The Janus Face of Science and Technology

Dual Use: Civilian or Military?

- Nuclear Power and Nuclear Weapons
- Missiles and Space
- Avoiding The Nuclear Precipice
- The Legacy of Joseph Rotblat
Janus, the Roman god with two faces, symbolizes the ambivalence of science and technology. One face represents “good” aspects of science that seek truth and serves noble and widely respected purposes. The other face shows the “bad” part of science that distorts the truth and exploits knowledge for partial interests and destructive purposes. Both faces are inextricably linked as complementary mirror images, reflecting a society that is both shaping and is being shaped by science. Here, good and bad are not just statements about the quality of science, but also moral judgements, based on the viewpoints and values of those who judge. Some actors profit from the fruits of science, while others may suffer adverse consequences.

Scientific and technical progress is part of the societal process that is driven by decisions of actors pursuing their own interests. Following democratic rules does not mean that the majority decides whether scientific results are true or false, but whether the consequences are right or wrong. Using science and technology as instruments of power and destruction serves no common purpose and cannot claim support by society. The duality of science and technology as instruments of power and destruction serves no common purpose and thus cannot claim support by society. In particular this is the case for the military applications of science and technology that are driving the arms race, undermining international security. Attempts to control the international flow of sensitive technologies are still necessary and partly effective but face the problem that the civilian and the military sector are inextricably linked. The military is exploiting the commercial sector which produces technologies for global markets on a mass scale and at low cost.

This dual-use is well known in the nuclear sector where weapons materials can be extracted from the civilian nuclear complex that includes reactors, uranium enrichment facilities and plutonium reprocessing plants. With this inextricable link the Atoms for Peace program contributed to the proliferation of nuclear weapons (Regina Hagen, Xanthe Hall). The inalienable right for nuclear energy, enshrined in Article IV of the Non-Proliferation Treaty, brings the genie out of the bottle: The bargain of the NPT, providing access to nuclear power in exchange for getting rid of the bomb, is reminiscent of the story about separating the two sides of a coin, ending with two coins – each again with two sides. The latest proof is Iran, whose government pursues its inalienable right for Uranium enrichment and neglects the consequences (Martin Kalinowski). The international community, unable to prevent this path, condemns it, and the United States, still paralyzed with Iraq, threatens to counter proliferation with military force, fuelling Iran's nuclear incentives. US pressure has obviously failed to bear fruit in Iran but it has also blocked a negotiated way out of the North Korean crisis (Hui Zhang). At the same time, the Bush Administration has struck a nuclear deal with India, rewarding this nuclear weapon state that never acceded to the Non-Proliferation Treaty in the first place (Zia Mian, Ramana). This double standard, justified by the good guy – bad guy dichotomy, further inspires Iran, North Korea, and others to join the well-respected nuclear club (Zia Mian, Alexander Glaser). Japan with its Rokkasho reprocessing plant gives another example (Masa Takubo), and NATO’s strategy of sharing the nuclear umbrella across Europe, including Turkey, continues its outdated deterrence doctrine (Aslihan Türmer).

The ambivalent face of nuclear power also became visible with the Chernobyl reactor accident 20 years ago which made clear that tetering on the brink of the nuclear abyss can go badly wrong. However unlikely the chain of events may have been, it did occur, affecting the life of millions of people across Europe. Spending billions of dollars on clearing the mess was too much for Gorbachev’s new reform course. Instead of Glasnost (openness), the regime tried to hide the truth, making the consequences even worse (Alla Yaroshinskaya). With a renaissance of nuclear power, the possibility of another Chernobyl cannot be excluded.

The Janus Face of Science and Technology
Inextricable Links, Inalienable Rights, and Double Standards

The duality of science and technology can be observed in other technology fields, most obvious in biotechnology, but also in missile and space technologies (Jürgen Scheffran). This is demonstrated by the conversion of Intercontinental Ballistic Missiles (Galina Iofina) and kinetic energy anti-satellite weapons, both linked to civilian spaceflight (Wang Ting). To restrain proximity operations in space and ensure space security, the case for a Code of Conduct in space is made (Michael Katz-Hyman).

Living on the edge of the abyss was typical during the nuclear weapons age when even minor events ran the risk of triggering an all-out nuclear war that could destroy the whole planet. Turning away from the nuclear abyss was a common theme of a workshop that the Nuclear Age Peace Foundation organized in February this year in Santa Barbara (see contributions by David Krieger, Adi Bali, Matt Martin, Alice Slater, Tom Graham, and Wade Huntley). Science plays a role in the outlined paths towards nuclear disarmament, not by serving the security of some and creating insecurity for others, but by supporting concepts of common and global security that remove incentives to get the bomb.

Joseph Rotblat, the scientist whose life is inextricably linked with the ambivalence of the nuclear age, died in 2005 (Mel Watkins). His life represents the good part of science in a double meaning: it was both of high quality and justified by high moral standards. Ten years before his death he worked closely with INESAP in drafting a path towards a Nuclear-Weapon-Free World. His mind remained young, an inspiration for generations to come – and hopefully see a world without nuclear weapons and free from war. Interviewed by David Krieger about what is needed to achieve a mass movement for abolition, he answered: “I think two things a positive and a negative.” In this dialectic mode of thinking, both faces of science find proper consideration.

Jürgen Scheffran
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Life in a Nuclear Powered Crowd

Zia Mian and Alexander Glaser

The idea of a wondrous future powered by atomic energy is now a hundred years old. Fredrick Soddy and Ernest Rutherford discovered in 1901 that radioactivity was part of the process by which atoms changed from one kind to another and involved the release of energy. Soon, Soddy was writing in popular magazines that radioactivity was a potentially “inexhaustible” source of energy, and offering a vision of an atomic future where it would be possible to “transform a desert continent, thaw the frozen poles, and make the whole earth one smiling Garden of Eden.” The promise of an “atomic age,” with nuclear energy as the global, utopian technology for the satisfaction of human needs, has been a recurring theme ever since.

Soddy also saw that atomic energy could possibly be used to create terrible new weapons. It is perhaps no surprise in an international system dominated by competing, armed nation-states that the first practical application of atomic energy came in 1945 when the United States built the first atomic bombs and used them to destroy the Japanese cities of Hiroshima and Nagasaki. The bomb was, American leaders said, the “winning weapon.”

This display of the awesome power of atomic technology served to revive and strengthen the visions of an atomic solution to economic and social problems. American newspapers, for instance, predicted an atomic utopia, “a world of unlimited power, unlimited abundance – a world limited only by man’s capacity to imagine new wants and needs.” Lewis Strauss, the head of the United States Atomic Energy Commission famously declared in 1954 that nuclear energy meant “our children will enjoy in their homes electrical energy too cheap to meter.”

What the world saw over the past fifty years was the construction of vast facilities for the production of highly enriched uranium and plutonium for nuclear weapons. The United States and Soviet Union produced tens of thousands of nuclear weapons, and were joined as nuclear weapons states by the United Kingdom, France, China, Israel, India, and Pakistan, and recently perhaps North Korea. Many other states tried and for a variety of reasons abandoned their nuclear weapons ambitions. Iran still persists. Others may also try, as the United States becomes ever more bellicerent in remaking the world as it sees fit and meets resistance.

At the same time, the peaceful use of nuclear power has fallen far short of what was promised because of the enduring problems of nuclear safety, high costs, nuclear proliferation, and public opposition. Nuclear industries have stagnated in the states that were pioneers in the technology such as the United States, the United Kingdom, and Russia. Some states set up nuclear energy programs and then decided to phase them out. What little new building is taking place, is in states that came late into the nuclear age, such as China and India.

Despite this, a large-scale expansion of nuclear energy is being urged by some proponents as a way to grapple with the problem of climate change now being brought on by the accumulation of greenhouse gases from burning fossil fuels over the past hundred or so years. But amidst the talk of a second chance for nuclear energy, there is some recognition that a nuclear future may be dark.

We outline below some particular concerns about nuclear safety and nuclear proliferation and suggest that any large-scale global expansion of nuclear energy generation will bring new dangers and not be of much help in dealing with climate change.

Normal Nuclear Accidents

It is one of humanity’s oldest and most hard-earned pieces of wisdom that even the best-trained people make mistakes, in particular when performing routine-operations over extended periods. The past six decades have shown that nuclear technology does not tolerate error.

Nuclear energy is perhaps the primary example of what are called ‘high-risk technologies’ with ‘catastrophic potential;’ for such technologies, “no matter how effective conventional safety devices are, there is a form of accident that is inevitable, and such accidents are a ‘normal’ consequence of the system.” There is, in short, no escape from failures of the system. For those countries that have nuclear facilities but have not yet had a nuclear accident, it may only be a matter of time and luck. Continuing reliance on nuclear energy and building and operating more nuclear reactors only serves to increase the risk.

The consequences of a severe accident at a large nuclear power reactor were made apparent by the 1986 Chernobyl disaster, which was triggered by errors of judgment by the reactor operators. In its report on the accident, the United Nations Scientific Committee on the Effects of Atomic Radiation noted that there was severe radioactive contamination of about 150,000 square kilometers of the former Soviet Union, and the fallout affected “practically every country in the northern hemisphere,” and smaller amounts of radioactivity penetrated into the southern hemisphere. Humanity was unavoidably linked together on a global scale.

A 2005 study by the Chernobyl Forum estimated that around 4,000 people will eventually die due to radiation exposure from the accident. However, the Chernobyl Forum’s Expert Group on Health, coordinated by the World Health Organization, suggested in its report that there might be over 8,000 deaths from cancer and leukemia because of the accident. There have also been long-term consequences for the survivors and their fel-
low citizens. A 2002 study commissioned by UNDP and UNICEF with the support of UN-DOCHA and WHO found that in Ukraine, Belarus, and Russia a total of over 118,000 people were evacuated and over 230,000 resettled (and over 11,000 still expecting resettlement) because of the accident and observed that "[t]he affected population – those exposed to radioactive fallout, remaining in the affected areas, or forced to relocate – continue to face disproportionate suffering in terms of health, social conditions, and economic opportunity… Many have found it difficult to adapt and continue to face serious psychological, economic, and social problems."8

The study went on to note that there have been broader and more enduring social and economic consequences, observing that "[t]he accident has also had a continuing impact on the opportunities and well-being of a much wider circle of the inhabitants of Belarus, Ukraine, and Russia, through the negative image that it has created for large areas of these countries. It has imposed a heavy burden on the national budgets through the cost of clean-up, compensation and recovery… These commitments have diverted resources away from other priorities, such as health, education and investment."9 Future generations will pay the price.

Normal Nuclear Proliferation

The fact that a nuclear energy complex can be established for peaceful purposes and then put to use for producing weapons materials was recognized very early on. Robert Oppenheimer, the head of the United States’ Manhattan project that produced the first atomic bombs in 1945, noted in 1946 that if there were an effort to ban all nuclear weapons:

"We would not make atomic weapons, at least not to start with, but we would build enormous plants, and we would design these plants in such a way that they could be converted with the maximum ease and the minimum time delay to the production of atomic weapons saying, this is just in case somebody two-times us; we would stockpile uranium; we would keep as many of our developments secret as possible; we would locate our plants, not where they would do the most good for the production of power, but where they would do the most good for protection against enemy attack.”10

The difference in scale between civilian and military nuclear programs is important. A 40 MW(th) reactor like CIRUS in India produces enough plutonium for about two nuclear weapons a year, while one of India’s small, roughly 700MW(th) power reactors (which produces ca. 200 MW electric power) can yield about ten times that much plutonium a year. A similar case holds for uranium enrichment; about 150 tSWU (or 150,000 separative work units) are required to produce the annual low-enriched uranium fuel for a 1,000 MW(e) nuclear power reactor, while ten percent of this enrichment capacity could produce 100 kg of highly enriched uranium, enough for several nuclear weapons.

There is a long history of how states have inter-woven their civil and military nuclear ambitions and capabilities. UK, France, China, Israel, India, and Pakistan built their nuclear weapons programs on an infrastructure developed supposedly for nuclear energy. Iraq, North Korea, and Iran, all signatories of the 1970 nuclear Non-Proliferation Treaty, concealed their nuclear weapons ambitions behind a ‘peaceful’ nuclear program. At the same time, it should be noted, the US has started producing tritium for its nuclear weapons stockpile at civil power reactors.11

It was recognition of the overlap between civil and military nuclear materials and capabilities that led to the system of safeguards on civil nuclear facilities, starting in the 1950s. As part of the NPT, non-nuclear weapon states are required to declare and open their civil nuclear facilities for international inspection, so as to detect significant amounts of material being diverted for illicit nuclear weapons purposes. One measure of the failure of these efforts is that the United States has been seeking to deny North Korea, Iraq, and Iran key elements of the nuclear fuel cycle, and is now proposing to limit future access to uranium enrichment and plutonium reprocessing to all but a handful of states (even though under the NPT all signatories are allowed to develop and exploit these technologies). These policies are a clear recognition of the proliferation dangers of civil nuclear power and the particular problems of uranium enrichment and plutonium reprocessing facilities and attendant capabilities.

Nuclear Futures

Nuclear energy is now being offered as a way to solve the problem of global-warming-induced climate change. To significantly reduce greenhouse gas emissions, nuclear power would have to expand several-fold. It is worth asking what would be the proliferation implications of such an expansion. We ignore for the moment whether nuclear energy would in fact help lessen climate change as well as the political and economic obstacles that make such an expansion scenario unrealistic in the first place.

Here, for illustrative purposes, let us assume that nuclear power grows to about 1,500 GW(e), which corresponds to a four-fold expansion from today’s level and, if achieved by 2050, would be equivalent to only about 28% of the estimated global electricity supply, compared to about 15% today. This is about the upper limit for nuclear capacity for 2050 adopted in a 2003 MIT study, The Future of Nuclear Power.12

Most studies on the future of nuclear power simply assume a global nuclear capacity of 1,000 GW(e), 1,500 GW(e), or sometimes even 10,000 GW(e), as if it would “just be there,” i.e. assuming nuclear power plants located nowhere in particular. The MIT study did not shy away from making predictions about the actual distribution of nuclear capacities in a global expansion scenario and estimated that 56 countries could have commercial nuclear plants in a 1,500 GW(e) world, including many that currently have none, such as Vietnam, Indonesia, the Philippines, Malaysia, Thailand, Australia, New Zealand, Norway, Italy, Austria, Poland, Turkey, Venezuela, Portugal, Israel, Libya, Algeria, Uzbekistan, Morocco, Kyrgyzstan, Kazakhstan, Egypt, etc.13
One can infer the nuclear fuel cycle infrastructure required to support such a crowd of nuclear powered countries. We assume continued reliance on the currently dominant pressurized water reactor technology, using low-enriched fuel based on the once-through fuel cycle. From a non-proliferation perspective, this is superior to alternative scenarios involving reprocessing and separation of plutonium, which is a directly nuclear-weaponusable material. This reactor-fleet, however, would require a huge global enrichment capacity (see Figure 1).

