

Nuclear treaties and nuclear policy

J. Pasupathy

There has been an ongoing discussion in our country about the Comprehensive Test Ban Treaty (CTBT) and nuclear policies in general. It is pertinent to consider a few questions in this regard.

1) What are the implications of the various nuclear treaties?

- a) We enthusiastically supported the 1963 partial test ban treaty.
- b) We have refused to accede to the Nonproliferation treaty (NPT) of 1970 which was indefinitely extended in 1995.
- c) In 1993 our representatives in Geneva were enthusiastic about CTBT but our position changed later and we refused to sign the CTBT in 1996. After Pokhran II we are 'willing to think again'. During the period of negotiations on CTBT, the Indian representatives had asked for a number of substantive changes in the treaty which of course were not incorporated. Will India insist on these being reconsidered before it agrees to sign the treaty?
- d) Soon the Committee on Disarmament (CD) will begin discussions on the Fissile Material Cutoff Treaty (FMCT). What should be our position?

2) Nuclear deterrence

- a) How credible is our capability to manufacture weapons of assured destructive potential and deliver them in case we suffer a nuclear attack?
- b) Should we conduct more tests?
- c) What are the costs? Where do nuclear weapons fit in, in our overall defense posture.
- d) Is there a minimal nuclear deterrence?

3) Nuclear proliferation and disarmament (cf. Boxes 1 and 3)

The spread of missile technology and relative ease with which nuclear materials are available in many countries

should be a very serious cause of concern for us. Given that both USA and Russia are unlikely to reduce their arsenals to even a level like thousand weapons each by the end of this decade and China, UK and France will keep a few hundred apiece, what should be our immediate concern to contain the nuclear peril, in the current decade?

4) Finally, what is the democratic process by which we as a nation accede to an

international treaty? Specifically in the context of CTBT and its successor FMCT, should there be public hearings by parliamentary committees before we sign these?

In trying to answer these questions, I work within a framework, which has the following elements.

1. 'Nuclear devices/weapons' have been inducted in South Asia for nearly a decade now and a debate at

Box 1. The State of Nuclear Proliferation in May 1998 (adapted from www.armscontrol.org)

Recognized Nuclear Weapon States – China, France, Russia, United Kingdom, United States

Unrecognized Nuclear Weapon States – India, Israel, Pakistan

States of immediate proliferation concern – North Korea, Iran, Iraq, Libya

Recent converts to nuclear non-proliferation – Algeria, Argentina, Belarus, Brazil, Kazakhstan, South Africa, Ukraine.

China, France, Russia, United Kingdom, United States: The Nuclear Weapon States are recognized as such by the 1968 Nuclear Non-proliferation Treaty (NPT) in exchange for their pledge in Article VI of the treaty to pursue nuclear disarmament in good faith. The current arsenals of the nuclear powers are:

- China: 275 operational strategic warheads and 150 operational tactical warheads;
- France: 400 operational strategic warheads, 60 operational tactical warheads and 50 warheads awaiting dismantlement;
- Russia: 6,240 operational strategic warheads, 4,000 operational tactical warheads, about 18,000 warheads in reserve or awaiting dismantlement;
- United Kingdom: 200 operational strategic warheads, 80 operational tactical warheads (to be retired), and 120 warheads awaiting dismantlement; and
- United States: 7,450 operational strategic warheads, 970 operational tactical warheads, 2,300 warheads in reserve, 1,350 awaiting dismantlement.

India, Israel and Pakistan: These three states are not members of the NPT but are believed to possess nuclear weapons or components of nuclear weapons that can be quickly assembled. Estimates of the current arsenals of the *de facto* nuclear powers are: India, 60 to 80 weapons; Israel, 70 to 125 weapons; Pakistan 10 to 15 weapons. India and Israel are assumed to use plutonium in their weapons; Pakistan is believed to use enriched uranium.

Belarus, Kazakhstan, and Ukraine: In 1991, these former states of the Soviet Union found themselves not only independent, but also with large numbers of nuclear weapons on their soil. All three states have returned to Moscow the Soviet nuclear weapons based on their soil (Belarus, November 1996; Kazakhstan, April 1995; and Ukraine, June 1996), and have acceded to the NPT.

South Africa: South Africa successfully developed its own indigenous nuclear weapons program using enriched uranium and then – unique among nations – gave up its arsenal of six nuclear weapons of its own volition. Dismantlement of the program was completed in 1991, and was made public in 1993. South Africa acceded to the NPT in 1991, and in 1994 was declared to be nuclear weapons-free by the IAEA.

the present time about who did what in the past, is not so important as what we should do in the days ahead.

