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New Weapons Technologies and East–West Security in the 1980s

HENRY ROWEN

Many technologies of military relevance are changing; and they interact in complex ways. Undoubtedly some will play a decisive role in future wars, but which? We can make a few predictions with confidence, more which are only inferences, and still more which are mere conjecture.

There are four non-nuclear technologies whose advances are of cardinal importance: (*a*) those of sensing and transmitting signals over a wide range of the electro-magnetic spectrum; (*b*) data processing; (*c*) advances in aerodynamics and propulsion; (*d*) ordnance. The core of technological change lies in the technologies of information, interacting with and amplifying the effectiveness of the other technologies. The first extends our capacity to detect things – targets and non-targets – in an increasingly wide range of environments and to send enormous amounts of data rapidly over long distances. The first and second together make it possible to search for and extract signals from noise, natural and man-made, and to guide vehicles with great precision to targets. The third, together with the others, enables us to build aerodynamic vehicles which can be small and have the ability to fly 'nap of the earth' for long distances. The fourth makes it possible to tailor more closely the effects of weapons to the characteristics of targets and to the error of delivery; this is especially important for non-nuclear weapons but it is to some extent possible with those which are nuclear.

These changes affect our central concerns: NATO's ability to defend itself at the non-nuclear level and its reliance on nuclear threats; the destructiveness of war and the issue of whether we should be trying to make war more horrible or more humane; our ability to keep open sea lines of communication; the capacity of East and West to project power into third areas; and whether or not we should try to limit the advance of technology.

Ten Propositions

Advances in these technologies support the following propositions:

1. The most elementary proposition is familiar: *if one can see a target* – in the absence of enemy interference – *one will be able to hit it.* And many more targets will be visible from longer distances than in the past: ships, aircraft, air bases, factories, bridges and tanks. This is in marked contrast to the wars of the past, in which hundreds of aircraft might spray thousands of bombs over the landscape in order to get a few on target. Improvements in accuracy now make it possible to reduce the amount of ordnance delivered by a factor of between 100 and 10,000 for a wide range of target types, including soft missile sites, electric power plants, petroleum refineries, steel plants, etc., causing damage that could put such facilities out of action long enough to be significant in important contingencies.

However, if the *attacking* vehicles can be seen, perhaps they too can be hit precisely. The complication suggests a duel which cannot be decided in the abstract. But another proposition applies: defences are almost inevitably imperfect – something can usually penetrate. Now that the chances are good that what gets through will hit, the attacker will find the penetration price worth paying if the target is sufficiently valuable.

2. *Forces that operate against a homogeneous background*, especially the sky or the surface of the sea, *will be especially visible and therefore potentially vulnerable.* (This principle of course leaves unsettled the outcome of duels involving aircraft or cruise missiles against ships.) And those that operate against a more heterogeneous background, for example, on land or under the sea, can no longer count on relatively easy concealment. As Andrew Marshall has put it, the sea is no longer black ink.

3. *Less damage to civilians* – especially from the use of high explosives – *will occur as an accidental consequence of war*, because more bombs will hit their targets rather than the neighbourhood, and fewer bombs need to get through to the vicinity of the target. This does not mean, of course, that war will necessarily be more humane, only that a deliberate choice will have to be made if civilians are to be hurt. And again, especially with non-nuclear weapons, such a choice will often be at the expense of directing attack at military targets.

4. *The invaders rather than the invaded will probably be at a disadvantage.* I am not now making the familiar but usually muddled distinction between offensive and defensive weapons. For example, are mobile air defences which are moving forward as part of a combined-arms team offensive or defensive weapons? Clearly both; however, invaders usually have to concentrate their forces and often make themselves visible as they do so; this now makes them more vulnerable. Eric Klippenberg rightly points out that our problem is not offence versus defence – or invading and blocking – in general, but the Warsaw Pact's ability to invade and ours to block. In order to invade they must move; and with improved sensors their movements will be more easily detected. A clear case in point is amphibious landings on unfriendly shores: if the invaded side is equipped with modern surveillance technologies and precision weapons, the invader's prospects are not promising. A less clear but probably valid argument of a similar kind can be applied to blocking ground invasions, especially where the invader's routes of attack are channelled by the terrain. The Pact – if also equipped with weapons of precision – may be able to launch an attack that is both powerful and smaller. Such an attack would generate fewer signals and these signals could be more easily concealed in 'noise' created by exercises, for example, and would be less likely to give NATO a helpful warning time.