The projected enrichment infrastructure is daunting, both in size and distribution. Countries with no or negligible current commercial nuclear power programs – such as Iran, Pakistan, Mexico, or Indonesia – would deploy and operate large-scale enrichment facilities. It is predictable that global enrichment operations at this scale would periodically lead to suspicions, allegations, and international crises. Iran’s plan for its Natanz facility to have a maximum capacity of 250 tSWU/yr have incited fears about proliferation, but in a future built around a large expansion of nuclear power, Iran might operate enrichment facilities with a total capacity of almost 3,000 tSWU/yr. For comparison, less than 5 tSWU are enough, in principle, to produce sufficient highly enriched uranium for one nuclear weapon a year.

Similarly, more countries may explore plutonium reprocessing, in spite of its extremely unfavorable economics and environmental and proliferation concerns, as a way to defer decisions about the final disposal of nuclear waste. This reckless strategy of kicking the nuclear can down the road for future generations to deal with has already been adopted by a few states, including Japan and perhaps soon by the United States as part of its Global Nuclear Energy Partnership.

The much greater stocks and flows of uranium and plutonium associated with nuclear energy programs require an extremely prudent approach with respect to the idea of expanding nuclear power in the future. At the same time, any effort to expand nuclear power around the world will inevitably lead to a further increase in large-scale and small-scale research and development (R&D) activities around the world. With respect to proliferation concerns, this is the single most important dilemma of nuclear power: a nuclear program that is small – or even completely irrelevant – from a commercial perspective is generally large enough to support a substantial nuclear weapons program.

It is likely that if nuclear power begins to expand rapidly on a global scale, there would be increasing concerns about nuclear proliferation, as many countries explore many new technologies. Thus, even if nuclear energy ultimately fails to expand as imagined by some today, we will have to face lots of ‘proliferation noise’ in the international system that mixes up and makes it difficult to identify and deal with ‘real’ proliferation as well as legitimate and unwarranted fears of covert military programs. As the Iraq war showed, some states may not hesitate in feeding and then taking advantage of proliferation fears as a pretext to go to war.
Nuclear Power and Climate Change

The new argument being advanced for nuclear energy is that it offers a solution to climate change, or at least to lessen the scale of global warming by reducing future greenhouse gas emissions. But nuclear power would primarily contribute to electricity production and, therefore, would be unable to mitigate about two thirds of global CO₂ emissions, which are due to the fuels-used-directly (FUDs) in industry, transportation, and the residential/commercial sectors.13 The bulk of greenhouse emissions would remain to be addressed.

Nuclear energy can at best hope to substitute for the use of coal, the dominant fossil fuel used to produce electricity. But coal is very abundant and inexpensive, and it will remain so for many decades to come. It is therefore naïve to assume that coal will simply be abandoned on a global scale. Countries with large domestic reserves of low-cost coal and rapidly growing economies will use their coal resources; China for instance plans to increase its use of coal for power and heat generation in two decades.16 Concerns about climate change may slow down and limit the scale of this process at best.

It seems that if no solution to the “coal problem” can be found, then no solution to the climate change problem exists. However, compared to FUDs, almost complete “decarbonization” of electricity production is relatively straightforward and can be done using existing non-nuclear technologies.17 This may be more attractive than investing in large-scale nuclear expansion.

This is recognized in a major 2006 report by the UK government’s Sustainable Development Commission which observed that building new nuclear plants is not an answer to tackling climate change. It concluded that doubling nuclear capacity in Great Britain would make only a small impact on reducing carbon emissions by 2035.18 The report identified five major problems to continued or increased reliance on nuclear power: the absence of a proven method for safe and secure long-term nuclear waste disposal; the uncertain but high future costs of nuclear energy; nuclear energy’s need for a large, centralized power generation and distribution system that serves to hinder further development of small-scale renewable and distributed energy supplies; as a large-scale supply-side technological ‘fix,’ nuclear energy undermines energy efficiency options; and lastly, the security and safety risks associated with nuclear proliferation.19 These problems are worth keeping in mind in any debate on the future of nuclear energy in any country.

There are alternatives. For example, a 1998 study performed for the European Union developed a scenario for a European energy system based on renewable energy sources that would reduce CO₂ emissions by 80% by 2050 (compared to 1990) and phase out nuclear energy at the same time.20 A central finding of this and similar studies is that there is no simple, one-size technological solution to energy production that can be applied everywhere. The identified energy systems are very heterogeneous, strongly depending on country-specific conditions: offshore wind electricity dominates in Denmark, while solar-thermal and photovoltaic electricity is strong in Spain and other South European countries. This must be accompanied by substantial reductions in the demand for primary energy in all sectors of modern society. The list of necessary steps is long and these steps have to be taken swiftly. With every year that passes without decisive action, further bottlenecks are created and the costs of changing policy become ever greater.

Conclusion

The hopes invested in nuclear technology are as old as the basic scientific ideas that underlie it. The past hundred years have shown the many problems with nuclear technology. Particularly grave are the risks and consequences of a nuclear accident and the dangers of supposedly peaceful nuclear facilities, material, and knowledge being used for nuclear weapons programs. Continued reliance and any large-scale expansion of nuclear energy would perpetuate and worsen these dangers. And there is no imminent technological fix for these problems, as the 2003 MIT study The Future of Nuclear Power was compelled to conclude:

“We have not found and, based on current knowledge, do not believe it is realistic to expect that there are new reactor and fuel cycle technologies that simultaneously overcome the problems of cost, safety, waste, and proliferation.”21

Nuclear energy also offers a marginal but costly solution to the problem of climate change. The brittleness of nuclear power actually creates dangers for constraining future greenhouse gas emissions.22 Even a single major accident is likely to stop any attempt to sustain current levels or to expand nuclear power—indeed, if such an accident occurred in the U.S. or Western Europe, it would mean the end of nuclear power in these regions. Building more nuclear power risks the danger of being stranded up the nuclear creek without a paddle, where having invested enormous resources in an expensive and inflexible technology, and having built up a formidable nuclear legacy, there would be no significant contribution to meeting global energy needs. In such a situation, clean and safe renewable alternatives could take a long time to come on stream.

Given all this, it is worth asking why nuclear energy is still on the table as an option. A large part of it may be due to a continuing identification of nuclear technology as an advanced technology, as representing the future. It has been observed that nuclear energy proponents always talk in the ‘future tense,’ that is “in terms of what it will bring rather than what it has already wrought or what it requires from society to maintain operation.”23 This succeeds in so far as the public and elites continue to believe in an ideology of ‘progress,’ ceaselessly ‘rising living standards,’ the need for ‘growth’ in the production and consumption of material goods, and insist on comfortable habits of inefficient energy consumption, all without regard to consequence for society or planet.

The tension between nuclear fears and a reluctance to give up the actually existing comforts of everyday life is revealed dramatically in a 2006 International Atomic Energy Agency public opinion survey conducted in 18 coun-
tries that found most people are opposed to building new nuclear reactors but seem to support continued operation of existing reactors. The poll conducted in states with and without large nuclear industries found that overall 59% were opposed to building new plants while 62% of respondents said existing nuclear facilities should continue to be used. This suggests that the door will slowly close on the nuclear future as old nuclear power plants finally shut down and plans for new plants command no public support.

Rather than wait for nuclear energy to wither away, the international community should make a virtue of a necessity. We need to plan collectively how to phase out reliance on nuclear energy, invest in energy conservation and efficiency and renewable sources of energy, and explore paths towards a safe, more secure, and ecologically sustainable form of social life and economy.

3 Arjun Makhijani and Scott Saleska, The Nu
5 United Nations Scientific Committee on the Effects of Atomic Radiation, Sources and Effects of Ionizing Radiation: UNSCEAR 2000 report to the General As
6 Chernobyl’s Legacy: Health, Environmental and Socio-Economic Impacts, Chernobyl Forum September 2005; www.iaea.org/ NewsCenter/Focus/Chernobyl/pdfs/05-
8601_Chernobyl.pdf. The Chernobyl Forum includes International Atomic Energy Agency, World Health Organization (WHO), United Nations Development Pro-
gramme (UNDP), Food and Agriculture Or-
ganization, United Nations Environment Programme (UNEP), United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA), United Nations Scientific Committee on the Effects of Atomic Radia-
tion (UNSCEAR), the World Bank, and the governments of Belarus, Russia, and Ukraine.
obyl/EGH%20Master%20file%202005. 08.24.pdf; Table 16.4 (p. 145) gives a model-
based prediction of over 8,200 deaths from excess cancer, and Table 16.2 (p. 141) gives 216 emergency worker deaths eventually at-
tributable to radiation.

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letter_main.html.

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Spreading the Nuclear Disease
The Revival of “Atoms for Peace”

Xanthe Hall

The idea of nuclear proliferation is very alarming to most people. They envisage nuclear weapons in the hands of unstable countries or even terrorists. What does not seem to worry many people, however, is the enlarged interest worldwide in acquiring nuclear technology under the premise of using it “peacefully.” Only in the cases of Iran and North Korea are there any large public expression of concern that they may have other, less peaceful, intentions with their nuclear programmes.

In fact, almost all of the states that have or have had an illicit nuclear weapons programme hid it behind a programme for nuclear energy or research. They frequently received help from nuclear weapons states or from members of the Nuclear Suppliers Group (NSG) to get the technology and use it to produce their own material for nuclear weapons. Indeed, the Non-Proliferation Treaty (NPT) explicitly provides for help to set up a civilian nuclear programme and requires only that the country agrees to certain controls from the International Atomic Energy Agency (IAEA) that are regulated by so-called Safeguards Agreements.

“Atoms for Peace”

In the aftermath of the development of nuclear weapons, Harry Truman said in a message to the US Congress in October 1945: “The hope of civilization lies in international arrangements looking, if possible, to the renunciation of the use and development of the atomic bomb, and directing and encouraging the use of atomic energy and all future scientific information toward peaceful and humanitarian ends.”

As early as 1946, there were those taking a dim view of this idea, such as the Acheson-Lilienthal Committee, mandated to present proposals for the US to submit to the United Nations. They concluded that the risk of nuclear proliferation was endemic to the idea because the pursuit of atomic energy and the pursuit of atomic bombs were in large part interchangeable and that an international inspections regime based on good faith was doomed to fail: “We have concluded unanimously that there is no prospect of security against atomic warfare in a system of international agreements to outlaw such weapons controlled only by a system which relies on inspections and similar police-like methods.”

This is pointedly true today, where the NPT relies on the International Atomic Energy Agency (IAEA) to provide the technical tools to safeguard its political deal: the exchange of a promise to eliminate nuclear weapons for the promise to deliver nuclear technology for civil use.

The IAEA was the brainchild of Dwight Eisenhower and his beloved US “Atoms for Peace” programme in the 1950s. Originally, his idea was that the Agency would manage a kind of uranium bank. The uranium would be supplied by reducing the nuclear weapons stockpiles, therefore decreasing the threat of nuclear war, and it would in turn be used “to provide abundant electrical energy in the power-starved areas of the world.” Eisenhower took this idea further in his famous “Atoms for Peace” speech before the United Nations in 1953 and proposed that in order to control the spread of nuclear weapons, nuclear secrets should be shared for the betterment of humankind.

The global outpouring of support for Atoms for Peace – with the notable exception of the Soviet Union – was driven by a massive campaign to promote the beneficial aspects of the application of nuclear energy in the fields of medicine, agriculture and research. A media hype ensured its popularity in the US, while the idea languished in the Soviet Union, which quite rightly saw it as a propaganda tool. In fact, the idea was principally driven by US foreign policy, aiming to bind countries to the West and the idea of capitalism and to demonstrate the West’s lead in nuclear-military potential. Later, the idea was wholeheartedly embraced by the nuclear export industry, which benefited economically.

The Atoms for Peace programme was in reality a far cry from Eisenhower’s uranium bank. It became a collection of agreements on technical cooperation, backed up by a safeguards system that ultimately became the domain of the IAEA. The completion of the NPT in 1968 anchored the concept of the right of all states to the civilian use of nuclear energy, so long as they renounced nuclear weapons, under Article IV of the treaty.

The Role of the IAEA

The IAEA has a major conflict of interests. In order to continue to be funded, albeit not very well funded, it must be seen to act in the interests of its member states and to abide by its statute, which stipulates the promotion of nuclear energy. This puts them in the contradictory position of trying to explain just how dangerous the technologies and materials in the nuclear cycle are and why they need to be pedantically safeguarded, meanwhile claiming that nuclear energy can be used “peacefully” and continues to be the energy of the future.

The IAEA has 139 member states, but only 35 are on the Board of Governors. Its statute stipulates that the following rules for the make-up of the Board apply: “The outgoing Board of Governors shall designate for membership on the Board the ten members most advanced in the technology of atomic energy including the production of source materials, and the mem-
ber most advanced in the technology of atomic energy including the production of source materials in each of the following areas in which none of the aforesaid ten is located: North America, Latin America, Western Europe, Eastern Europe, Africa, Middle East and South Asia, South East Asia and the Pacific, Far East. 6

A further 25 should ensure equitable representation from the regions. This means that “top ten” members are almost certainly from the NSG and include the five original nuclear weapons states. These are also the main funders and therefore have more weight when it comes to decisions about how IAEA proceeds when dealing with potential proliferators.

An example of this is the way that the IAEA handled the North Korean nuclear crises. North Korea claims that this was the first time that the IAEA presented a member state with photographs of installations taken by the intelligence service of another member state and made them public. Since then, this has become rather common, and suggests that IAEA’s neutrality has been eroded, especially since intelligence information is often politically motivated or even tampered with, as has been seen in the case of Iraq. In 1992, the IAEA only conducted a small number of inspections in the space of four months before declaring that they had discovered a discrepancy in the North Korean material accounts. The controversy surrounding this very small discrepancy was disproportionately large, in North Korea’s opinion, and led to the ensuing crisis and North Korea cancelling its membership in the IAEA. It is claimed that the then-chief of the IAEA inspection team was of the opinion that, if they had continued the inspections, the problem might have been clarified. But the North Koreans’ perception is that the IAEA Secretariat was in a rush to reach a conclusion about compliance in order to satisfy certain states.