2. Nuclear weapons cannot be disinvited and the world will be living under the shadow of nuclear weapons for many years (Box 2).
3. Security interests do demand a limited role for NW in the larger framework of defence and needs a thorough discussion.
4. Nuclear proliferation dangers are very real, given the proliferation of missile technology and large amount of fissile materials that exist in the world today.
5. We need to rethink our approach to nuclear disarmament issues given.
 - a) That we are in a self-contradictory situation of developing nuclear weapons on the one hand and pleading for elimination of all nuclear weapons on the other.
 - b) India's ability to influence progress of disarmament is at best marginal if not insignificant at the present time. We need to evolve a new approach, whose primary objective would be to establish an international order that can effectively curb clandestine transfer of nuclear and missile technology and materials, either to a nation or groups within a nation state. Our disappointing experience with NPT shows that the current mechanisms are ineffective.

Consider now what the various treaties imply for India. As far as the limited test ban treaty is concerned, happily there has been universal agreement although it is worth reminding ourselves that China and France did not become signatories in 1963 but followed their own time framework.

The non-proliferation treaty NPT has sought to freeze the number of weapons state as of 1968, without any serious move towards disarmament. What is worse from India's point of view, is that the treaty has been violated in practice, by transfer of material and perhaps knowhow to Pakistan with no concern about India's security by the rest of the world.

The CTBT seeks on the one hand to halt further development of weapons

and on the other to tighten the non-proliferation regime. The USA conducted its last test in September 1992 while the erstwhile USSR in October 1990 and UK in 1991. The treaty was opened for discussion in 1994. France and China continued testing till 27 January 1996 and 29 July 1996 respectively. India opposed the treaty which prevented CD from forwarding the treaty to the UN. However, Australia introduced the treaty as a resolution in the UN which was adopted. A notable feature of the treaty is the entry into force clause which requires 44 states (states which have nuclear reactors) to ratify this treaty within a three-year period. With the rejection of the treaty by the US Senate, there is perhaps time for us to enter into fresh negotiations on this treaty and seek modifications that can take into account some of the concerns that our representatives in CD had expressed.

Apart from all the objections that India had about the NPT, it has additional reservations regarding CTBT. Specifically, seismological monitoring perhaps

is not as reliable a way of determining whether an underground explosion has taken place or not. There were some false alarms in the past, and it would be recalled that foreign and some Indian critics disputed the nature and yields of the Pokharan tests. Further, inspection by IAEA teams on grounds of suspected conduct of tests is a delicate problem. Even a country as staunchly anti-nuclear as Japan when faced with the Tokaimura accident was not enthusiastic about letting in IAEA, that too in a commercial establishment.

Even if India signs the CTBT, it will not be accorded a nuclear weapon country status. Since India is not a signatory to NPT there are many things like low enriched uranium which are easily available to the rest of the world but are denied to India. Perhaps a debate in parliament will reveal what India gains and concedes by signing the CTBT either in its present form or a modified version. The chances of CD agreeing to reopen the CTBT for modification are, however, very remote.

Box 2. The future of US nuclear weapons policy

Excerpts from the Executive Summary of the US National Academy of Sciences Report. For the full report, see www.armscontrol.org.

'During the Cold War, nuclear deterrence was the bedrock of US strategy for preventing both nuclear war and major conventional war because a more effective alternative was not apparent...'

'This committee has concluded that the dilemmas and dangers of nuclear deterrence as practised by the United States in the past can and should be alleviated in the post-Cold War security environment by confining such deterrence to the core function of deterring nuclear attack, or coercion by threat of nuclear attack, against the United States or its allies. That is, the United States would no longer threaten to respond with nuclear weapons against conventional, chemical, or biological attacks.'

'As long as nuclear weapons exist, this very existence will exert a deterrent effect – existential deterrence – against unrestricted conventional war among the major powers, since it will be recognized that, in a world with nuclear weapons, such conflicts might well lead to their use, with intolerable destruction as the result.'

'The dangers of initiation of nuclear war by error (e.g. based on false warning of attack) or by accident (e.g. by a technical failure) remain unacceptably high. (On the Russian side, the dangers of erroneous, accidental, or unauthorized nuclear weapons use may be even higher than during the Cold War because of subsequent deterioration of the military and international-security infrastructure and of morale'.)

'Since nuclear weapons can be small and portable and not easily detectable by technical means, however, a regime that would provide high confidence of locating a small number of hidden warheads would be extremely difficult to achieve.'

'The path to the prohibition of all nuclear weapons is not yet clear.'