5. One reason for uncertainty about the universality of proposition 4 above is that *better information on the location and movement of an opponent's forces, together with more effective means of attack, increases the advantage of moving first.* This creates a danger of pre-emptive strikes. The surprise-attack advantage, which has been evident in the two most recent Arab–Israeli wars, also applies to navies operating in enclosed areas, for example, the Mediterranean. It does not imply an inexorable increase in first-strike instability but, rather, indicates that adaptations are needed to increase warning of and to reduce vulnerability to such pre-emptive strikes.

6. *Advances in technology make some measures to reduce vulnerability easier.* Improved sensors now make it possible to detect small but possibly lethal forces earlier. But heavy dependence on warning and high alertness is risky and costly; it is better to seek a posture that would force a potential first-striker to mount a larger – and noisier – effort. This can be done by using distributed or dispersed systems made up of smaller parts, which are also less likely to be seen, linked by advanced communication technologies. Because increased precision reduces payload needs, and therefore vehicle size in many cases, small vehicles might be substituted for large. This principle applies to aircraft, cruise missiles and remotely piloted vehicles (RPV), and ships.

7. *Distance matters less.* The performance of some high-precision navigation and guidance systems does not vary with distance (the manufacturer of the global positioning system advertises a 30-foot median inaccuracy anywhere). Satellites have eased the problem of gathering information at a distance; the cost of movement by sea has been low for some time, and increased distance adds little to expense; long-haul air transport costs have continued to decline with the advent of jumbo jets. But distance is not irrelevant: the interval between a decision to move forces and their first arrival at the distant terminus and the time it takes to fill a 'pipeline' can be important parameters. The local conditions of the terminus are also very important (for example, whether there are local

air defences or a local logistic distribution network), but these factors are more or less independent of distance.

8. *Both the demands on command and control and the potential for extending its scope are increasing greatly.* The necessity of dispersal, concealment and mobility increases the demand for control, while these technologies of information enormously increase the supply possibilities. As Uwe Nerlich and others have pointed out, the main obstacle to realizing these possibilities may be vested organizational interests within services and within separate national governments. There will be a great advantage accruing to those who develop operational procedures for handling large amounts of data and who design procedures for information handling and decision-making which match well to technological and human capacities.

9. *Advanced technology is necessary but not sufficient.*[1] Technology is most powerful in the hands of those who develop and adopt an effective doctrine for its use. The tank had been around for twenty-five years before it was first used with decisive effect. It required years of doctrinal development by Fuller, Liddell-Hart, De Gaulle and others before its full potential was realized by Guderian. The German success with tanks was not based on superior technology but on a superior concept of how to use a not-very-advanced technology. We should expect to see this lesson repeated.

10. A technological lead is extremely useful, but *size of forces still matters a great deal.* Some of the technological developments are partially offset by each other, and this gives an advantage to the side with the most weapons. Although the Soviet Union lags in some of these developments she is ahead in others (for example, mobile SAM and deployed cruise missiles). The winner of the future – as in the past – will often be the side that runs out of weapons and troops second. Despite superior NATO information technologies, the Soviet Union might manage simply to blast through with enough tanks, artillery and people.

[1] Does the Vietnam War demonstrate that it is not even necessary? Perhaps, but the fairly modern Soviet SAM defences were undoubtedly useful in the North, and Soviet-made artillery and, in the end, tanks made a great difference in the South.