Whether these claims are in fact correct or not is not examined here. The point is that the perception by certain states is that the IAEA looks for and discovers discrepancies more often when directed to do so, whether through denunciation by exile groups or intelligence information from states that have their own political agenda. Abuse of the Agency can not be ruled out, and similarly to the UN Security Council, the power of the nuclear weapons states or the NSG to push their own agendas is evident. Apart from not wanting Iran or North Korea to acquire the nuclear option by developing a fuel cycle, these states want to secure the ability to continue exporting their product – nuclear power – without the accusation of adding to proliferation. Also with a move away from the dependence on oil that gives the Middle East too much power for the taste of the US, the battle for control over nuclear technologies must be won.

**Controls and Safeguards**

The NSG is a group of 45 mainly industrial countries that have set themselves the goal of developing guidelines for nuclear export controls. Another group that is even more exclusive is the “Zangger Committee”, a club of 35 states that is trying to standardise the export controls for all NPT members. This committee has developed a “trigger list” of countries that are not allowed to receive any exports until they have signed and ratified the Additional Protocol to the Safeguards Agreement, which strengthens the safeguards system, by allowing further measures, such as intrusive inspections and on-site sampling.

IAEA Director General Mohamed ElBaradei said in 2004 that “even a verification system making use of the authority under the additional protocol may not reliably detect low levels of clandestine nuclear activity (…) Our recent experience has also taught us a clear lesson regarding the accessibility of nuclear technology. The technical barriers to mastering the essential steps of uranium enrichment – and to designing weapons – have eroded over time, which inevitably leads to the conclusion that the control of technology, in and of itself, is not an adequate barrier against further proliferation.”

He argues that the only way to shore up this verification system is through an effective system of export controls and intelligence information, both of which are influenced by political expediency. He continues to insist, however, that nuclear energy benefits mankind.

An inquiry in 1996 in the United Kingdom into arms trading with Iraq showed that this contradiction between the promotion of nuclear energy and trying to prevent nuclear proliferation is reproduced by governments all over the world. While departments in the Foreign Ministry work studiously on proposals to prevent nuclear proliferation, trade and industry departments are doing their utmost to sell dual-use technologies, pushed by an unrelenting commercial lobby. A good example is the case of the German Hanau mixed-oxide (MOX) plant, which Siemens wanted to sell to China. Standing next to Heinrich von Pierer, Head of Siemens, then Chancellor of Germany Gerhard Schröder announced while visiting China in 2003 that the plant would be sold, thereby completely disregarding current export controls on nuclear goods. Incidentally, an IPPNW campaign effectively stopped this deal from going through.

Although the pace of the spread of a new technology is affected by policy decisions, by the same token, policy decisions can be driven by the availability of technology. In other words, the presence of a nuclear energy programme will always provide a state with the temptation to make nuclear weapons, should it see its security as being at risk. This is demonstrated by a letter from a top Israeli nuclear physicist to the Israeli Defence Ministry, who said:

“I do not think that there is anyone among the responsible individuals in the United States who would believe that a state that was in possession of a large-scale plutonium separation capacity, and which would have the objective capabilities of doing so, would not exploit its knowledge for military purposes or at least conduct experiments in that direction. For this reason it should be clear that to the extent that we would be allowed or helped in research involving plutonium separation, it would mean that we were being actively helped in nuclear weapons research.”

The system of “safeguarding” that is run by the IAEA to enable the
continued transfer of nuclear technology has been shown to be full of holes. The case of Iraq showed that declassified information on how to build simple nuclear weapons is widely available. The IAEA relies heavily on voluntary reporting, followed up by inspections. This has sometimes led to discoveries, such as in North Korea and Iran, that the reports do not match up to samples taken on the ground. But these are also subject to political discrimination. It has been shown that the amount of plutonium judged to be present at a given time in a reprocessing plant in France, Japan or Britain can vary by up to 30% from what can actually be measured. The IAEA asserts that the international standard is only about plus-minus 1%, but in the real case of a plant, that made MOX fuel at Tokaimura in Japan, 70 kg (enough for about 8 crude nuclear weapons) could not be accounted for. It took the IAEA two years to negotiate shutting down and cleaning out the plant, and at the end they still could not account for 10 kg.10

Ed Lyman of the Union of Concerned Scientists explains: “For instance, the reprocessing plant the Japanese are building at Rokkasho would have an output of something like eight tons of plutonium a year. If there were a 1% uncertainty in the ability to measure the plutonium going into that plant (it is probably going to be higher than that), this value would be several hundred kilograms. This means that several hundred kilograms would have to disappear from the plant before the IAEA could say for sure that there was a diversion. There could be a diversion of many bombs worth of nuclear material without the IAEA able to say confidently that this is going on.”11 He continued: “The Liberal Party leader in Japan this week said that if Japan desires, it has enough plutonium to use in its nuclear power plants for 3,000-4,000 nuclear weapons. This was aimed at China. The statement is true enough, but for Japan to actually make a statement like that shows the importance of maintaining stringent safeguards against diversion at Japanese nuclear facilities.”12

The Global Nuclear Energy Partnership (GNEP)

US President George W. Bush is reviving the vision that Eisenhower once had. More than fifty years later, he plans a massive new investment in nuclear energy and building some 40 new reactors in the US. According to the US Department of Energy (DOE), the initiative “is a comprehensive strategy to enable the expansion of emissions-free nuclear energy worldwide by demonstrating and deploying new technologies to recycle nuclear fuel, minimize waste, and improve our ability to keep nuclear technologies and materials out of the hands of terrorists.”13 It promises to provide almost “limitless” energy in an “environmentally friendly manner while reducing the threat of nuclear proliferation.”14

Apart from the problems that arise from the use of nuclear energy for health and the environment, which are of major concern and side-stepped by the DOE, the initiative represents a kind of global takeover bid in the field of nuclear technology. It would set up a consortium of countries that would supply ‘fuel services’ to other countries. Bush already made it clear in the past that he wished to disallow certain countries the right to the high-risk technologies, such as uranium enrichment and reprocessing. It is not clear how it would be established, who would be a supplier and who would be on the demand side. India and Russia have, for instance, already been approached with the offer to join this dubious “partnership.” But what is clear is that this initiative plays into the present row over Iran’s nuclear programme and stands to profit from an outcome whereby Iran does not enrich its uranium domestically.

Some have likened this Bush initiative to the “Star Wars” vision of Ronald Reagan. The vision of nuclear energy as limitless and safe cannot be backed up by reality. All of the glossy packaging contains no actual existing technologies that can deliver these promises. Their proposed reprocessing technique is claimed by the US to be proliferation resistant,15 because the plutonium is mixed with other transuranic elements, making it more radioactive and no longer suitable for making nuclear weapons. In fact, the radioactivity emitted is so low as to be unproblematic to one bent on stealing it, and could be used as fissile material for a weapon, say the Union of Concerned Scientists.16

The repercussions for the long-standing agreement enshrined in the NPT are immense. If the internationalisation of “dual-use” technologies is agreed upon, it would mean that a whole new set of rules would have to be established. GNEP proposes that the IAEA Safeguards have to be improved, while so-called safer technologies are put forward. And it would result in a strengthening of the present discrimination to be found in the treaty, which presently divides the world into nuclear weapons states and non-nuclear weapons states, by now adding “fuel cycle states” as another class of countries and excluding those on the list of states that the US and the NSG do not trust.

Business with India

There was an outcry from the international community when India and Pakistan tested their nuclear weapons in 1998, although it was in fact known for many years that they possessed at least the option and probably also the weapons. Both countries were able to acquire enrichment and reprocessing technologies from other countries by illegal and legal means. It has been a commonly held position of the five original nuclear weapons states that India and Pakistan should renounce their nuclear status and become fully-fledged members of the NPT by getting rid of their nuclear weapons. Until this happens, a question mark remains over the treaty as to its effectiveness. However, India has refused to join the NPT because it maintains that the treaty is inherently discriminatory in allowing the five nuclear powers to maintain their arsenals without meaningfully pursuing the elimination of their arsenals as required under Article VI of the NPT.

Now the US and France are underlining that question mark by doing nuclear business with India. George W.
Bush and the Indian Prime Minister Manohar Singh issued a joint statement\(^7\) in July 2005 which signalled a resumption of US nuclear trade to India to develop both its civilian and military nuclear infrastructure and capabilities. Civilian nuclear assistance was stopped immediately following the Indian nuclear bomb test in 1974. On March 2, 2006, Bush and Singh signed an agreement that India would receive full cooperation from the USA to develop its failing nuclear programme and in return would separate its nuclear facilities into clear civilian and military sectors. India also agreed to uphold the moratorium on nuclear testing and not to export sensitive nuclear technologies.

There are many problems with the actual content of the agreement:
- Only 14 of the 22 nuclear installations in India would be safeguarded by the IAEA and liable to inspection.
- Eight installations remain in the military sector and no agreement was made on reductions or confidence building measures to constrain this growing nuclear threat.
- The agreement leaves India’s abilities to produce fissile material for nuclear weapons intact.
- Some of the CANDU reactors supplied by Canada will not be placed under safeguards and can be used for power production or for producing weapons-grade plutonium. These reactors will remain in the military sector although they were supplied for civilian use and have been misused in the meantime for military purposes.
- The stockpile of plutonium, both separated and in spent fuel, will not be subject to IAEA inspection and can be used for making new nuclear weapons.
- The supply of uranium from the NSG puts India in a position to use its indigenous reserves for making nuclear weapons.

The most important problem of all, however, is the precedent that this agreement sets. Pakistan is already asking for the same treatment, and although the US has refused on the grounds of its poor proliferation record, other states that have a better record, such as Israel or Brazil, will feel encouraged to apply. Those members of the NPT who have renounced nuclear weapons in order to receive this kind of cooperation with the NSG can quite rightly wonder at this sudden turn-about in world politics. Iran has experienced serious difficulties in receiving assistance in developing its nuclear programme or receiving material from suppliers, despite its membership in the NPT. They ended up having to buy from the so-called Procurement Network of A. Q. Khan, thus drawing suspicion on themselves that they were covering up a military programme (which may in fact be the case, but as yet there is no evidence for this).

The main factor in the US-India equation is the strategic alliance that the US is aiming to build in order to counter China and the fight against radical Islamic movements. The US has already built up a significant military cooperation with India. Here, once again, US interests dominate over multilateral agreements and their actions serve to strongly undermine the international non-proliferation regime as it stands.

Conclusion

The civilian and military uses of nuclear energy are so inextricably linked that ultimately the situation that was recognised by the Acheson-Lilienthal Committee in 1946 has only worsened in the last 60 years. Despite the development of new detection technologies, tightened export controls and strengthened safeguards, the world is still dependent on the good intentions of states for its security. The answer to the problem cannot therefore be found in technical solutions, and the idea of multilateral uranium centres would worsen the perception of states that they are being excluded from having independent access to nuclear energy. The only solution is the phasing out of nuclear power and the development of sustainable energy.

While on the one hand, the nuclear industry is trying to sell the myth of a return to ”Atoms for Peace” as a palliative for environmental catastrophe, Iran’s argument that it wants to develop this energy resource to cover its domestic energy needs is dismissed as not being credible. The nuclear industry is trying to sell nuclear energy as economically viable, environmentally safe and proliferation resistant – none of which it is. But in order to sell the third claim, it needs to introduce a new system that directly contradicts Article IV of the NPT – the inalienable right of all parties to civilian nuclear energy. That new system, however, divides the world into another one of “haves” and “have-nots” creating further tensions that will, for certain, tear the NPT apart and could even lead to war.

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1 Description of the NSG according to their homepage: “The Nuclear Suppliers Group (NSG) is a group of nuclear supplier countries which seeks to contribute to the non-proliferation of nuclear weapons through the implementation of Guidelines for nuclear exports and nuclear related exports. The NSG Guidelines are implemented by each Participating Government in accordance with its national laws and practices. Decisions on export applications are taken at the national level in accordance with national export licensing requirements.”; www.nuclearsuppliersgroup.org.
4 Ibid.
7 List of states that have signed and ratified the Additional Protocol at www.iaea.org/OurWork/SV/Safeguards/sg_protocol.html.
The Inextricable Link: Nuclear Energy and the Bomb

Regina Hagen

“Nuclear power powers the bomb!” This slogan is spread across a huge inflatable nuclear power plant that has often been used for nuclear-related street events around the world. “Nuclear power powers the bomb” means that nuclear energy makes the nuclear bomb possible in many ways. Know-how and skills, materials, technologies, processes, and methods. What is suitable for the peaceful uses of nuclear energy can also create the foundation for military uses, for building the bomb. The difference lies only in the intention.

This close link is nothing new. In its very first resolution of January 24, 1946, the United Nations General Assembly decided to install a “Commission to Deal with the Problems Raised by the Discovery of Atomic Energy.” The resolution demonstrates that just five months after the use of a uranium and a plutonium bomb on the Japanese cities of Hiroshima and Nagasaki, respectively, the world community cherished the illusion that the (then) promising nuclear energy could be exploited while the terrible nuclear bomb could somehow be disposed of once and for all.

The Commission was tasked with drawing up proposals “for extending between all nations the exchange of basic scientific information for peaceful ends” and at the same time “for control of nuclear energy ... to ensure its use only for peaceful purposes.” Furthermore, the body was to make suggestions “for the elimination from national armaments of atomic weapons” as well as “for effective safeguards.” At that time, nuclear weapons were in the exclusive possession of the United States. The Soviet Union built its first nuclear weapons in 1949.

The inability – or the lack of will – of scientists, governments, and diplomats to acknowledge the inextricable link between the civil and military utility of nuclear energy and the danger that nuclear weapons technology can be proliferated by means of “civil” nuclear know-how and technology plagues us to this day. According to the Swedish Peace Research Institute SIPRI, six decades after UN Resolution 1, the official and unofficial nuclear weapon states keep 26,500 nuclear warheads in their arsenals.

“The problem of nuclear energy is complicated by the fact that there is no such thing as non-weapon-grade plutonium. ... The reality is [that] it is possible to make nuclear weapons out of almost any kind of plutonium at all. Every state that has a nuclear power plant produces plutonium...,” says nuclear expert Zia Mian. And nuclear power or research reactors are now operated by more than fifty countries.

