Research And Destruction

Military scientists make horrid, expensive weapons. But, argues **Frank Barnaby,** they needn't be aggressive weapons.

Detente between East and West is likely to lead, particularly since the recent Soviet coup, to significant real decreases in military budgets. But reductions in funds given to military research and development, currently running worldwide at a total of nearly $100,000m a year, are not likely. On the contrary: military science budgets may well increase.

Not only are there powerful academic and industrial vested interests intent on increasing military budgets, but some countries - the USA and Israel are typical examples - put great score on keeping abreast of all advances in military technology. To be ahead in military science is believed to be an essential element of national security.

But to continue investing such large resources in military science in today's world is both immoral and unwise. Immoral, because the research talent now monopolised by military science is needed to tackle urgent global problems. Unwise, because if advances in military technology are allowed to continue unabated, they will lead, detente notwithstanding, to perceptions of a nuclear first-strike capability which will destabilise international relations and considerably increase the risk of nuclear war.

Military or military-related activities currently absorb about 60m people worldwide - roughly equivalent to the entire labour force in European manufacturing industries. Around 20% of the world's 2.5m research scientists and engineers work only on military R & D. If just physicists and engineering scientists are included, the percentage is even greater: over 50% of the world's research physicists and engineering scientists are military scientists[1]. Put another way, military science absorbs scientific and technological capabilities ten times greater than those available to *all* the developing countries.

The global problems arising from the population explosion and from poverty are well known. They include the food crisis, pollution, the urgent need to develop new sources of energy and raw materials whilst preserving currently available resources, and the need to improve health, diets, housing and education standards. The skills monopolised by military science are vital for, and could rapidly be diverted to, many of these global problems. If we don't so divert these skills, the rich-poor poverty gap - and therefore North-South tension - is bound to increase until it becomes a direct threat to world security.

East-West, better relations have made the Soviet-American arms race redundant. But although increasing economic collapse is taking the Soviets out of important parts of the arms race, there is no sign that the Americans (or some Europeans, like the British and the French) intend to decrease their military R & D effort. So far as the USSR is concerned, its strategic nuclear arsenal is the main surviving element of its superpower status, and for this reason the Soviets will probably continue to modernise their strategic nuclear weapons in the current situation. We must therefore expect that the Soviet-American nuclear arms race will continue.

Over the years, that arms race has acquired a technological momentum which has caused, and is causing, important changes in Soviet and American nuclear strategies. Consequently, it has become extremely difficult for political leaders to keep military science under political control. The formation of large teams of nuclear scientists and technologists - to operate military nuclear reactors and other nuclear weapon facilities, and to design, develop, test and produce nuclear weapons - eventually results in the emergence of powerful lobbies, made up of scientists with a professional interest in designing and producing increasingly sophisticated nuclear weapons, just to convince themselves that they can do so. These lobbies have become part and parcel of the political process. Together with the other elements of the defence establishment, they generate initiatives within the decision-making process, in favour of the continual modernisation of nuclear weapons and their supporting technologies. Such inputs are difficult for political leaders to overcome - to the extent that nuclear strategies are now mainly determined not by the requirements of rational foreign policy considerations, but by the technological characteristics of nuclear weapons and their supporting technologies.

The targets at which nuclear weapons are aimed are generally determined by the accuracy with which the weapons can be delivered. Inaccurate nuclear weapons are seen as useful for deterrence, by threatening an enemy with unacceptable death and destruction. Accurate nuclear weapons are seen as useful for war fighting, by assured destruction. Thus a paradox of the nuclear age is that nuclear deterrence based on mutual assured destruction (MAD), if it works at all, only does so with inaccurate nuclear weapons. As more accurate nuclear weapons are deployed, the enemy may assume that his own nuclear forces and not his cities are the target; thus the cities cease to be effective hostages.

In other words, accurate nuclear weapons weaken and eventually undo strategies of nuclear deterrence based on assured destruction. Thus unless military nuclear technology is brought under control, nuclear war fighting strategies will give way to nuclear war winning strategies, in which victory is perceived to be possible.

A range of military technologies being developed at present looks set to strengthen military and political perceptions about the possibility of fighting and winning a nuclear war. Developments in anti-submarine warfare are particularly disturbing. Now that land-based ballistic missiles are vulnerable to a first (pre-emptive) nuclear strike by hostile land-based missiles, nuclear deterrence depends mainly on the continuing invulnerability of nuclear strategic submarines. But if these do become vulnerable, a first nuclear strike may be seen as desirable and even essential, to prevent the enemy from himself acquiring a first strike capability.