Some Inferences

If these changes, vigorously pursued, promise a relative improvement in NATO's ability to block an invasion and to do so while reducing collateral damage, it would seem that they would be unambiguously a good thing. Consider, however, the furore in the United States and Germany over the neutron bomb. The neutron bomb has been attacked on the grounds that it is (*a*) too destructive and (*b*) not destructive enough. Those of the first view claim that such weapons are too destructive because the effect of neutrons is not well enough known, or declare that radioactive fallout may be increased. Those of the second view declare that the gap between nuclear and non-nuclear arms has been narrowed and that the reduction in civilian damage makes the use of these weapons tempting, more likely and therefore dangerous because, once nuclear weapons are used, escalation follows.

This dispute bears on the potential role of improved non-nuclear technologies. Advanced non-nuclear technologies will cause less indiscriminate destruction. Should we reject them on the grounds that to use them will be too tempting? Not if we believe that we face a formidable adversary against whom we need a capacity to act which is militarily effective without being suicidal. The second part of this requirement, a capacity to take non-suicidal action, is even more important in an alliance than in a single state. Political decisions are more likely to be taken if the criterion of achieving a desired military effect within the constraint of limited civilian damage can be met.

Modern non-nuclear technologies can do more: for some missions they can substitute for nuclear weapons. Where this is the case, there is no blurring of the distinction between nuclear and non-nuclear – the firebreak between non-nuclear and nuclear choices is widened. This can hardly be in dispute. But it does not follow that a large-scale substitution of non-nuclear for nuclear weapons must come next. Firstly, although the Soviet Union lags in the development of technologies of information, she does not seem to lag in fielding useful equipment and in making needed adaptations, and NATO's ability to maintain an effective lead is uncertain. Secondly, whatever the potential for improving the non-nuclear blocking capacity, the need to discourage a nuclear attack on Europe remains

urgent. Thirdly, more vehicles will be genuinely dual-capable – i.e. nuclear and non-nuclear – because the effectiveness of small non-nuclear packages is higher. Cruise missiles and RPV provide perhaps the best examples.

Defending Europe

Unless NATO continues to make changes to reduce its vulnerability, the Pact's surprise-attack capacity will grow; it may already be able to mount a powerful attack without extensive reinforcement, and such an attack could give NATO little usable warning. In constrast, if NATO's posture is resilient to sudden attack, the Pact will have to build up and concentrate, and it could be vulnerable during this process if NATO has invested in improved battlefield surveillance, mobile artillery, air-delivered area munitions, improved anti-tank weapons, etc. Despite the growing difficulty of penetrating modern air defences, much more effective attack against fixed targets (for example, bridges and command centres) might be managed in order to disrupt the forward movement and supply of Pact forces. On the battlefield, improved target-acquisition technology and the use of RPV, drones and precision weapons (including advanced area munitions) could serve to blunt a Soviet combined-arms attack, at least to the extent of disrupting it, perhaps with substantial direct destruction. (There is a good deal of disagreement about the best way to achieve these ends.)[2]

The Soviet Union, of course, is adopting these technologies, and (given her higher material production rates) her inventories of advanced weapons may grow rapidly. She is investing heavily not only in the ground-force equipment about which we hear so much – tanks, self-propelled artillery, anti-tank weapons and armoured personnel carriers – but also in surveillance, electronic countermeasures and command-and-control capacities. She is also investing much more than before in tactical aircraft with offensive capacities. These are equipped with modern precision munitions, including those with area coverage, and they will present a much greater threat of disruption and damage to NATO forces than in the past. Mobile air defences and improved low-altitude radar coverage have become urgent for NATO force improvement.

Defence of the flanks may be especially affected by the increased vulnerability of sea and air forces noted in Proposition 2 above. In a Soviet attacking force these components could be subject to high attrition. So also might some of the Western forces moving in reinforcement of the flanks. The lesson, yet again, is to avoid 'gigantism'. A multiplicity of smaller units will permit earlier arrival of some reinforcements on the flank – an important political desideratum – as well as providing more difficult targets for Soviet attack.

