasis on the limitations of "the great deterrent," and the policy implications of those limitations, that mainly distinguishes this article from his earlier book.



thermonuclear weapons and their effects, but one must also give due credit to Sir John for a flexibility of mind that is no doubt among his special distinctions. Perhaps there is also something about the experience of being an author, especially the author of a book, that brings one intimately into the rough-and-tumble of the marketplace so far as ideas are concerned. Anyway, the kind of drastic conversion that Sir John underwent within two years regarding some of his fundamental beliefs is not a common occurrence among his professional colleagues, especially among those still on active duty. As Sir John observes in the aforementioned article: "Not many people, even in the fighting services themselves, have really grasped the full tactical implications of an age in which nuclear power is the dominant strategic factor in war. There is a tendency almost subconsciously to shy away from those implications, which should not be ascribed merely to the influence of vested interest."

#### The Need for Consistency

The sense of Emerson's famous remark about consistency being the hobgoblin of little minds has on the whole enjoyed remarkable verification in military history. Trite historical examples of unintelligent rejection of the novel need not detain us, except possibly to note that the catalog is long. Much more interesting for our purposes are the instances where eager acceptance of the new is coupled, not only within

the same organizations but often within the same persons, with stubborn insistence upon retaining also much of the old. These are the people who on the whole have come off best when the scores were in. For their very inconsistency has often provided a hedge against wrong predictions.

The intensely conservative or reactionary are always proved wrong, because changes in armaments over the past century have been much too rapid and drastic to offer any cover to those who will not adjust. But the occasional brilliant seers who have the courage of their convictions and the analytical skill to recognize and expose inconsistency when they see it have all too often been tripped up by one or more critical assumptions which turned out to be in error, and then their own consistency worked only to make their whole logical construction dangerously wrong, as was certainly the case with Douhet.<sup>14</sup>

No doubt a proper intuitive feeling for the hazards of prediction and for the terrible forfeits involved, in the military sphere, in finding oneself overcommitted to a wrong guess, is one of the reasons why military men as a group tend to put a rather modest value on analytical brilliance as an alternative to mature military judgment. Nevertheless,

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<sup>14</sup>See my article, "The Heritage of Douhet" in the U.S.A.F. Air University Quarterly Review Vol. 6, No. 2 (Summer, 1953), pp. 64ff.

there is a limit to the amount of inconsistency that is reasonable, especially since in the world of nuclear armaments it may become, to say the least, exceedingly expensive. And if any one thing is clear from all the foregoing, it is that the strategy of "massive retaliation", as commonly understood, is, like the headman's axe, rather too sharp a cure for ordinary ailments.