Civil-military dual use, however, is not limited to plutonium. Enrichment facilities used to enrich uranium to the reactor-grade level of 5-7% can easily be reconfigured for 20-90% enrichment. In addition, dozens of research reactors run on nuclear-weapons-useable highly enriched uranium, and not all of them are located in countries that are above suspicion.

Thus, what distinguishes a country with strictly civil intentions from one that fosters (secret) military ambitions is less the availability of the means rather than the will – and comprehensive safeguards that leave no loophole. The effectiveness of controls and safeguards was also presumed when the nuclear Non-Proliferation Treaty (NPT) was negotiated almost two decades after UN Resolution 1. The treaty, which entered into force in 1970, not only grants each State party the “inalienable right ... to develop research, production and use of nuclear energy for peaceful purposes without discrimination”, but the members to the treaty “undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy.” And that is not all. The treaty also states that “Parties to the Treaty in a position to do so shall also cooperate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially...

10 Paul Leventhal, Safeguards Shortcomings – a Critique, Nuclear Control Institute, September 1994.  
12 Ibid.  
14 Ibid.  
15 UREX+1a as opposed to the PUREX
in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world.”

Facilitation of nuclear energy became the explicit task of the International Atomic Energy Agency (IAEA), which was founded in the context of the US Atoms for Peace program in 1957. It was only with Article III of the NPT that the IAEA was additionally tasked with safeguarding nuclear activities “with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices.” This dual role demands a challenging balancing act from the IAEA.

Since then, awareness has increased that it is important to take “appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy”, as stated in the 1994 Convention on Nuclear Safety. The convention, however, completely disregards the threat from international proliferation and makes “effective separation” a requirement only on a national basis, i.e. within a country. And even this organizational effort is required only by the minority of countries that have actually ratified the convention.

On the international level, pushed by the US and other self-declared non-proliferation guardians, and under the impression of more or less hidden and advanced nuclear weapons programs that were uncovered in the past (e.g. in Brazil, Iraq, Libya, North Korea, or South Africa), the IAEA attempts to prevent any breakout from the non-proliferation regime by ever more sophisticated and intrusive Safeguards Agreements and mechanisms. However, the debate about Iran shows that the world community does not trust even the most sophisticated and intrusive Safeguards Agreements and mechanisms. The way out of this dilemma is now seen to be a complete prohibition of certain nuclear activities by certain “suspected” states.

But even without a full nuclear fuel cycle – from uranium mining, milling, enrichment, and power production to “reprocessing” (with the separation of weapons-usable plutonium) and final waste disposal – and the associated risk of diversion of nuclear-weapons-usable materials, there remain considerable military nuclear dangers – dangers that are not restricted to state actors only.

Since the terror attacks on the Pentagon and the New York Twin Towers in September 2001, numerous administrative bodies have agonized over the question of just how nuclear power plants can be protected against accidents or deliberate attacks with large passenger airplanes or military jets.

To give an example: according to expert organizations, e.g. the Munich Environmental Institute, it is doubtful that any (even latest generation) German nuclear power plant would withstand the crash of a large passenger plane with sufficient fuel on board – or even an attack with a larger armor-piercing weapon. “According to the Reactor Security Commission, this scenario has so far not been considered. After all, nuclear power plants are not explicitly designed to withstand a crash by a civilian passenger plane.”

The same is true for other nuclear facilities in Germany like the industrial-scale uranium enrichment plant in Gronau; the interim storage facilities in Ahaus, Gorleben, and Greifswald; or research facilities like the one in Karlsruhe or the Garching research reactor, to name just a few.

It is true that the effects of such a deliberately provoked accident would be different from the damage caused by a nuclear bomb. The aftermath of Chernobyl, however, gives a realistic idea of the long-lasting and serious consequences of any such scenario.

Although more limited with respect to the region affected, a so-called “dirty bomb” or radiological weapon would also make an effective terror weapon. It could disperse radioactive waste, medical isotopes, or other radioactive material in a huge explosion and cause not only drastic health and environmental damage but also uncontrollable panic reactions by the population involved.

This list of nuclear technology-related security dangers is far from complete yet. Expert circles discuss the theft or unauthorized transfer of fissile materials to technologically sophisticated terror groups, which would allow them to build and use a “primitive" nuclear bomb; the theft or transfer of complete nuclear warheads; the unauthorized launch of operational missiles; nuclear blackmail, etc.

The only safeguard against such horror is consistent and complete nuclear disarmament, codified under international law in a Nuclear Weapons Convention. A further requirement is the speedy and global phasing out of civil nuclear energy, combined with the search for intelligent and sustainable solutions for the unimaginably huge masses of nuclear waste that exist already. This is truly a difficult endeavor and a dangerous heritage.

We must, however, not ignore the voice of the "next generation", which addressed the delegates at the 2005 NPT Review Conference as follows: “If you fail to take concrete steps towards a nuclear-weapon free world, how will you answer for burdening us with such a horrifying menace? You are charged with making this decision. If you fail to act, how will you look into your own mirror?” I have no doubt that this question is not only directed to the United Nations delegates, but to us all.

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The Inalienable Right to Peaceful Nuclear Power

A Recipe for Chaos

Alice Slater

The drums of war are sounding yet again. We have seen a flurry of new reports about preparations and rehearsals for a US military strike against Iran to “take out” its nascent bomb making capability, as Iran asserts its inalienable right under the Non-Proliferation Treaty to enrich uranium for “peaceful” nuclear power. As we watch the planned transformation of the imperial US military into a “global strike force,” seeking “full spectrum dominance,” its abhorrent willingness to wage illegal preemptive wars, the recent Nuclear Posture Review that would authorize the use of nuclear weapons even against non-nuclear weapons states, and its designation of so-called “rogue states” as the “axis of evil” we are reaping the grim whirlwind of that policy. We now see North Korea and Iran relying on Article IV of the Non-Proliferation Treaty (NPT) to develop what is ostensibly described as “peaceful” nuclear technology which would give them the capacity and materials they need to build bombs of their own as a deterrent against US threats.

Peaceful Nuclear Energy: An Oxymoron

Article IV of the NPT provides an “inalienable right to peaceful nuclear technology” and was offered as a sweetener to the countries that agreed to sign the treaty and forego the acquisition of nuclear weapons. But “peaceful” nuclear technology is an oxymoron for the 21st century. The international community had clearly acknowledged that peaceful nuclear technology is a gateway to nuclear weapons proliferation when it required the signatures of 44 nations with civilian nuclear – capability on the Comprehensive Test Ban Treaty (CTBT) before the treaty could enter into force.

There are now 440 “peaceful” reactors in 31 countries – all producing deadly bomb materials, as well as 283 research reactors in 56 countries, many still operating on highly enriched uranium. The signers of the CTBT were well aware that by having a nuclear reactor, a nation had been given the keys to a bomb factory and would need to be included in any effort to ban nuclear tests, regardless of whether they proclaimed any intention to develop weapons. And US CIA Director George Tenet said, “The difference between producing low-enriched uranium and weapons-capable highly enriched uranium is only a matter of time and intent, not technology.”

There are nearly 200 million kilograms of reactor waste in the world, containing about 2 million kilograms of plutonium – with only 5 kilograms needed to make one nuclear bomb. The US is planning to build 50 more reactors by 2020; China plans 30; and 27 more are already under construction worldwide – to churn out more toxic poisons; on tap for bomb-making, with no known solution to safely containing the tons of nuclear waste that will be generated over the unimaginable 250,000 years it will continue to threaten life on earth.

Countless studies report higher incidences of birth defects, cancer, and genetic mutations in every situation where nuclear technology is employed – whether for war or for “peace.” A National Research Council 2005 study reported that exposure to X-rays and gamma rays, even at low-dose levels, can cause cancer. The committee defined “low-dose” as a range from near zero up to about ten times that from a computer tomography scan. “There appears to be no threshold below which exposure can be viewed as harmless,” said NRC panelist, Herbert Abrams, professor emeritus of radiology at Stanford and Harvard universities.

For example, WHO abandoned its original 1961 agenda for research on the basic human health implications of food irradiation. It ceded to the IAEA, whose mission is preserving the nuclear industry not the health of people, the ultimate power of researching the safety of irradiated foods. The IAEA is leading a global campaign to further the legalization, commercialization and consumer acceptance of irradiated foods. “We must confer with experts in the various fields of advertising and psychology to put the public at ease,” one
IAEA report states, also recommending that the process “should not be required on the label.” Yet the NRC study, stating that there is no safe dose of radiation, clearly justified the public’s rational fear of radiation. It is time for the IAEA to give up its dual mission in nuclear technology. While the Agency plays an indispensable role in inspecting and verifying compliance with nuclear disarmament agreements, it should not continue to act with a manifest conflict of interest as a shill for the nuclear industry.

Whatever naiveté may have existed in the world about the potential of harnessing nuclear technology for benign purposes, in 1953, when President Eisenhower made his Atoms for Peace speech to the United Nations General Assembly, we can no longer turn a blind eye to the terrifying consequences of the nuclear age. At that time, Eisenhower said:

“It is not enough to take this weapon out of the hands of the soldiers. (Would that we could!) It must be put into the hands of those who will know how to strip its military casing and adapt it to the arts of peace. The United States knows that if the fearful trend of atomic military build up can be reversed, this greatest of destructive forces can be developed into a great boon, for the benefit of all mankind. The United States knows that peaceful power from atomic energy is no dream of the future. That capability, already proved, is here — now today. Who can doubt, if the entire body of the world’s scientists and engineers had adequate amounts of fissionable material with which to test and develop their ideas, that this capability would rapidly be transformed into universal, efficient, and economic usage.”

Interestingly, in Eisenhower’s famous farewell address, in which he warned the country of the military-industrial complex, in a little noted aside, he also cautioned, presciently, against the abuse of the science, warning that:

“If holding scientific research and discovery in respect, as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite. It is the task of statesmanship to mold, to balance, and to integrate these and other forces, new and old, within the principles of our democratic system ever aiming toward the supreme goals of our free society.”

Can there be any doubt that the “scientific-technological” elite at Los Alamos and Livermore Laboratory have been driving the nuclear arms race, squandering lost opportunities for nuclear disarmament since the end of the Cold War, and developing new untested weapons designs that create the need for more tests which are used as an excuse to block US ratification of the Comprehensive Test Ban Treaty?

What does it take for a country to be willing to inflict the toxic assault of nuclear waste on its own people in light of the lessons we have learned during the past 60 years of the nuclear age? One delegate at the disastrous Non-Proliferation Treaty Review last spring, shared quite frankly, at an NGO panel that his country was unwilling to forego its “inalienable right” under the treaty because their scientists wouldn’t want to be left behind in state-of-the-art knowledge. They need to play in the major leagues of science with the big boys. So despite the promise of clean, safe abundant energy from the sun, the wind, the tides, many non-nuclear weapons states have underscored their equal rights to the dark fruits of nuclear technology. Will this kind of scientific machismo, which has created so many gruesome chapters in world history, be supported at the expense of the health of so many people and of the very survival of our biosphere? Will we satisfy our scientists’ dangerous thirst for knowledge and status despite the obvious possibility that the peaceful nuclear reactor can readily be converted to a bomb factory?

The nuclear crisis we face today is a direct result of the export of peaceful nuclear technology to countries such as Iraq, Iran, and North Korea. Indeed, every nuclear reactor enables a country to develop its own nuclear weapons, as we have seen in the case of India, Pakistan, and Israel, who never joined the Non-Proliferation Treaty. Under the guise of “peace”, other countries, such as South Africa, Argentina, Brazil, and Libya were also well on their way to developing nuclear bombs, which they later abandoned.

IAEA Director Mohammed ElBaradei recently stated: “We just cannot continue business as usual that every country can build its own factories for separating plutonium or enriching uranium. Then we are really talking about 30, 40 countries sitting on the fence with a nuclear weapons capability that could be converted into a nuclear weapon in a matter of months.”

The current flurry of negotiations and the move to try to control the production of the civilian nuclear fuel cycle in one central place, as proposed by ElBaradei, simply will not fly. It would be just another discriminatory aspect of the NPT, creating yet another class of haves and have-nots under the treaty, as was done with those permitted to have nuclear weapons and those who are not. Now it is proposed that some nations be permitted to make their own nuclear fuel, while others, such as Iran and North Korea, would be precluded from doing so. And in the wake of the stern warnings to Iran, and the referral of the issue to the Security Council, which has provoked Iran to begin enrichment of uranium for nuclear fuel under its “inalienable” right, the US has incomprehensibly announced its Global Nuclear Energy Partnership to control the spread of nuclear materials in which “supplier” nations would manufacture nuclear fuel rods, ship it to other countries, by rail, road, and sea, to use in their reactors and then take back the irradiated fuel and reprocess it, breaking a 30 year taboo in the US on turning irradiated reactor fuel into weapons-grade material. Brazil too, recently announced its intention to get into the action, by proclaiming that it is weeks away from firing up a major uranium enrichment plant.

We think we can control the atom while in reality we have been pushing our luck since 1945 when we unleashed its awful power and created jerry-built structures to contain its
terrifying consequences. As more countries acquire nuclear power, against a backdrop of unauthorized preemptive war to strike at “rogue” nuclear weapons – the nuclear phantoms are chasing us – we imagine them where they aren’t and fail to see them under our very noses; or we deliberately turn a blind eye for geopolitical reasons or commercial greed. Trying to exercise control over the enrichment and distribution of nuclear fuels would be like going down the same path we’ve been on for the last 50 some-odd years for nuclear arms control. Do you think France, Japan, or the US, for example, will surrender control of nuclear materials production, any more than the nuclear powers have surrendered control of atomic bombs? It would be a long drawn-out effort with discriminatory rules in the end – when, instead, we could be expending our energy and intellectual treasure on shifting the energy paradigm to make nuclear and fossil fuel obsolete.

But there are commercial interests which do not want to lose their ability to continue to profit from the human misery caused by nuclear and fossil fuels. The sun, the wind, the tides, and geothermal energy are here in abundance for all the world’s people and they are free. We already have the technology to harness the bounty of the earth. And we know how to store it when the sun doesn’t shine and the wind doesn’t blow, by using hydrogen fuel cells. It is clearly not beyond our financial means, as argued by the corporate supporters of toxic fuel industries particularly when you compare the costs of clean, safe energy to the more than two hundred billion dollars spent annually to subsidize fossil and nuclear fuels, while renewable energies receive less than a tenth of that amount world wide.8 Not to mention the cost of war to protect those poisonous energy sources, or even the military infrastructure and naval operations operating during peacetime, on guard duty for the oil tankers plying the seas with their noxious cargo.