It is natural to speculate not only about the implications of these developments for the Alliance *vis-à-vis* the Warsaw Pact but also about the implications for intra-Alliance relations of changes in information technology. One should not, however, conclude that increased US technical dominance in the Alliance will be a consequence. These technologies are dynamic; the United States has a lead in some, but others in the West are not far behind. They are ubiquitous – they will pervade both civil and military sectors. It is important for the West to stay ahead, and fortunately it seems to have an advantage in economic organization, and even in culture, in these technologies.

It is difficult to see major implications for large states relative to small states in these developments, but other distinctions may emerge clearly. For instance, people who live on islands will find it easier to protect themselves against invasion, whereas those who depend on unimpeded movement of shipping may find themselves at a disadvantage. (There are lessons for Japan and for the NATO countries here.)

Because the prospects for action at a distance are improved, the possibility of an effective non-nuclear attack across political boundaries is more likely, at least against peripheral bases and war-supporting industry in an attacker's homeland. Such a possibility raises the familiar problem of escalation or, more precisely, widening of the war. Those who hold that no serious use of nuclear weapons should be contemplated because of the risk of a nuclear

[2] For a discussion of differing European and American views on how to conduct tactical air operations under modern conditions, see Stephen Canby *The Contribution of Tactical Air-power in Countering a Blitz: European Perceptions* (Washington DC: Technology Service Corporation, May 1977).

holocaust and that non-nuclear cross-border attacks on military forces or war-production facilities of an attacker are too dangerous are, in effect, in favour of giving an attacker an unconditional promise that his homeland will be safe. Such a stance is not promising for stability in Europe. It does at least appear that there can be a *choice* between the use of nuclear weapons – on the battlefield only, say, or even on NATO territory only – and non-nuclear use on Warsaw Pact territory.

NATO has a critical dependence on sea lines of communication. Alliance shipping must continue to operate; oil must be transported and reinforcements sent to Europe. Soviet ocean surveillance is improving rapidly through the use of satellites with data links, increased access to overseas bases for reconnaissance aircraft and information-gathering ships. These, together with cruise missiles and long-range supersonic *Backfire* bombers, make the Soviet Union much more effective in sea attack. In a surprise attack, particularly, she might score important successes.

There are good reasons, however, why NATO should not be too gloomy about the prospect of keeping these lines of communication open. In the absence of a large accretion of territory, or bases in better positions, the Soviet Union will continue to have only restricted access to the open oceans, and barriers with sensors, submarines and 'smart' mines can make her transits costly. Air-defence barriers can also deter her aircraft. Much of her information-gathering and peripheral attack abilities might not survive long in a serious conflict. (Nor, incidentally, should the West count on its own surviving any longer.) The Soviet surface fleet is likely to be very vulnerable beyond the umbrella of Soviet land-based air defences. In short, a prolonged struggle to keep sea lines open seems likely to be successful for NATO. What is more worrying is the disruption which the Soviet Union could cause to these lines during the critical opening period of a European conflict – which might also be the closing period if she managed a rapid advance.

Competition and Conflict in Third Areas

Skill in deploying small forces rapidly and striking with high accuracy over very long ranges is clearly increasing. Commando raids of the kind carried out at Entebbe and Mogadishu are examples of one type; others are the rapid movement of Cubans to Angola and the air and sea supply by both sides to the Middle East in the 1973 war.

The Soviet Union is achieving sustained growth in her ability to project power into areas remote from her borders, and particular progress has been made in her long-range airlift. Some years ago she was unable to sustain a small airlift to Peru; now she conducts long-range operations to distant places as a matter of routine. This development is not so much the product of a major technological advance (although cumulative improvements in aircraft design, engines and command and control are important) as of investment and learning in a new line of work. This is another illustration of the point already made that it is often not a technological breakthrough that is of decisive importance but learning how to use technologies that are evolving incrementally.

