The grim reality: the current nuclear situation

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The Cold War ended 10 years ago. But we are still faced with huge nuclear arsenals, nuclear arms races, the spread of nuclear weapons and the capability to make and deliver them to more and more countries, an undiminished danger of the accidental or unauthorised launch of nuclear weapons, and an increasing threat of nuclear terrorism.

In spite of all this, people have been lulled into a false sense of security, believing that we no longer need to worry about the danger of nuclear war. A more reasonable view is that, human nature being what it is, if nuclear weapons exist they will sooner or later be used. The only way to remove the risk of nuclear war is to abolish nuclear weapons.

The nuclear arsenals

The number of nuclear weapons in the world's arsenals is irrationally large. The United States, for example, has an operational nuclear stockpile of about 8,750 warheads, 7,250 of them strategic and about 1,500 tactical. If the nuclear weapons in reserve and those waiting for dismantlement are added, the total reserve becomes about 12,500. Assuming that the START I and START II Treaties are implemented, the American nuclear arsenal by the end of the year 2007 will still contain about 10,000 nuclear warheads—3,500 strategic, 1,000 tactical and 5,500 in reserve.

The Russian nuclear arsenal currently contains 7,250 strategic nuclear warheads, about 4,500 tactical weapons and about 10,000 with uncertain status—a total of about 22,000 nuclear weapons. By the end of the year 2007, the Russian arsenal should under the START Treaties contain about 11,000 nuclear warheads—3,500 strategic, probably about 2,500 tactical and about 5,000 in reserve.

The nuclear arsenals of the other six nuclear-weapon powers are tiny compared with those of the Americans and Russians. The probable numbers are : France, 500, China, 400, Israel, 200, UK, 200, India, up to 100 and Pakistan, 10 or so. The grand total number of nuclear warheads in the current world's nuclear arsenals is, therefore, approximately 36,000. End 2007, 22000 if START II is implemented.

The START process

Will START II be implemented? The USA ratified START II on 26 January 1996. The Treaty has not been ratified by Russia and faces stiff opposition in the Duma. The main objection in Russia to START II is that it will leave the USA with a significant strategic advantage by committing Russia to eliminate its multiple-warhead land-based ICBMs, the most powerful element in its strategic nuclear forces but allows the USA to retain its Trident SLBMs, the most powerful element in its strategic nuclear forces.

In spite of the Russian delay in ratifying START II, the Clinton Administration has not ruled out the negotiation of a START II Treaty, which, if it comes into force, may further reduce the number of strategic nuclear warheads deployed by each side, perhaps to about 2,000.

The START process is bilateral involving only Russian and the USA

The next most urgent multilateral nuclear arms control measure is the negotiation of a ban on the further production of fissile materials for nuclear weapons. The Conference on Disarmament in Geneva plans to begin the process of such a negotiation in January.

A treaty banning the further production of weapon-grade materials in designated military facilities should, on first sight, be easy to negotiate. In all of the five declared nuclear-weapon states the USA, Russia, the UK, China, and France the production of weapon-grade plutonium and highly-enriched uranium is soon coming of has already some to an end. This is why these powers are willing to ban future production.

But such a ban will be, to say the least, of limited effect unless it includes those civil nuclear-power reactors, called reactor-grade plutonium….

The reactor-grade plutonium can be used to fabricate nuclear weapons was proved by the British who exploded at least one such device in the 1960s.

Since 1945, when plutonium was first produced on a significant scale, the world has produced a huge amount of plutonium a total of about 1,400 tonnes. About 230 tonnes of this plutonium were produced for use in nuclear weapons. The other 1,150 tonnes are civilian plutonium produced, as an inevitable by-product, by civilian nuclear-power reactors while they are generating electricity.

About 230 tonnes of civil plutonium have been separated from spent nuclear-power reactor fuel elements in reprocessing plants, so that there is about as much separated civil plutonium in the world as military plutonium. About 30 tonnes of additional civil plutonium are being separated each year.

New types of nuclear weapons

Some argue that the development of new types of nuclear weapons is not possible without testing them. This may well be true for nuclear weapons based on current technologies. But will the Comprehensive Test Ban Treaty (CTBT) inhibit the development of new generations of nuclear weapons?

There are two schools of thought. According to some scientists at Los Alamos and Lawrence Livermore National Laboratories, then main American nuclear-weapon design establishments, nuclear-weapon designers have reached the ultimate in nuclear-weapon technology and that there will be no further significant improvements in nuclear weapons. Nevertheless, scientists at the weapons laboratories must be thinking about future nuclear-weapon designs.

They will be encouraged by the second school of thought, which believes that fundamental scientific research now going on in civilian laboratories will provide nuclear-weapon designers with the knowledge needed to develop an entirely new generation of nuclear weapons, weapons which will not be covered by existing arms control treaties, such as the Comprehensive Test Ban Treaty.

Two eminent Swiss nuclear scientists, Gsponer and Hurni, for example, explain in a recent comprehensive technical study that fundamental research of the elementary particles which make up matter, will be the basis of the new weapons. This research is devoted to understanding extreme states of matter, such as very high pressures, very high energies, very high energy densities, and so on. Compared with the nuclear weapons in today's arsenals, tomorrow's weapons will, according to Gsponer and Hurni, offer significant military advantages, especially for tactical use, because most of them will not produce large amount of radioactivity.