'More fundamentally, the knowledge of how to build nuclear weapons cannot be erased from the human mind. Even if every nuclear warhead were destroyed, the current nuclear weapons states, and a growing number of other technologically advanced states, would be able to build nuclear weapons within a few months or few years of a national decision to do so.'

The question of signing the FMCT is extremely complicated; on the one hand there is the serious problem of proliferation. If the START II treaty is approved by Russians we can expect dismantling of several weapons, all the nuclear materials will have to be carefully accounted for and safely disposed off. Besides, with advances in technology even reactor grade plutonium can be used to make a weapon and there are thousands of tons of spent fuel around the world. While retaining the space to protect our interests we need to work with others to secure meaningful international agreements.

Do we have/can we make reliable nuclear weapons? Firstly we must note that enormous strides in technology have taken place in the past five decades since nuclear weapons were first made. To illustrate – today any average scientist almost anywhere has more computing resources available in his PC or laptop than what was available in World's major scientific centers not just fifty years ago, even more recently as a decade. Whole range of new materials electronic devices and chemical explosives are available to a bomb designer of today which were completely unknown in an earlier era. To appreciate this point simply consider the difference in cost, components and quality between say radios that were available fifty years ago and now. It should then hardly be surprising if a bomb designer in China, India or Pakistan is able to better his Western counterpart.

Clearly without testing no weapon can be inducted into one's defense forces. There has been much criticism in India of the Pokhran tests, some of which is in poor taste. While we have no reason to doubt the integrity, competence and claims of our scientists, the following story is worth bearing in mind. The year was 1966 and the occasion sixtieth birthday of the great physicist Hans Bethe and place Cornell University. Richard Feynman was giving one of the talks in Bethe's honour, and during the talk he made a 'mistake' in writing an equation. As he was correcting his mistake, there was a ripple of laughter from the young undergraduate students. Feynman then turned on his heel with chalk in his hand and asked 'How many of you have done a calculation in physics and got it right the first

Box 3. Scenario of nuclear disarmament

Following START I, USA has reduced its weapons from 10,568 in 1991 to 7958 in 1999; similarly Russia has reduced its level from 10,271 to 6578. If START II which is currently stalled in the Russian Duma is successfully completed by 2007 the levels will come down to no more than 3000 to 3500. (There are complex details about sea-based, land-based missiles, heavy bombers, etc. which the interested reader can access through various websites.) START III will include confidence building measures, more transparency about the nuclear arsenals and will bring it down to 2000 each. The US National Academy Sciences study hopes that, the next stage will reduce it to a thousand weapons each. This will be followed by inclusion of China, France and the UK, i.e. the P-5 in talks on further reduction. Only at a still later stage India, Israel and Pakistan will be included in further disarmament talks. This world view of course assumes that there is no serious change in the world order either for the better or for the worse over the next couple of decades.

time?'. While I have no knowledge of the materials, design and the theoretical expectations about the yields and how they compared with the actual yields in the Pokhran tests I am astonished to see that scientists with very little knowledge and competence rush to pronounce judgements! It is entirely possible that the tests did not produce exactly the results that were theoretically anticipated. Such discrepancies are a matter of routine in any scientific work. It is one thing to oppose nuclear testing and nuclear weapons, but it speaks poorly of people who indulge in character assassination.

As for further testing, let us note that to develop the weapons in their arsenal, the P-5 countries have conducted several tests over the years.

- a) A country like the USA has something like ten different proven designs in its arsenal. Even if we think a single proven design is good enough to serve our limited purpose of self-defence, are the tests conducted so far adequate?
- b) Again scientists in the USA took nearly five years to 'improve' from the time they produced the first unwieldy thermonuclear device to the later 'leaner and meaner' versions that went into their arsenal. So the answer to the question whether India should do further testing depends on the following – the types of weapons and their adaptation to the delivery systems that we will be using. This is clearly a technical decision and can only be made by scientists entrusted with the work; however it is always a good idea, to have a second opinion by experts who are not

directly involved in the development of these weapons. It should also be borne in mind that there are compulsions arising from the international situation that can prevent us from going ahead with a particular course of action, like for example denial of materials or technical hurdles or simply political factors. The important thing is to make sure that we do not get ourselves into a strait-jacket, so that our ability to take appropriate actions is not severely curtailed as has happened in the past.