The growing capacity of the Soviet Union to operate in third areas raises many issues which go beyond the scope of a discussion centred on new technologies. But in one region at least, the Middle East, the transfer of modern arms is occurring on a scale large enough to warrant comment. Some of these weapons are simple to use; others, such as the F-15, are extraordinarily complex and will require a large support system and foreign help for many years to come. The 1973 war showed how effective many of these weapons can be, how rapidly regional balances can be altered by the transfer of advanced weapons, and the high intensity of conflict and rate of material usage that can result.

Possession of advanced weapons by regional powers increases the potential cost to outsiders of intervention as, for instance, the Soviet Union threatened in the Middle East in 1973. Still more costly would be intervention against the future regional possessors of nuclear weapons.

How Constraining is Cost?

It is often remarked that some of the new weapons are impressively effective but priced out of reach. The unit cost of some modern weapons is indeed very high, but some of the most costly weapons may not be the most useful ones in the years ahead. For example, it has been decided not to go ahead with the $100-million-per-item B-1 bomber; the US Administration

is trying to keep Congress from going ahead with a $2-billion nuclear-powered aircraft carrier; tanks costing $1 million or more apiece are not likely to be produced in large numbers. In short, the changes that are taking place affecting weapon costs are more complex than is implied by the observation that everything is getting much more costly; a shift towards less costly alternatives is also evident. In contrast, the costs of a given capability in information technologies continue to decline rapidly, especially with data processing.

New technology merely offers a wider range of choice; the old alternatives do not disappear, and, if old is better than new within a given budget, it can still be chosen. Complaints about the high cost of some of the new weapons largely come down to complaints and worries about the size of defence budgets. Given the impressive build-up in the East, these worries seem justified and need to be faced.

To those who see advances in technical knowledge as increasing the potential for destruction, and therefore its reality, technology is bad and should be stopped. If not stopped by agreement with adversaries, perhaps it should be stopped by unilateral action. The alternative, and on the whole dominant, view is not that technology is good *per se* or that if something can be made it should be, but rather that advances in technology give us a wider range of choices. And more choices, by and large, are better than fewer.[3]

Should we try to stop some of these non-nuclear technologies? Some proposals have been made to this effect – for example, the barring of napalm and area-distributed sub-munitions. Many current versions of these weapons lack delivery accuracy, which reduces their military effectiveness and increases the likelihood of collateral damage. (Even so, it is doubtful whether they are as indiscriminately damaging as the iron bombs that used to be so widely scattered.) But area weapons being developed will be more precise in delivery, and therefore not as subject to the legitimate charge of causing inadvertent damage.

The principal legitimate reason for prohibiting a military technology, in my view, is that it might cause indiscriminate damage. Because these technologies offer increases in precision and control they should be encouraged. In addition, most emerge from advances so integral to the fabric of modern industrial development that it would be virtually impossible to put workable agreed contraints on them – although we might manage to slow ourselves down.

To the extent that technological changes and changes in force disposition (especially in the East) are increasing the advantage of pre-emption, the Mutual and Balanced Force Reductions (MBFR) negotiations might usefully concentrate on measures to increase warning of attack preparations, reducing noise through restrictions on manoeuvres, and notification of movements in the region and deployments into it.

It should be evident that the Alliance depends crucially on the new technologies. Certainly a failure to press ahead vigorously will leave us at a growing disadvantage. In some of them – micro-electronics and computers for instance – the West has an advantage that it is not likely to be transient. We can identify the technologies that are of cardinal importance and in which we have – or can acquire – a comparative advantage, and drive this advantage as far as possible. We do not have many areas left in which we have an edge over the East, and we need to make the most of what we have.

[3] This does not necessarily mean that we should go all the way to develop a technology before thinking about whether we really need it. For example, it makes sense to stop and think hard about some types of recombinant DNA research, or nuclear reactor technologies that necessarily require the wide circulation of nuclear explosive materials. After thinking about it, we might sensibly decide to impose some restrictions on what is developed.