So why don’t we have a ten-year crash program to achieve a nuclear-free, fossil-free, and biomass-free energy transition? Because of the corporate interests that insist on peddling their polluting and proliferating sources of energy – their “cash cows.” Once the infrastructure to harness the sun, wind, tides, and geothermal is constructed, there will be no fuel stock to sell. It would probably be the best way to end poverty on the planet as well – since poor countries can get free, clean earth energy, abundantly available, and will not have to spend their meager budgets for their critical power needs. We need new thinking and it has to start with us – ordinary people with no corporate axe to grind with an interest in perpetuating disastrous forms of energy on the planet. We must not buy into the propaganda that clean safe energy is decades away or too costly. There are mountains of evidence that those statements are falsehoods deliberately disseminated by corporate spin machines to keep their profits coming and to oil the war machine. And don’t be fooled by industry deceptions about how “clean” nuclear power is carbon free. Fossil fuel is used in every step of the process of creating these standing bomb factories – from the mining, milling, and enrichment of uranium to the building and decommissioning of aging plants and the transporting and storing of nuclear waste.9

If, as we work to phase in safe, clean energy, eliminating the evil twin of nuclear weapons, so-called “peaceful” nuclear technology, as we continue to press ahead for weapons abolition, we’ll have a real road map to a nuclear free world. Otherwise, I fear we would not be dealing with a full deck and are doomed to failure in two ways – halting nuclear weapons proliferation and saving our planet from the ravages of climate change caused by the massive carbon releases into our atmosphere.

Time for an International Sustainable Energy Fund…

It is time to support a protocol to the NPT calling for the establishment of an International Sustainable Energy Fund, and begin to shift massive subsidies and tax breaks for the development of the safe abundant energy of our earth from the sun, wind, tides, and geothermal sources. Whoever heard of a terrorist attacking a windmill? Article IV would become obsolete, just as Article V, which provides for “peaceful” nuclear explosions, has been rendered inoperative by the Comprehensive Test Ban Treaty which forbids nuclear explosions of any kind. Clean safe energy is available to us now. We have the technology. We need to be vigilant in providing the ample evidence in its favor to counter the commercial forces arguing that it’s not ready, it’s years away, its too expensive arguments made by companies in the business of producing dirty fuel. Here’s what Franklin Delano Roosevelt had to say about similar forces in 1936:

“Our had to struggle with the old enemies of peace – business and financial monopoly, speculation, reckless banking, class antagonism, sectionalism, war profiteering. They had begun to consider the Government of the United States as a mere appendage to their own affairs. We know now that Government by organized money is just as dangerous as Government by organized mob.”10

What are the prospects for establishing an International Sustainable Energy Agency? Last spring more than 40,000 people marched in Central Park calling for the abolition of nuclear weapons on the eve of the failed 2005 NPT Review. More than 1,000 people came from Japan, among them over 40 hibakusha – survivors of Hiroshima and Nagasaki. The Mayors of Hiroshima and Nagasaki have launched the Mayors for Peace campaign Vision, calling for negotiations for the elimination of nuclear weapons to be completed in 2010 with complete dismantlement by 2020. Abolition 2000, a global network of over 2000 organizations in more than 90 countries is working with the Mayors and the newly formed Parliamentarian Network for Nuclear Disarmament for a treaty to abolish nuclear weapons. The network has drafted a model nuclear weapons convention which is an official UN document.11

Abolition 2000 recognized “the inextricable link” between nuclear...
The women of Greenham Commons whose 19 year protest and encampment resulted in the removal of NATO’s nuclear-tipped cruise missiles from the UK, this is expected to be a great civil action that will serve to create a breach in the armor of the nuclear powers, beginning with the UK.

This past fall, led by Canada and Mexico, a group of middle power nations nearly succeeded in garnering support, during the UN General Assembly session of the First Committee, for four ad hoc committees in the Conference for Disarmament in Geneva to begin discussions on nuclear disarmament, negative security assurances, a fissile material cut-off treaty, and a treaty to ban weapons in space. Under enormous pressure from the US, they withdrew their proposal, but promised to follow through next fall if there is no progress. The Middle Powers Initiative is supporting this process and other potential avenues to break the disarmament deadlock with its newly formed Article VI Forum. There is a burgeoning grassroots movement for nuclear abolition.

But all elements must be addressed holistically. If we do not firmly reject the new American drive to empire and maintain the heavens for peace, if we do not at the same time phase out nuclear power, but rather think that we can continue to control this leaking sieve in a discriminatory regime, we will find ourselves in a state of perpetual war with little chance for a lasting and peaceful nuclear-free world.
Just after midnight on the 26 April 1986, a fatal accident occurred in unit four of the Chernobyl nuclear power plant (NPP) in the Ukraine. The RBMK-1000 reactor had been only working for three years, but the consequences of this accident will produce negative effects on the ecology of the planet for many hundreds of years to come.

Despite the fact that the capacities of their nuclear power plants were being increased year after year and that nuclear weapons tests were being actively conducted, the Union of Soviet Socialist Republics (USSR) was the only nuclear country in the world without laws to regulate the safety and use of nuclear energy such as those adopted in other countries a long time ago – e.g. in France in 1945 and the USA and Great Britain in 1946. Now, all developed countries have passed nuclear legislation.

The project for developing this legislation in the USSR was drafted two years before the accident at Chernobyl, but was not implemented even after the accident had happened because of excessive bureaucracy. There was no legal basis to assist any claims from the dozens of military and civilian nuclear accidents that occurred every year, some causing human casualties (e.g. at the Leningradskaya’s NPP in 1979, or at the military nuclear plant Mayak in the Ural Mountains). There was never a response and the government did not let its own people or the world community know about such accidents.

It was no surprise that, after the explosion at the Chernobyl nuclear power plant, neither the USSR government nor the local authorities were ready to take legal action on the resulting ecological, social and other problems. It should be noted that this was in the time of Gorbachev’s “perestroika” and “glasnost.” The scale of the consequences of the accident and the changes that had taken place in society by this time made it impossible to keep the facts of the catastrophe hidden. People in the affected territories continually demanded that the government should settle their health problems, the ecological damage to the affected territories, and supply compensation for material losses on the basis of sound legislative processes.

In April 1990, the USSR Supreme Soviet reviewed the situation concerning “liquidation” of (removing) the Chernobyl accident consequences and noted: “The accident at the Chernobyl NPP is the biggest and most wide-spread disaster of the present time, affecting the destinies of millions of people residing in a vast territory. The ecological effects of the Chernobyl accident forced the country into facing the necessity of solving new, exceptionally complex, large-scale problems, affecting virtually all spheres of social life, many aspects of science and manufacturing, culture, ethical values and morality.”

**First Nuclear Legislation of the USSR**

The first attempts in the USSR to find a legal settlement of the ecological and other problems caused by Chernobyl were the bylaws adopted jointly by the CPSU (the Communist Party of the Soviet Union) Central Committee and the Council of Ministers of the USSR. A decree adopted twelve days after the accident (7 May 1986) *On the terms of payment and material provision of employees of enterprises and organisations in the Chernobyl NPP zone* has become the first document regulating the procedures between the government of the USSR and the Chernobyl NPP.

Also, as a consequence of the Chernobyl accident and several decades after the introduction of nuclear energy into the USSR, a Ministry of Nuclear Power was finally established. Alongside this a legal framework appeared which could bear the responsibility of regulating activities associated with the implementation of the “Atoms for Peace” programme. A number of other joint decrees by the CPSU Central Committee and the Council of Ministers of the USSR adopted during 1987-1988 were aimed at solving various problems associated with the consequences of the terrible accident.

The first decree on Chernobyl was adopted directly by the legislative body of the country – Gorbachev’s Supreme Soviet of the USSR – four years after the catastrophe, on 25 April 1990. The decree *On a comprehensive programme to clear up the consequences of the accident at the Chernobyl NPP*, and the situation relating to the accident also authorised the first State Union-Republican programme of immediate action in 1990-1992. The decree assigned a duty to the Council of Ministers of the USSR “to draft the Law on the Chernobyl Catastrophe and put it in to the Supreme Soviet of the USSR in the fourth quarter of 1990. To define in the Law the legal status of the victims of the catastrophe, the participants of the accident clear up process and persons involved in activities in the affected area, as well as those subject to involuntary resettlement; the legal regime of the disaster area; control of resident population and their activities; military service; and the formation and functioning of state administrative bodies and public organisations in the affected area.”

However, none of these measures were implemented in time. A year later, in the next decree by the Supreme Soviet of the USSR of 9 April 1991 *On the progress of the implementation of the decree by the Supreme Soviet of the USSR of 25 April 1990*, it was mentioned that “there it has not been possible yet to adopt the Law on the Chernobyl Cat-
astrophe and the Law on Nuclear Energy Use and Nuclear Safety due to the delay in submitting drafts of these laws.”

It was not until 1991, five years after the accident at Chernobyl, that fully adequate legislative acts regulating the responsibility of the government for the damage inflicted on the citizens as a result of the activities of a nuclear enterprise were adopted in the USSR. These are:

2. the Law of the Ukrainian SSR On the Status and Social Protection of Citizens that Suffered as the Result of Chernobyl Disaster, adopted 28 February 1991;

As can be seen from their titles, these laws tackle the ecological problems only indirectly. However, they were a significant step forward when compared with the legal vacuum that existed during the five years immediately after Chernobyl. The scale of the Chernobyl catastrophe and the subsequent ecological damage were the initial motivation (particularly for scientists and lawyers) for the first laws to be adopted in Belarus, the Ukraine and Russia which allowed to attempt to solve the social and ecological problems. This was all the more important as nobody had ever faced these kind of problems before.

The other nuclear accidents reported in the United States of America (Three Mile Island), England (Windscale), and in other states could by no means be compared to the global consequences of the release at Chernobyl.

**Criticism of the Chernobyl Legislation**

Almost 20 years after the Chernobyl accident, as a result of many diverse investigations into the consequences of the catastrophe and compensation for the damage inflicted on the affected people, various scientists, specialists and ecologists began to question the “Chernobyl” laws of Russia, Belarus and the Ukraine with regard to the social protection of the population. A number of studies exposed the current provision of social-economic and medical protection as too harsh and offered, in my opinion, reasonable criticism. The main problem is that of evaluation of the dose delivered to the population, according to which a decision on compensation and aid can be made. An analysis of the current Chernobyl legislation on social protection testifies to the fact that it does not take into consideration several crucial aspects of this fundamental problem. The particular problems here are the methods of how to evaluate the delivered dose and how to determine the consequences, by considering the individual peculiarities of release and migration of radionuclides, the duration of exposure, dose rate, etc.

According to Oksana Zitzer (one of the leading specialists of the State Committee on Environmental Problems of Russia), the estimates of dose delivered according to the existing legislation, are imperfect due to the following reasons:

1. The risk of radiation exposure by the population may vary extensively.
2. Evaluations of the average individual dose for a particular group of the population exhibit a high spread in the values obtained, indicating that the reliability is very low and that the number of inspections in each territory should be increased.
3. Although long-term investigations have been carried out up to now by the Institute of Biophysics, the Institute of Radiation Hygiene and other establishments of the Ministry of Health Care of the former USSR and Russia, the scope of dosimetric and epidemiological data is totally insufficient to specify model parameters such as dose distribution in various regions and the parameters of social-related biological effects (e.g. mortality, differences in people’s sensitivity to radiation, etc).

4. Finally, the differences in people’s sensitivity to radiation is a very important factor in influencing the total outcome of irradiation in the various regions as the radiation-sensitive part of the population shows an extremely high population mortality.

Taking these facts into account, the following conclusions can be made:

1. The evaluation of territorial contamination according to the density of radionuclide deposition and correspondingly the evaluation of individual received dose – the so-called “zone” approach, which is currently used in the absence of any other method – is imperfect.
2. Radionuclides migrate, are absorbed and transform in the environment, changing into both less and significantly more dangerous elements. **The Concept of Radiation, Medical and Social Protection of the Population Exposed to Radiation Effects** was adopted by the Russian Commission on Radiation Protection and recommended by the Government of the Russian Federation for the revision and specification of the “Chernobyl law” provisions. In accordance with this concept, the “dose” approach is intended to replace the current “aerial” approach. But how can that be achieved in practice? The problem lies in the initial days and years after the Chernobyl catastrophe. It is the problem of the ‘big lie’ by the former Soviet authorities concerning people’s health after the explosion.

It is already well known that after the nuclear catastrophe, the USSR government immediately took measures to classify both the fact that the accident had occurred and its consequences on the population and the environment. The USSR government released instructions marked “top secret” in order to classify all data on the incident, especially that related to the health of the population which suffered as a consequence of the accident.

This was followed by instructions issued by the USSR Ministry of
Health and the USSR Ministry of Defence to classify irradiation doses accumulated by the population, liquidators (people that were in charge of clearing up the consequences of the accident) and military personnel. These regulations demanded that medical staff should not enter a diagnosis of “acute radiation syndrome” in the files of the military-liquidators – instead, it should be replaced by something else.

The classified documents have not been accessible for many years. It was only in 1991, when the Soviet Union was collapsing, that I managed to obtain the secret protocols of the Operative Group of the Political Bureau of the Central Committee of the CPSU (the Communist Party of the Soviet Union) and other documents. These secret protocols stated that a number of persons were subjected to irradiation and were hospitalised during the first days after the Chernobyl accident.

The Secret Protocols of the Communist Party

The first description of the state of the population’s health appears in the protocol of 4 May 1986: “The report of Mr. Schtepin [First Deputy Minister of Health Care of the USSR] on the hospitalisation and medical treatment of the population subject to radiation effects: It is noted that by 4 May, a total of 1,882 persons have been hospitalised. The total number of persons examined has reached 38,000. 204 persons have been found suffering radiation syndrome of different levels of seriousness – among them 64 children. 18 persons are in a critical state.”

The protocol of 6 May 1986 states: “It is reported... by Mr. Schtepin that by 9:00 am on 6 May, the total number of hospitalised persons is 3,454. 2,609 of them are on stationary treatment, including 471 children. According to the updated information, the number of persons suffering acute radiation syndrome reached 367, including 19 children. 34 of them are in a critical state. In the 6th Moscow Hospital there are 179 persons on stationary treatment, including 2 children.”