If a new generation of nuclear weapons does emerge, the first type will probably be a pure nuclear-fusion weapon. The nuclear fusion process is essentially the opposite of nuclear fission. Whereas in nuclear fission the nuclei of heavy isotopes are split into lighter ones, in nuclear fusion light nuclei, like hydrogen, are joined, or fused, together. The fusion process, like the fission process, is accompanied by the emission of energy which can be used to produce an explosion.

Today's thermonuclear weapons consist of two separate stages. One stage is a nuclear-fission weapon which acts as a trigger for the second stage. The explosion of the fission trigger produces a high enough temperature and pressure to fuse together nuclei of hydrogen contained in the second stage. The energy from this nuclear fusion produces a large explosion.

Tomorrow's thermonuclear weapons will probably not rely on a nuclear-fission trigger to provide the conditions needed for nuclear fusion. Instead they may use new types of very powerful conventional high explosives, arranged, for example, in a spherical shell around a capsule containing the hydrogen gases tritium and deuterium. When the explosives are detonated the capsule will be crushed inwards and the gases rapidly heated to a temperature high enough to allow the fusion of hydrogen nuclei to take place. Such a H-bomb would be relatively simple to design and construct. The ideal terrorist weapon of the next century.

Scientists have already achieved some nuclear fusion using currently-available high explosives but the amount of fusion produced has not been nearly enough to be militarily useful. But new explosives are being developed which can produce energy concentrations much greater than those produced by today's conventional high explosives.

In the not too distant future, explosives powerful enough for use in militarily useful pure-fusion weapons will almost certainly be developed.

Looking a decade or two ahead, nuclear-fusion weapons may be triggered by laser beams or by anti-matter, such as anti-protons. When anti-matter makes contact with matter, both are annihilated with the production of much energy. Gsponer and Hurni calculate that the annihilation energy produced by only a millionth of a gram of anti-protons would be enough to trigger a large thermonuclear explosion.

Key scientific instruments for the development of the next generation of nuclear weapons are inertial confinement fusion devices. Two large ones are planned the National Ignition Facility or (NIF) at the Lawrence Livermore Laboratory in California in the USA, and the Laser Megajoule (LMJ) facility at Bordeaux, in France.

The results from the NIF could help nuclear-weapon scientists to develop a laser-triggered pure-fusion bomb using miniaturised high-intensity lasers. And experiments on the production of anti-matter are planned with the laser beams, which are likely to produce anti-protons much more efficiently than the large particle accelerators currently used for this purpose.

The NIF scientific programme also includes research on metallic hydrogen. Above a certain pressure, hydrogen may be converted from a gas into a solid metallic state at room temperature. Metallic hydrogen may be 30 or so times more explosive than the best conventional high explosives. It is described as "possibly the most powerful chemical explosive conceivable". Metallic hydrogen clearly has the potential to be used in the triggers of pure-fusion weapons.

Which school of thought is likely to be correct? Have we seen the end of the nuclear arms race? Or will yet another generation of nuclear weapons be developed? Only time will tell. But it would, to say the least, be surprising if the nuclear-weapon designers have had their day.

Getting from 200 to zero

As described, START III, if and when negotiated, may reduce the number of strategic nuclear warheads to about 2,000 on each side. It seems reasonable to suggest that the other nuclear-weapon powers are then brought into the process and that the declared nuclear-weapon powers should further reduce their nuclear arsenals to 200 each by, say, the year 2030.

To get from 200 nuclear warheads to abolition will need special arrangements. Who will be allowed to deploy nuclear weapons during the transition from 200 to zero? The UN? Or will the nuclear-weapon powers be allowed to keep their nuclear weapons under international supervision during the final stage of abolition?

But perhaps the most important question of all is: Can nuclear weapons ever be abolished in a world of sovereign nation states? If not, what system of global goverance is needed for a nuclear-weapon-free world? These are all huge questions which will require much public and political debate.

Yesterday, Senator Roche mentioned the people in white coats the military scientists. These are the people who develop weapons of mass destruction biological, chemical and nuclear.

There are a lot of them. Globally there are some 2.5 million scientists and engineers in research of all types. Of these, about 25% are in military research and development. If you include only physician and engineering scientists—those at the forefront of technological advance—more than 50% are in military R & D. As Hose Ramos Horta said last night, these are the people who showed ….working on the solutions of global problems—working for the good of humanity rather than its destruction. I was a military activist myself and know from personal experience that unless the activities of the military scientists are controlled the development and deployment of weapons of mass destruction will go on.

Professional scientists and engineers military and non-military that belong to professional bodies the various institutes of physics, engineering, biology etc. Professional medicine bodies have contacts with and influence on these institutes. Medical people and this may be a job for the IPPNW, should, through their professional bodies, persuade their fellow professionals to stop working on military science and technology. In particular, we need to stop young people from becoming military scientists. Sadly, virtually no attempt is being made to do so. Yet this may be the best, if not the only chance of reversing the biological chemical and nuclear arms race and thereby improving the prospects for humanity.