There is also a debate in India at another level about weaponization; one side says that, (i) While we should go on collecting weapons materials and continue R&D efforts about design of weapons and missiles we should actually not assemble let alone test a weapon. Another side says, (ii) If we are going to rely on nuclear weapons for self-defense, let us do it right, i.e. go through tests so that a potential aggressor does not miscalculate our ability to retaliate. Curiously some of the advocates of the first position think that it is consistent with our moral posture and somehow consistent with principles of Ahimsa. The only Prime Minister of India who had consistently opposed Indian reliance on nuclear weapons was Morarji Desai. If India takes to renounce unilaterally dependence on nuclear weapons, it certainly would be a great moral stance and many in India are likely to welcome it. I for one would welcome it but once we do admit that nuclear weapons are an ingredient of our defense the question whether our weapons can be used with a notice of three minutes or three months is a mat-

ter of detail and not one of fundamental principle. There are clearly various steps that need to be taken for confidence building measures and eliminate the danger of these weapons being released under a false alarm. While the problem of preventing a weapon from going off when let us say, there is a crash of the carrying aircraft can be solved technically and has been solved, the problem of human error remains. Scientists need to educate the public at large that there is simply no margin for error – even if a crude nuclear bomb is exploded in our region it can escalate and will mean the end of civilization in our part of the world for sure if not for the rest of humanity as well.

Now is the concept of a minimal deterrence meaningful? Yes and No. Nuclear strategists have argued that a couple of hundred warheads that are mobile (i.e. not sitting ducks) are good enough to survive a first strike and can be used to retaliate unacceptable levels of damage to the aggressor. Even this will be an expensive proposition and can be achieved only in the long run. An immediately more important factor that India will have to contend with in the short run is the following – any ‘balance of terror’ *vis-à-vis* Pakistan that India tries to establish can easily be disturbed by intervention by third countries. In other words India is simply powerless at the present time as it has been in the past to be able to control many events in its neighbourhood.

Now what about costs? This must be examined at various levels. First of all, since we do not have unlimited amount of fissile material, there will be some trade off between, development of nuclear power and nuclear weapons. As far as expenditure on scientific research is concerned, according to a responsible Secretary of GOI support for R&D, outside the Trimurti departments of DAE, DRDO and Space has been quite weak in India and we need to take adequate steps to support scientific research. Turning to defence it is worth emphasizing that we have one of the world’s largest armed forces, and even conventional weapons are getting more and more sophisticated and expensive. In addition, we have large paramilitary forces which also require much sophisticated and expensive equipment to deal with internal security, border incur-

sions, etc. Nuclear component of our defence strategy can only be a small part of the overall picture and competing demands on scarce resources have to be handled very carefully. As everyone knows, most of the revenue earned by the government goes to pay largely items like debt servicing, administration, defence (routine already committed). Given these and the compulsions of a coalition government, there is very little that is left for innovations and new projects. Add to this the remark of late Rajiv Gandhi, ‘out of every one rupee committed for development work only fifteen paise reaches the persons for whom it is meant’. If the nuclear debate leads us to examine larger issues of defence strategy and budgetary matters, it will be a very welcome development.

Proliferation and disarmament

The first weapons that were designed used fissile materials plutonium or uranium of high isotopic purity – this is no longer necessary. In fact it has been argued that even reactor grade plutonium with only 65% isotopic purity (weapons grade means better than 90% purity) can be used to make a weapon with destructive power of a few kilotons. This is a matter of serious concern. There are many countries with reactor grade plutonium ostensibly meant for civilian use for nuclear power. To give some indication of the quantity of spent fuel that was available some five years ago – India had 1050 tonnes, South Korea 2300, Pakistan 130, UK 26040, etc. Putting it differently, there are several hundred tonnes of separated reactor grade plutonium available in the world today. A crude bomb requires no more than twenty kilograms of this material.

There is another aspect of proliferation, this is the spread of missile technology. For example, it is now admitted that the North Korean NoDong missile with a range of 1300 km became the Ghauri missile in its Pakistani version and Shahab-3 missile in its Iranian version. While Iran and North Korea are signatories to NPT, Pakistan is not and nuclear weapons are easy to transport clandestinely. North Korea recently tested the Taepo Dong-1 missile which used solid fuel and took the world by surprise. While even these missiles can carry small pay loads and hit Alaska or

Hawaii, Taepo-Dong-2 can reach the US Mainland according to some reports. The point is simply the following – a world in which missiles and nuclear materials are easily available is far too dangerous a place for everyone.

Now let us come to the question of treaty making under the Indian system. Every country has a unique procedure in entering into various international agreements or bilateral agreements with other nations. For example in the case of trade negotiations like GATT, this may involve enacting specific legislations which only the parliament can do. However, in the case of bilateral agreements like Indo-USSR friendship treaty, Shimla agreement, etc. only the texts of the agreement were placed before the parliament.