The cynicism of the authorities shown in the document is striking: “The proposal of the Ministry of Health Care of the USSR to publish data on the number and state of persons hospitalised in the 6th Moscow Hospital should be accepted, bearing in mind that there are American specialists working in this hospital.” If Americans had not been working there, the world would never have learned about the number of people suffering from the Chernobyl accident and undergoing treatment in the 6th Moscow hospital.

In the protocol of the 12 May 1986: “It is reported... by Mr. Schtepin that in the course of the last day 2,703 more persons have been hospitalised, generally in Belorussia. 678 persons have been discharged from hospitals. 10,198 persons are undergoing treatment and medical examination in hospitals.” It is seen therefore that the number of ill people had been increasing every day, but from the 13 May 1986, the number of hospitalised persons in the reports of the Deputy Minister of Health Care of the USSR sharply decreased, while the number of discharged persons started to increase.

The protocol of the 13 May 1986 notes that “…in the course of the last day 443 persons have been hospitalised, 908 persons have been discharged from hospitals. 9,733 persons including 4,200 children are undergoing treatment and medical examination in hospitals. Diagnosis of radiation syndrome has been concluded in 299 cases including 37 children.” A question arises as to why the process of discharging people from hospitals became so rapid after the number of ill persons started to increase.

The protocol of 6 May 1986 states: “It is reported... by Mr. Schtepin that by 9:00 am on 6 May, the total number of hospitalised persons is 3,454. 2,609 of them are on stationary treatment, including 471 children. According to the updated information, the number of persons suffering acute radiation syndrome reached 367, including 19 children. 34 of them are in a critical state. In the 6th Moscow Hospital there are 179 persons on stationary treatment, including 2 children.”

The protocol of 6 May 1986 was confirmed even for pregnant women and children. Such an action meant that, by applying the new norms (which exceeded the old ones by 10 to 50 times) more than 10,000 people, hospitalised for treatment due to irradiation by the accident, had suddenly been defined as healthy and were discharged. It also explains the sharp decrease in the number of people suffering from acute radiation syndrome. It goes without saying that the Soviet Party leadership increased the acceptable irradiation doses by 10 to 50 times in order to cover up the true number of the affected people. To a significant extent they succeeded. As the process of democratic transformation began in the USSR, however, the truth about the real scale of population irradiation due to the Chernobyl catastrophe gradually started to emerge.

In the parliamentary hearings in the USSR Supreme Council in 1990, Academician Ilyin (the director of the Institute of Biophysics and one of those covering up the truth about the health of people in the affected territories) had to admit under the pressure of the deputies’ inquiries and the facts presented on the affected territories (including mine) that “1.6 million children received worrying irradiation doses; decisions should be taken on how to act further.” He also admitted that “if the dose limits were lowered to 7 rem per 35 years [of life], we would have to increase the number of 166,000 people now planned to be relocated by approximately 10 times. Relocation of a total of 1.6 million people would have to be considered. Society must balance all the risks and profits of such an action.”

As one can see, neither the health of people nor the real state of things nor the legal situation were considered - only the economic side of the problem was taken into account. The USSR was not able to relocate such a large number of irradiated people. Thus, the officials were trying to cover up the truth about the health of the population from the people themselves.
Public Statements about the Risks of Irradiation by Soviet Medical Officials

The official medical documents from my own Chernobyl archive allow me to easily trace the dynamics of the changes in the position of the “fathers” of the notorious concept of the Soviet 35 rem safety levels for the population of the affected territories. (The fathers are academicians Illyn, Chazov and Gus’kova.) Briefly, the essence of this concept lies in a belief that a person may receive 35 rem over 70 years without health disorders. A month after the accident this “ceiling” was increased to 70 rem over 70 years, and several months later was decreased to 50 rem over 70 years, then back to 35 rem. It is interesting that the same official scientists - L.A. Ilyin, E.I. Chazov and A.K. Gus’kova - had stated in their book, written before the Chernobyl accident in 1982, that the threshold should be 25 rem over a lifetime. So, we see the “scientific” nature of the official concept of safe levels of exposure.

The first more or less open report of Radio-contamination Patterns and Possible Health Consequences of the Accident at the Chernobyl Nuclear Power Station (70 pages of typescript) was presented by Academician L.A. Ilyin at the General Session of the Academy of Medical Sciences of the USSR in Moscow, which took place on the 21-23 March 1989. This document contained the 35-rem concept of the Ministry of Health of the USSR. It is of particular interest that for the population of the strict control zones (SCZ) “the estimates of late effects was based on the actual doses in the four years following the accident and on the projected doses until 2060, the latter having been calculated on the assumption that restrictions on the use of home-grown products would be lifted in the strict control zones.” The following simple questions arise: who had actually evaluated the doses received by the population in the first 2-3 months, and who had they done it? I know very well the efforts made by officials in the Naro-dichi district of the Zhitomir region to eliminate primary medical documents representing the actual doses. Instead, medical staff were ordered to register understated dose values. Are these “actual” dose estimates worthy of belief?

The official secret documents of the Academy of Medical Sciences of the USSR from my archive are of a similar nature. According to these documents, autopsies of those who died after the accident, including children, have not been carried out in the strict control zone in the Zhitomir region. The conclusion drawn by the authors of this report on the prediction of the population’s future in the strict control zones is astonishing: “Despite a trend for an increase in spontaneous mortality and mortality of malignant neoplasm, which is registered in data from all over the USSR, values of these parameters are assumed to remain stable throughout the investigated 70 years period. Hence, ratios of an increase in the number of excess fatal tumours over their spontaneous level can only be corrected by a reduction.”

This idea is repeated in the general conclusion: “The data presented in this report provide evidence that the predicted levels of the radiogenic effects of the accident at the Chernobyl NPP, in the majority of cases including the population in the strict control zones, will likely be in a range of values less than a standard deviation from the spontaneous levels of the corresponding pathology.”

In other words, among the population residing in the strict control zones exposed to radiation every day since the catastrophe at the Chernobyl NPP, the authors say, there will be less fatal cases of induced cancers than among the population of all other territories! This is a remarkable Communist Party tale for the Soviet people.

One year later, in 1990, at a meeting of the Supreme Soviet of the USSR, the Chairman of the Government Commission on Liquidation of the Consequences of the Accident at the Chernobyl NPP, V.Ch. Doguzhiev said that “... the irradiation dose of 62% of the population who were subject to medical examination was found to be 1 to 5 rem. Out of the 1.5 million people residing in areas most contaminated with radionuclides, including 160,000 children, a thyroid irradiation dose of 87% of adults and 48% of children was at most 30 rem. For 17% of children the dose amounted to 100 rem.”

Health of the People 20 Years Later

The results of studies conducted by conscientious scientists about 20 years after the Chernobyl accident are striking. According to an estimate by the World Health Organisation, the number of people who took part in clearing up the consequences of the accident amounts to 800,000. (Russian scientists estimate this number to be approximately 600,000). Nobody knows the exact figure because, according to the documents, “Persons who had taken part in the clear up of the accident after the 1st January 1988 should not be included in the registry from 1989 - by order of the Ministry of Health Care of the Ukrainian SSR.”

The data of the Ukrainian officials shows that 148,000 people have died due to the consequences of the Chernobyl catastrophe in the first ten years after the catastrophe. The Russian Committee of Liquidators announced that 100,000 liquidators died over almost 20 years and that their deaths were connected with their work at Chernobyl. According to the data of The Union of Chernobyl of Ukraine, 622,250 people have died over the 20 or so years since the catastrophe (the organisation has a special daily counter on their website). According to the reports of the Ministry of Health Care of Belarus, the total mortality in the most contaminated areas of the country increased by 51% compared with the period before the Chernobyl accident.

It is noted in the report of the specialists from the Ministry of Labour of Russia and the Ministry of the Environment of the Russian Federation (M.S. Malikov and O.Yu. Zitzer) that more than 500,000 children under 14 years of age are living in the Ukrainian territory affected by the Chernobyl catastrophe. The most alarming fact, as noted in the report, is that 150,000 inhabitants have received thyroid irradiation doses.
which are dozens or hundreds of times higher than the acceptable level.

The incidence of child thyroid cancer has significantly increased. Whereas only 2-3 cases of thyroid cancer were registered annually before 1986, 200 cases were registered in the Ukraine in 1989 alone. Dramatic increases, particularly in the number of thyroid cancers among children in the Ukraine, Russia and Belarus should be noted – with most of these cases being found in Belarus. Data from the European Association for the Study of the Thyroid Gland shows that this number is only the beginning of the outbreak, and in the next 30 years thousands of children will suffer from thyroid cancer. In April 2000, World Health Organisation researchers said that the Chernobyl disaster will cause 50,000 new cases of thyroid cancer among young people living in the worst-affected regions.

The report on the effects of Chernobyl predicted that the worst was still to come for more than seven million people affected by the disaster. “Chernobyl is a word we would all like to erase from our memory,” said the UN secretary general, Kofi Annan, in a foreword to the report. But he added that “more than 7 million of our fellow human beings do not have the luxury of forgetting. They are still suffering, every day, as a result of what happened.” Kofi Annan also noted that the exact number of Chernobyl victims may never be known, but that 3 million children require treatment and “many will die prematurely.”

Based on a comparison with the number of thyroid cases among British children, the researchers found a dramatic rise in cancers among infants living in Gomel at the time of the accident. Some time ago, the Swiss Medical Weekly published results from research at the Clinical Institute of Radiation Medicine and Endocrinology Research, Minsk, Belarus, showing a 40% increase in cancer between 1990 and 2000. The researchers used data from the National Cancer Registry, established in 1973. They compared the post-Chernobyl period with rates before the accident on April 26, 1986. The figures they found all have high statistical significance and increases in the various regions are as follows:

<table>
<thead>
<tr>
<th>Region</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brest</td>
<td>33%</td>
</tr>
<tr>
<td>Vitebsk</td>
<td>38%</td>
</tr>
<tr>
<td>Gomel</td>
<td>52%</td>
</tr>
<tr>
<td>Grodno</td>
<td>44%</td>
</tr>
<tr>
<td>Minsk</td>
<td>49%</td>
</tr>
<tr>
<td>Mogilev</td>
<td>32%</td>
</tr>
<tr>
<td>Minsk city</td>
<td>18%</td>
</tr>
<tr>
<td>all Belarus</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Conclusion**

The lessons of Chernobyl for our future are:
1. The main and overriding lesson is to shut down all NPPs around the world and eliminate all nuclear weapons.
2. Until this can be achieved, countries possessing NPPs must pass a special law on ‘glasnost’ for all nuclear accidents and the criminal liability of the officials on the concealment of nuclear incidents.
3. The governmental machinery must be ready to adequately defend the population and the liquidators during and after NPP accidents.
4. The national and international nuclear legislation must define the risk of NPPs for people and the responsibility of the nuclear countries for possible transboundary nuclear accidents and catastrophes and their consequences.
5. Extremely important! A special chapter on the control and inspections of any NPPs by NGOs must be added to the current national nuclear laws in every country.
6. The UN must revise the IAEA’s Statute in order to prevent the proliferation of nuclear facilities of dual use. (Countries with NPPs may also use them to produce the material for nuclear weapons.)
7. All governments should generate and implement plans to replace NPPs with alternative sources of energy.

As a member of the Supreme Soviet of the USSR, Alia Yaroshinskaya secured top-secret documents of the Communist Party Politburo on Chernobyl in 1992. She published on the “hidden truth” of Chernobyl, for which she was awarded the Alternative Nobel Prize in 1992; ayaro@mail.domonet.ru.

**New Greenpeace Report on Chernobyl**

In April 2006, on the occasion of the 20th anniversary of the Chernobyl accident, Greenpeace issued the report *The Chernobyl Catastrophe: Consequences on Human Health*. According to Greenpeace, the report involved 52 respected scientists and includes information never before published in English. It challenges the International Atomic Energy Agency (IAEA) to shut down all NPPs around the world and eliminate all nuclear weapons.

The new data, based on Belarus national cancer statistics, predicts approximately 270,000 cancers and 93,000 fatal cancer cases caused by Chernobyl. The report also concludes that on the basis of demographic data, during the last 15 years, 60,000 people have additionally died in Russia because of the Chernobyl accident, and estimates of the total death toll for the Ukraine and Belarus could reach another 140,000.

The report also looks into the ongoing health impacts of Chernobyl and concludes that radiation from the disaster has had a devastating effect on survivors; damaging immune and endocrine systems, leading to accelerated ageing, cardiovascular and blood illnesses, psychological illnesses, chromosomal aberrations and an increase in foetal deformations.

In another part of their website, Greenpeace introduces with photos and texts a few victims of the Chernobyl catastrophe under the title of *Who is affected*. One of them is “Annya was born in 1990 in Zakoppyte, a village highly contaminated by the Chernobyl nuclear meltdowns of 1986. A cancerous brain tumour at the age of four marked the end of Annya’s childhood and the beginning of a life of pain and illness.”

See www.greenpeace.org/international/campaigns/nuclear/nomorechernobyls/who-is-affected.

1. [www.greenpeace.org/raw/content/international/press/reports/chernobylhealthreport.pdf](http://www.greenpeace.org/raw/content/international/press/reports/chernobylhealthreport.pdf).
Only 50 deaths caused by Chernobyl?

■ IPPNW Germany

Berlin, April 6 2006: A report published today by the physician’s organisation International Physicians for the Prevention of Nuclear War (IPPNW) Germany and the German Society for Radiation Protection (GfS) belies the claim by the International Atomic Energy Agency (IAEA) that less than 50 people died as a result of the accident at Chernobyl (see IAEA press release of September 5th 2005).

The facts presented by Dr. Sebastian Pflugbeil, President of the German Society for Radiation Protection, show that the IAEA figures contain serious inconsistencies. For instance, the IAEA claim that future fatalities due to cancer and leukemia in the most heavily exposed groups are expected to number 4,000 at the most. However, the study by the WHO, that this claim is based on, forecasts 8,930 fatalities. “And when one then reviews the reference given in the WHO report, one arrives at 10,000 to 25,000 additional deaths due to cancer and leukemia,” says Pflugbeil. These inconsistencies are not surprising, given the mandate of the IAEA: to promote nuclear energy. This prevents the Agency from being independent.