Moreover, moves to nuclear war fighting and war winning strategies considerably increase the risk of nuclear war by accident. For example: one side may be capable of severely limiting the damage created by the other side's strategic nuclear submarines in a retaliatory strike, and it may believe it can destroy, using anti-ballistic missiles, the enemy missile warheads which survive a surprise attack. In this situation the temptation to make an all-out first strike could become virtually irresistible, particularly during a period of international crisis.

However, while advances in nuclear military technology have clearly become destabilising elements in international relations, the deployment of some new conventional - ie. non-nuclear - weapon systems (see box), together with the adoption of appropriate military postures, could work to stabilise the relations between countries.

Weapon systems based on anti-tank, anti-aircraft and anti-ship missiles are benefiting in particular from the new technologies in this area. New anti-tank missiles, for example, are rapidly making the main battle tank obsolete, particularly when used on helicopters. Operational research shows that one helicopter should be able to destroy 17 times its value in tanks before being shot down in battle. The use of 'fire-and-forget', top attack, precision-guided missiles will allow helicopters to attack armoured vehicles from much larger ranges, considerably reducing their vulnerability. Improved avionics will allow helicopters to operate at night and in bad weather, and the new technologies will eventually revolutionise helicopters themselves, raising top speeds from a present 400 km per hour or so, to much higher and even supersonic speeds.

The new conventional military technologies are making defence increasingly cost-effective, in that it is becoming cheaper to destroy (by short-range missiles) the enemy's long-range weapon systems - like main battle tanks, long-range combat aircraft and large warships, which are seen to be the main weapons of invasion and occupation - than to deploy one's own. For this reason, interest in military policies which emphasise defensive systems - called non-offensive or non-provocative defence - is increasing.

In fact non-offensive defence is already, or very soon will be, the most economical military posture. The underlying principle is that the size, structure, weapons, logistics, training, manoeuvres, war games, military academy text-books, and all the other activities of the military forces, can be so designed as to demonstrate that *in their totality* they provide an effective conventional defence, whilst having virtually no offensive capability. Military forces could, on request, be opened for inspection by neighbouring or other countries, to assure them of the non-aggressive, non-threatening nature of the forces.

New military doctrines are needed in response to the changed political situation in Europe. Many argue that the democratisation process in Eastern European countries and the Soviet Union can only succeed if Western European countries and the central Soviet leadership can restructure their military forces to become non-offensive. Spurred both by economic constraints, and by the need for a defence strategy appropriate to a new European security system, European and Soviet political leaders may well be anxious to negotiate mutual non-offensive defence strategies, with adequate verification, as part of the European disarmament process. If so, they will be in tune with military technological realities - and at least some good will have come out of military science.

1. Figures fromThe *World Armaments and Disarmament SIPRI Yearbook 1983*, published by Taylor & Francis Ltd, London, 1983.

Cruel Hopes

Research into conventional (non-nuclear) technologies could help politicians working to stabilise international relations. But the new weapon systems are no soft option. Together with developments in computerised command, control, communications and intelligence systems, they can be grouped under three headings:

I Very powerful conventional warheads with improved yield-to-weight ratios.

Two examples in this category are cluster bombs and fragmentation munitions. Exploding fragmentation bomblets can scatter small, jagged chunks of metal over a large area. The fragments have razor-sharp edges, are very hot, and travel at high speeds. Most people in the range of the fragments are killed, many of them literally shredded.

Another new, powerful conventional warhead is the fuel air explosive used by coalition forces during the 1991 Gulf War. This weapon produces an aerosol cloud of a substance which is extremely explosive when mixed with air, such as propylene oxide vapour. Several clouds of fuel air explosive can be formed close together so that when ignited they produce an explosion as big as a low-yield nuclear one. People under the exploding cloud die from asphyxiation, caused by physical damage to the membranes of their lungs. The resulting fireball can kill and injure people on the edge of the explosion.

2 Sensor and guidance technologies for smart and ultra-smart fire-and-forget'missiles

Once launched, these missiles operate without any further instructions from the person or platform which fired them, detecting, identifying, and effectively attacking, in all weathers and battlefield conditions, armoured vehicles, combat aircraft and warships, as well as armoured fixed targets such as command and control centres.

3 Technologies which provide long-range and real-time surveillance and target acquisition

Advances in this area have given the military unprecedented reconnaissance capabilities. It is now possible to identify and track, in real time, enemy forces deep in their own territory. Sensors on board satellites, manned aircraft, and remotely piloted vehicles (pilotless aircraft) give advance warning of mobilisation and preparations for attack. The new weapons can be guided to their targets with great accuracy by real-time mid-course guidance and, more importantly, by terminal guidance. Accuracy is virtually independent of range. Terminally-guided missiles use radar or a laser system to search the area around the target and compare it with a map pre-programmed in the warhead's computer. The system locks-on to some fixed location near the target and guides the warhead precisely onto it.