I am not suggesting that in any of these instances, the role of the parliament was abridged since there is little reason to believe that the parliament would have overturned the Union Cabinet’s decision.

It is useful to contrast the US system of ratification with the Indian system which is based on the Westminster model. For example, in the case of the treaty regarding chemical and biological weapons, our representatives signed the accord based of course on negotiations and instructions from the Government of the day. The ratification process in India simply meant that the Union Cabinet gave its final approval and the instrument of ratification was placed before the appropriate international body. In the case of the USA, its Senate has to approve all treaties by a two thirds majority and the voting is preceded by extensive hearings and debate.

Coming specifically to the CTBT, if Indian representatives sign the agreement, they will most probably have to sign the existing treaty without any modifications that will take into account concerns expressed by our representatives earlier. Even without ratification signing is binding and India has an impeccable record of honouring its international commitments. Ratification would be a mere formality that the Union Cabinet will go through.

Even a cursory perusal of the Arms-control data (Boxes 1 and 3), makes it clear that India’s call for total nuclear disarmament is completely unrealistic at

the present time. Even if START II process is continued and START III also is completed both USA and Russia will still have more than 2000 NW in their arsenal. This level will be reached even optimistically only after about ten years. According to the projection by the US National Academy, this stage will have to be followed by a stage where US and Russia will cut their weapons to a level of about a thousand. This will set the stage for China, France and the UK to enter into disarmament negotiation. Countries like India, Israel and Pakistan will enter the picture only at a much later stage.

We should therefore concentrate on efforts that will halt clandestine transfer of materials and technology relating to nuclear weapons and missiles. At present, the United States is the sole arbitrator in these matters and its action is governed merely by its self-interests rather than true facts as have been established sometimes even by the US agencies themselves. We should try to find a mechanism by which, an arm of the UN, for example, can seriously investigate complaints from member states whose security is threatened by theft of nuclear materials by terrorist groups or clandestine transfer of weapons/missiles-related materials and technology and enable the Security Council to take remedial steps. (For example, pu-

native measures or at least restoration of status quo ante.)

It will only be a matter of time, before let us say a cargo ship registered in country A, with goods meant for country B from country C, is surreptitiously used by some terrorist groups to explode a crude nuclear device in some port of call of this ship. The concept of nuclear deterrence is such an unstable idea that, a suicidal group can easily trigger a nuclear war and destroy all human civilization. It is a sad commentary on human affairs that we have to depend on nuclear weapons to prevent large scale conventional wars between major powers.

Let me summarize:

1. Nuclear devices or weapons already have been in existence in South Asia for some years now and cannot be wished away.
2. If, in the opinion of our scientists, we need to do additional tests, we should carry them out at an appropriate time.
3. We must cap our nuclear goals – we must limit the role of nuclear weapons only for a second strike in retaliation for a nuclear strike against India only. We must maintain our integrity in not transferring technology in clandestine fashion or offer nuclear protection to any

other country even if such a situation arises in future.

4. The CTBT and FMCT should be discussed in parliamentary committees with inputs from knowledgeable citizens, before we sign them.
5. We will be justified in demanding a better mechanism for preventing clandestine transfer of materials and technology related to NW/missiles as a precondition to our signing the CTBT and FMCT. Given our excellent track record in honouring international agreements, we are in a strong position to demand this. This goal makes more sense than abolition of all nuclear weapons which is definitely not going to happen in the next couple of decades.

ACKNOWLEDGEMENT. In writing this I have received help from friends both in Government and outside it. I have also used information available from websites. However, I am solely responsible for any factual errors or misunderstanding. The views that I have expressed bear no relation to those of my employer, the Indian Institute of Science.

J. Pasupathy is in the Centre for Theoretical Studies, Indian Institute of Science, Bangalore 560 012, India.

COMMENTARY

Emergence, reductionism and the seamless web: When and why is science right*

P. W. Anderson

In modern science 'what you see' is very seldom 'what there is'. Every object or fact is explained in terms of something very far from direct human perception. From the days of Copernicus, Galileo and Newton, when the

mythical charioteers driving the sun, moon, and stars across the heavens were replaced by a structure of abstract natural laws, the tendency has been to analyse more and more deeply, reducing more and more of the complex world around us to the consequences of ever simpler, but more abstract and microscopic laws. In the 20th century this

process accelerated as bodies were reduced to atoms and the atoms, at first immutable, then were reduced mostly to electrons and empty space. The nucleus then itself became doubly composite, with the finest particles being objects which can never appear in isolation.

Physicists – and scientists in general – love to do two things: to take

*This text is based on the Pagels lecture delivered at Aspen, Colorado, August 1999.