According to Dr. Angelika Claussen, Chair of the German affiliate of IPPNW, the point is not to contrast the “correct” numbers with the obviously false ones provided by the IAEA. These cannot be claimed to have been found due to methodical problems. Essential data on the Chernobyl catastrophe have been kept secret, both in the East and in the West. Large epidemiological studies are very expensive and only possible with state support. “It is, however, possible to provide an informative basis to show to what extent and what kinds of damage we are dealing with when we are talking about the effects of Chernobyl,” says Claussen.

The IAEA is attempting to account for an evident rise in fatalities and disease by providing absurd arguments. “It is cynical, to say the least, when affected people in Ukraine, Belarus and Russia are told by the IAEA that they have a victim mentality, should feed themselves better and live more healthily,” says Claussen.

The IPPNW/GfS Report Health Effects of Chernobyl – 20 Years After the Reactor Disaster documents the catastrophic dimensions of the reactor accident, using scientific studies, expert estimates and official data: 50,000 to 100,000 liquidators (clean-up workers) died in the years up to 2006. Between 540,000 and 900,000 liquidators have become invalids. Congenital defects found in the children of liquidators and people from the contaminated areas could affect future generations to an extent that cannot yet be estimated. Infant mortality has risen significantly in several European countries, including Germany, since Chernobyl. The studies at hand estimated the number of fatalities amongst infants in Europe to be about 5,000.

In Bavaria alone, between 1,000 and 3,000 additional birth defects have been found since Chernobyl. It is feared that in Europe more than 10,000 severe abnormalities could have been radiation induced.

By referring to the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), one arrives at between 12,000 and 83,000 children born with congenital deformations in the region of Chernobyl, and around 30,000 to 207,000 genetically damaged children worldwide. Only 10% of the overall expected damage can be seen in the first generation.

■ In Belarus alone, over 10,000 people developed thyroid cancer since the catastrophe. According to a WHO prognosis, in the Belarussian region of Gomel alone, more than 50,000 children will develop thyroid cancer during their lives. If one adds together all age groups, then about 100,000 cases of thyroid cancer have to be reckoned with, just in the Gomel region.

■ Altogether, the number of Chernobyl-related cases of thyroid cancer to be expected in Europe (outside the borders of the former Soviet Union) is between 10,000 and 20,000.

■ In more contaminated areas of South Germany, a significant cluster of very rare tumors has been found amongst children, so-called neuroblastomies.

■ In Germany, Greece, Scotland and Rumania, there has been a significant increase in cases of leukemia.

■ In a paper published by the Chernobyl Ministry in the Ukraine, a multiplication of the cases of disease was registered - of the endocrine system (25 times higher from 1987 to 1992), the nervous system (6 times higher), the circulation system (44 times higher), the digestive organs (60 times higher), the cutaneous and subcutaneous tissue (50 times higher), the muscolo-skeletal system and psychological dysfunctions (53 times higher). Among those evaluated, the number of healthy people sank from 1987 to 1996 from 59 % to 18%. Among inhabitants of the contaminated areas from 52% to 21% and among the children of affected parent from 81% to 30%. It has been reported for several years that type I diabetes (insulin-dependent diabetes mellitus) has risen sharply amongst children and youth.

The report can be found at www.tschernobyl-folgen.de in German. For details, contact Xanthe Hall, xanthe@ippnw.de.
Iran’s Nuclear Programme – Civilian or Military?
Dual-Use Brings About Irreconcilable Positions and a Dangerous Dynamic of Escalation

Martin B. Kalinowski

This article was written in January 2006. See the box below the article for later developments in the Iran case. [The editor]

The Circumstances

Iran is running a nuclear programme that is a cause for concern. Iran claims that it is purely civilian. But behind the civilian programme there could be military intentions and it could also be the case that Iran already has or has had a military programme. There is, however, no evidence for this at all. Admittedly, there are many disconcerting indications that could be interpreted to mean that their intentions are more military than civilian in nature. But intentions cannot be proven when dealing with dual-use technology. Iran has provided a more or less plausible explanation for every single indication that has been discovered, claiming its purposes are only civilian. Iran quotes its right according to Article IV of the nuclear Non-Proliferation Treaty (NPT), whereby every party should be provided with full access to civilian nuclear technology. Because of the nature of dual-use technology, it cannot be proven that Iran is in violation of the NPT. No activities have been found that could only serve military purposes and would therefore deliver clear proof of the existence of a secret nuclear weapons programme. However, the situation is very serious for Iran, since it has breached its NPT Safeguards Agreement with the International Atomic Energy Agency (IAEA) on several occasions.

This article concentrates on the technical facts and does not attempt to analyse political statements and activities that have led to Iran coming under unfavourable scrutiny, and because of which Iran is alleged to have the intention of using its nuclear programme to camouflage an enterprise that is actually motivated by military purposes. Clear and extensive conclusions can only be reached in the absence of such allegations and mistrust.

No Violation of Article II of the NPT

Iran has been in breach of its obligations under the Safeguards Agreement that is used by the IAEA to implement the NPT on several occasions. And there are indications that point to the possibility of military intentions for the Iranian nuclear programme. But before one begins to discuss these, one thing should be made clear: the IAEA has as of yet found no evidence that Iran is secretly producing or diverted weapons-grade nuclear fissile material.2 There is no evidence that Iran wants nuclear weapons, and only this would be a violation of Article II of the NPT. This article forbids any non-nuclear weapons state that is party to the Treaty from acquiring nuclear weapons or any other kind of nuclear device through production or by any other means.

Up to now, the most explosive discovery was made in the Kala Electric Company in Abali near Teheran. The IAEA were able to prove the existence of highly enriched uranium in swipes that the inspectors had taken in 2003 from the surfaces of machine parts used for uranium enrichment. Iran had declared that it had only enriched the uranium up to a maximum of 1.2% U-235. The question of whether a breach of the NPT had been revealed by the evidence of traces of highly enriched uranium was argued over for two years. Iran declared that the traces were due to contamination of the plant which was imported from Pakistan. At first this could not be checked because it was difficult to analyse and decide upon the age of the uranium traces. Eventually, in August 2005, came the all-clear. An international team of experts were able to prove that the composition of the isotopes, that were in the traces found in Iran, matched samples taken in Pakistan and that had been made available to the experts. Thus the Iranian declaration was finally confirmed as being trustworthy because of its consistency with the measurements. But this news was barely reported in the media, and it has only become clear to a few observers that this means that no evidence of high enrichment of uranium has in fact been found in Iran. This means that the IAEA cannot accuse Iran of any breach of its obligations under Article II of the NPT.

Breaches of Article III of the NPT and IAEA Safeguards

The IAEA accuses Iran of having violated its obligations under the Safeguards Agreement in several in-

Summary of the NPT articles referred to in the article

<table>
<thead>
<tr>
<th>Article</th>
<th>Description</th>
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<tbody>
<tr>
<td>Article II</td>
<td>No non-nuclear weapon state that is party to the treaty is allowed to produce or otherwise acquire a nuclear warhead.</td>
</tr>
<tr>
<td>Article III</td>
<td>(1) and (2): Non-nuclear weapon states must accept full-scope safeguards for all of their source or special fissionable material</td>
</tr>
<tr>
<td>Article IV</td>
<td>Civilian nuclear technology is an inalienable right for every party to the treaty and there exists an obligation to make it available.1</td>
</tr>
</tbody>
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INESAP Information Bulletin No.26, June 2006
stances. Both nuclear materials and installations should have been declared. The following list includes facilities without nuclear material, which were not covered by the Safeguards Agreement but only by the Additional Protocol, which was signed by Iran in December 2003.

- Iran fed in and enriched uranium hexafluoride (UF₆) at the uranium enrichment plant at Natanz without declaring it to the IAEA. Iran is obliged, however, to do so. This breach was discovered by the IAEA in February 2003. Iran tried to excuse its behaviour by saying that only tiny amounts had been processed for test purposes.

- A pilot plant at Lashkar Abad near Karaj was built for laser enrichment but not declared to the IAEA. The IAEA visited the plant in 2004 and confirmed its nuclear use.

- The plant at the Kala Electric Company in Abali near Teheran was used for installing centrifuges that had been imported from Pakistan. Neither the existence of this plant, nor the construction of the uranium enrichment plant at Natanz, nor the heavy water production plant at Arak were declared to the IAEA.

- The import of natural uranium in 1991 was not declared. The processing and use of this material, as well as the resulting excess waste, were also not declared.

- The enrichment of imported UF₆ at the Kala Electric Company in Abali near Teheran, that was carried out in 1999 and 2002 for test purposes, should have been declared.

- The import of uranium metal in 1993 and its enrichment in the laser enrichment plant at Lashkar were not declared.

- The production of UO₂ targets in Isfahan Nuclear Technology Centre, their irradiation in the Teheran research reactor and the subsequent separation of 0.2 milligramm plutonium between 1988 and 1992 should have been declared.

- The production of various types of uranium oxide, uranium fluoride and of ammonium uranyl carbonate should also have been reported. Similar breaches and failures of numerous other countries have also been known without it having lead to a noteworthy international reaction, with the exception of Iraq and North Korea. The frequency and the prolongation of such incidences in Iran, however, as well as the intensity and scope of their secret nuclear programme does represent an anomaly.

After the discovery of these failures, Iran has made an effort since October 2003 to present a clean slate. Cooperation with the IAEA has improved and more transparency has been forthcoming, although delaying tactics and contradictory declarations have provided occasion for further scepticism. The required declarations were eventually made by Iran. All the design information for the named plants were made available. Inventories, material accounts and information on imports and transfers have been produced in detail. IAEA inspections of materials and plants to verify the inventory and further operation have been permitted. All the declared material could be verified and no diversion has been detected.
Iran voluntarily signed the *Additional Protocol* on December 18, 2003, and allowed it to be acted upon before it comes into force. When installa-
tions were discovered or sus-
pected, the IAEA was, on most occa-
sions, allowed to make inspections or were at least promised them. For the IAEA, however, unanswered ques-
tions remain about the story of the di-
rect and intermediated import of cen-
trifugal technology from Pakistan. In the case of the experiments with laser technology, all activities have ceased and the installation deconstructed. Since the construction site at Isfahan has come to light, in which it is alleged that centrifuges have been tested, Iran has ceased building work and allowed the IAEA to inspect it. Initially, Iran agreed during negotiations with the EU-3 group (UK, Germany and France) to freeze all nuclear activities. Added to this, Iran permitted special measures, over and above those dem-
danded by the usual nuclear safe-
guards, in order to verify compliance with that freeze.

**Breaches of Further Obligations?**

A decisive turn of events in the Iran crisis came with the *Teheran Joint Statement* by Iran and the Foreign Ministers of the EU-3 in October 2003 and the conclusion of the Paris Agreement between Iran and the EU-3 in November 2004. With the latter, Iran committed itself to the fol-
lowing:

- to suspend all activities pertaining to the so-called fuel cycle;
- to ratify the *Additional Protocol*;
- to declare all installations, activi-
ties and material and open them up to verification inspections by the IAEA.

In return, Iran was promised coopera-
tion over the issue of regional security and the civilian use of nuclear tech-
ology, as well as economic and tech-
nical support, that was to be worked out in detail at a later date.

However, the *Draft Agreement* put forward by the EU-3 on Au-
ger 5, 2005, offered little more than rather unspecific promises as well as the confirmation of undertakings that had already been agreed on under in-
ternational law at an earlier time. A positive element of the *Draft Agreement* was the British and French offer of negative security assurances (i.e. no nuclear attack on Iran).

Iran is accused of breaking its promised freeze on its nuclear pro-
gramme. At the beginning of August 2005, Iran announced that it would recommence its production of UF$_6$ in the uranium conversion plant at Isfa-
han. This measure was announced with the following three justifications:

1. Iran has a right to civilian nu-
clear technology under Article IV of the NPT, and this right has been un-
justly withheld and torpedoed since the early eighties;
2. Iran fulfilled all its obligations under the *Paris Agreement* but the EU-3 have done practically nothing, they only played for time by dragging out the negotiations;
3. UF$_6$ production is not included in the freeze agreed to in the *Teheran Joint Statement* of October 2003 since it is not an enrichment activity. Renouncing this preparatory step for enrichment was not wrenched from Iran until the *Paris Agreement* of November 2004.

Iran did not recommence UF$_6$ pro-
duction until November 16, 2005. The scheduling of both steps (the an-
nouncement and its execution) im-
plies that a clear political signal was intended. The removal of the seal was announced on August 1, only days before the EU-3 offer was to be sub-
mitted according to European obliga-
tion under the agreement. The res-
oluteness of Iran’s non-cooperative stance becomes even clearer when one keeps in mind that only a day before this announcement written notice was given by the EU-3 to Iran of the in-
tention to present the long-awaited offer no later than August 7. The IAEA seal was removed in the pres-
ence of IAEA inspectors, and UF$_6$ production was recommenced in No-
ember 2005. However provocative this scheduling might be, it still does not constitute a breach of the NPT. It could be interpreted as a breach of the additional concessions made to the EU-3 in the *Paris Agreement* of No-
ember 2004, whereby Iran is of the opinion that the EU-3 states were al-
ready in breach of their commitments of the same agreement.

Since the resolution of the IAEA Board of Governors of November 29, 2005, refers to the *Paris Agreement* and calls on Iran to suspend all en-
richment activities, Iran is accused of also not having complied with this resolution.

Iran’s provocation has led to fur-
ther escalation of the conflict. The IAEA Board of Governors ascer-
tained in their resolution of Septem-
ber 24, 2005, that the failures to com-
ply with safeguards and facts that have been known for between one and two years constitute non-compli-
ance in the context of Article XII.C of the Agency’s Statute. As a result, the country in question must not only be called upon to correct these circum-
stances, but the IAEA has to report all non-compliance to the UN Security Council. The resolution explicitly threatens that the Security Council will be asked to deal with unanswered issues pertaining to the purely peace-
ful intentions of the Iranian nuclear programme. Iran is called upon, in the resolution, to re-suspend or continue to suspend all activities related with uranium enrichment. Finally, it was decided to remain seized of the mat-
ter, and the pressure is growing within the Board of Governors to refer the Iranian nuclear programme to the Sec-
urity Council.

**Indications of Possible Military Intentions**

Alongside the clear breaches of agree-
ments already mentioned, there are indications and suppositions that do not, however, constitute evidence of a secret nuclear weapons programme. Yet Iran has exonerating explanations at hand for all these indications. The sheer extent of these clues, though, rocks Iran’s credibility.

- *Overproduction of uranium en-
richment*: At the moment Iran does not have a nuclear energy programme that needs enriched uranium for its fuel. The dimensions of the uranium enrichment plant, currently under construction at Natanz, could only be understandable if they would have a large number of nuclear power plants.
to cater for. Iran claims that they are planning such a civilian nuclear energy programme. Sceptics say this is not credible as Iran possesses large reserves of crude oil. However, one should be careful about calling the credibility of a programme into question simply because it appears to be inconsistent with the context of the national power supply.

- **Heavy water reactor.** A 40 megawatt heavy water reactor is being built in Arak that would be particularly good for the production of plutonium.

- **Military connections:** Part of the uranium enrichment efforts are being run by the defence ministry. Iran explains this by saying that the Iranian military undertakes similar activities for other commercial industrial operations.

- **Building completely underground:** The buildings in Natanz where the uranium enrichment plant is housed have been built completely underground. The surface is covered with earth, as though the plant is meant to be hidden. Iran explains this by saying that the plant needs to be protected from the air.

- **Camouflage company?** The Kala Electric Company in Abali, near Teheran, that tested the uranium centrifuges bought from Pakistan, was registered as a company of watchmakers.

- **Obliterating traces?** Before inspectors could visit the Lavizan-Shian Technology Research Centre in 2004 to look for an alleged biological weapon research facility, the building was completely demolished and even the earth was taken away. Iran claims, the land belonged to the city and was being reconstructed as a park. Further investigation showed this claim to be credible.

- **Inspectors are led astray:** When the IAEA wanted to visit the laser enrichment plant in Lashkar Abad in 2004, they were first taken to a place nearby, evidently with the intention of making the IAEA think that the information they had received from the opposition group National Council of Resistance of Iran (NCRI) was false. Eventually, Iran brought them to the right place.

- **Inspections are delayed:** There have still been no inspections of the military installation in Lavizan. It is suspected that various activities related to uranium enrichment are taking place there. Among other things, the dismantled laser enrichment experiment could have been reassembled there.

- **Polonium-210:** Small samples of metallic bismuth have been irradiated using neutrons. Polonium-210 is then generated. This can be used as a neutron source when mixed with beryllium and then used for initiating a chain reaction in a nuclear weapon. Iran explains this by saying that this is only research for civilian purposes that is not finished yet and has been ongoing for the last 13 years. Polonium-210 is needed by them for the production of nuclear batteries based on radioisotopes (such devices are for example used in the US space programme).

- **Other sensitive material and technology:** There are signs of other material and technology that are known to be related to nuclear weapons programmes but could not as yet be confirmed by the IAEA. These include an attempt to acquire tritium from South Korea, beryllium from China and highly purified graphite from Dubai.

- **Processing of uranium metal:** A few days before the IAEA Board of Governors meeting on November 24, 2005, it was made known that Iran had provided the IAEA with technical documents that contained descriptions of mechanical processing of metallic uranium, and in particular the production of hemispheres. There is no possible civilian use for these. This is clearly a military application that can be used for producing the central nuclear components of a nuclear weapon. The media jumped to the conclusion that this was the discovery of a new and particularly serious sign of an advanced nuclear weapon programme. It was implied that the situation was thus aggravated. In contrast, the IAEA assesses the transfer of these documents as a positive step towards fulfilment of the demanded transparency and does not see the existence of these documents as a breach of confidence. Actually, the described documents were found amongst a batch of many unasked for papers that Iran received from the Pakistani A.Q. Khan procurement network almost ten years previously, together with the delivery of the centrifuges. Iran asserts that they did not order any information on the construction of nuclear weapons, nor have they used any. All of the indications listed here, that suggest the presence of nuclear weapons ambitions, in particular because of the number of them, have been explained by Iran and are consistent with an assumption of innocence.

### Possible Positions

In light of the nuclear situation in Iran, every party has to take a decision in two respects. Firstly, one can either believe in Iran’s innocence or one suspects a secret nuclear weapon programme. Secondly, one can take the view, with respect to the NPT, that the treaty should not be applied discriminatorily, or one deems that a state that has already breached the treaty should be monitored more strictly, and has forfeited certain rights contained in the treaty. Table 1 shows the four standpoints that can result from these two irreconcilable positions.

- **Victim:** Iran claims that it is not guilty of having breached Article II of the NPT. Conversely, they see themselves as the victim of a breach of Article IV since the eighties, and even more so presently. Iran is prepared to indulge inspections, that it considers to be correct and necessary, since it admits that they have not fulfilled their safeguards obligations. But it is determined to realise the goal of attaining an unlimited civilian nuclear programme that has been denied it for so long. Up until now, Iran has only been prepared to tolerate a temporary suspension of its enrichment activities.

- **Perpetrator:** The US takes the opposing position. They have suspected Iran for the past 25 years of running a secret nuclear weapon programme and, in the meantime, are of the opinion that the evidence has been provided that Iran has breached Article II and III. Because of this presumption, most Western countries have refused any nuclear cooperation with Iran and have exercised pressure...
on other countries not to make nuclear technology available to Iran. Germany broke off construction of the power reactor at Bushehr after the Islamic revolution in 1979. Russia will now finish the reactor by 2006, while having taken particular precautions to avoid Iran using the operation of this reactor as justification for its uranium enrichment activities, or that they might divert plutonium from the spent fuel rods. For this reason, Russia provides the fuel and takes back the spent fuel. The USA would like to see all means of stopping Iran from getting the nuclear bomb to be implemented as fast as possible.

- The principle of equality: The lower left position in the diagram values the principle of non-discrimination so highly that even a violation of safeguards commitments would not lead to treating the state concerned in any other way. This position is seldom held.

- Innocent until proven guilty: Russia is the foremost representative of this position. The Russian government still believes there are no military intentions behind Iran’s nuclear programme, but supports measures that would reinstate the trust in Iran that it has lost through breaches of Article III. The EU-3 are somewhere between the top right position and the other extremes just below. It is clear that the EU-3 have their eye on Iran in light of past incidents, and demand stricter controls. The viewpoint that Iran had, or still has, a secret nuclear weapon programme is not openly held. A further judgement comes into play at this point. One can view the past IAEA inspections, the present investigations, and future implementable measures as sufficient to ensure that Iran is no longer running a nuclear bomb programme, since it cannot be kept secret. This viewpoint has the same outcome as the presumption of innocence. The more pessimistic variation is the fear that Iran is determined to run a nuclear weapon programme and that safeguards can never be enough to discover this. It cannot be prevented anyway. The outcome of this are not only the strictest possible nuclear controls but also to forbid Iran any technology that could give it direct access to nuclear-weapon-grade material. This is the same as the bottom right extreme position in the table.

Both the EU-3 and Russia, as well as the US, are insisting on a permanent limitation on the Iranian nuclear programme. They are offering Iran a solution in which Iran and Russia would run an uranium enrichment programme in Russia together. The conversion of uranium into UF₆ could continue to be run by Iran but they would have to deliver the UF₆ gas to Russia. The enrichment and fuel production would then take place there. Iran would be party to the profits from international sales. However, end of December 2005, Iran rejected this proposal and renewed its claim to enrich uranium on its own territory.

### Dual Use is the Source of Escalation

If Iran really does have, or has had, a secret nuclear weapon programme then it is because it was able to camouflage nuclear technology using its dual use traits. This makes the task of revealing true intentions and the provision of hard evidence extremely difficult. Because of this uncertainty, positions tip in favour of the extreme positions of “victim” and “perpetrator” in the diagram discussed above. By taking the role of victim, one can profit and there are no risks attached. That makes it an attractive prospect. The accusation of perpetrator, however, is based on indications combined with suppositions created by mistrust. Rather than allow international security to be endangered, the idea that Iran has nuclear weapon ambitions is adhered to.

If Iran really does not have a secret nuclear weapon programme, then it is the dual-use problem of the nuclear technologies referred to here that is causing this immensely dangerous peace-threatening escalation. Since a mere suspicion is almost impossible to falsify with hard facts, a fear is raging outside of Iran that is not to be stilled and an increasing rage inside Iran about the unjust treatment it is receiving. If fear is driving an escalation in which an ever more humiliating treatment of Iran is demanded, then the anger in Iran will provoke a kind of defiance that ultimately leads to an end to the willingness to cooperate. The recommencement of uranium conversion is such a reaction. Just before their November meeting, Iran threatened the IAEA Board of Governors with the discontinuation of voluntary cooperation with the inspectors and limiting themselves to a kind of “go-slow” with the inspectors, should the case be brought before the UN Security Council.

### What Is to Be Done?

#### Strict Adherence to All Safeguards Obligations

The discovered breaches in the past should give occasion for the IAEA to exhaust all possibilities during further monitoring of Iran that are offered by

<table>
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<tr>
<th>Iran’s nuclear programme is regarded as purely civilian in nature, until the opposite is proven.</th>
<th>NPT, no discrimination</th>
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<tbody>
<tr>
<td>Victim: Iran sees itself as a victim of a breach of Art. IV of the NPT. Cooperation and transparency where necessary. No renunciation, at the most suspension.</td>
<td>NPT, suspects get stricter controls</td>
</tr>
<tr>
<td>Innocent until proven guilty: Breach of Art. III of the NPT. Stricter inspections than demanded by the treaty or additional agreements.</td>
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</table>

| Iran is suspected of having a nuclear weapon programme until all traces in regard to this have been removed. | The principle of equality: Breach of Art. II and III of the NPT. Exhaustive inspections according to the treaty. Voluntary renunciation negotiated in return for compensation. | Perpetrator: Breach of Art. II and III of the NPT. Stricter inspections than demanded by the treaty or additional agreements. No full right to Art. IV of the NPT. |

| Table 1: Two irreconcilable positions and four possible standpoints |
the Safeguards Agreement and the Additional Protocol. All unanswered questions and contradictions have to be completely cleared up. All signs have to be followed up. For instance, there is allegedly an extensive complex of underground tunnels near Teheran that, according to information from an Iranian opposition group, are being used for nuclear activities. These have to be inspected by the IAEA. Iran has to allow all these measures. It has to make sure that all activities are made fully transparent and disclosed and should support the IAEA in clarifying historical events.

Experience shows, however, that even if every possible verification method is exhausted, it remains an extremely difficult task to uncover undeclared installations and material. Often a hint from outside is needed in order to bring undeclared nuclear activities to light and inspect them. The early discovery of the construction of an uranium enrichment plant in Natanz was made by a civilian organisation, the National Council of Resistance of Iran (NCRI), and made known in August 2002. When Iran protracted the planned IAEA inspection, due to take place in 2002, another civilian organisation, the Institute for Science and International Security (ISIS), became active and published satellite pictures that documented the progress of construction at the site. The IAEA was not able to visit the construction site until February 2003 and confirm the suspicions. A similar process took place with the heavy water production plant in Arak and also with the uranium centrifuges tested in Abali. The IAEA then found the traces of highly enriched uranium at the latter that were the subject of debate for a long time.

Improvement of Nuclear Safeguards

The potential of existing methods and technologies used for safeguards obviously need improving as regards their chances of uncovering undeclared activities.

For this reason the General Assembly of the IAEA decided in 2004 to develop new methods and technologies, in particular to accelerate the implementation of the Additional Protocol. In order to implement this decision, the agency called on all member states to support the search for, and development of, new technologies that can enable detection of undeclared nuclear material and installations for production. Primarily, what was meant was the discovery of the undeclared operation of reprocessing or uranium enrichment plants.

The following technologies were explicitly named within the request:

- detectors based on laser diodes for UF₆ and HF gas as an indicator of unreported uranium enrichment;
- monitoring and sampling of atmospheric inert gases (in particular krypton-85) for detecting secret plutonium separation and unreported reactor operation;
- antineutrino detectors to find undeclared reactor operations;
- geophysics methods for detecting undeclared facilities such as tunnels or hidden rooms or for verifying design information;
- in situ analysis of environmental samples.

The Additional Protocol provides the most important legal basis for the use of these new technologies. The technical possibilities of implementing this agreement are, however, not nearly exhausted. This is because further development and adjustment of the appropriate measurement technology for use in the field has to be carried out. On the other hand, procedures about how to use these verification methods and a basic understanding of their possibilities and limits are missing. Last but not least, high development costs and limited budgets stand in the way of speedy application.

Environmental samples are named as particularly relevant. In the Additional Protocol there are two different categories: on the one hand, samples taken at defined locations (location-specific environmental samples), and on the other hand, the operation of a network of stations over a wide area (wide-area environmental sampling). The latter has not as yet been carried out and needs to have a new board decision from the Governors to define an appropriate procedure. The first category includes.

Clear Signs of a Nuclear Weapon Programme Should Be Seen as a Breach of the NPT

A serious weakness of the NPT verification system lies in the inability to use the fabrication of nuclear weapons components that do not contain fissile material as official evidence of a violation of the treaty. This is because verification specifically refers to nuclear materials. Dual-use makes it very difficult to find clear evidence of nuclear weapon production. The already mentioned example of polonium-210 exemplifies this.

The IAEA can only use pertinent indications of a possible nuclear weapon programme as a reason to more precisely conduct permitted checks on nuclear weapon grade material. Only when there is evidence of the diversion of plutonium or highly enriched uranium may the IAEA report a breach of the NPT. Indeed, if such a circumstance should occur then no excuse would be accepted. The purpose of the diversion would not be examined. Such an examination would indeed be very difficult because of the dual-use nature. So any proved diversion of at least a significant amount of weapon-grade nuclear material is seen as a breach of Article II of the
NPT. However, there are reprocessing plants in which occasionally even more than significant amounts remain unaccounted for during a material audit. The hypothesis of a possible diversion is not pronounced if this amount could be explained by the statistically possible errors in the measurement.

**Forbidding Iran Specific Nuclear Activities or a Voluntary Renunciation?**

It has been demanded by many sides that Iran should not be allowed to operate a uranium enrichment or reprocessing plant. It is feared that they would hide military intentions behind ostensibly civilian purposes. As well as dual-use there is another argument for such a measure. Should a purely civilian nuclear programme actually exist then it represents a considerable latent proliferation risk. A secret nuclear weapon programme could progress a long way before fissile material was to be used. As soon as the access to fissile material is used for building a bomb it becomes key that the diversion be recognised very quickly. The IAEA works with strict time specifications as targets for detection are defined by the amount of time it takes for material used for making a nuclear weapon to be processed. With directly usable material such as highly enriched uranium (with more than 20% uranium-235), not more than one month is allowed to go by before it has to be detected. Several observers would like to avoid such a time-critical situation by disallowing directly usable nuclear material from existing or being produced in Iran.

A ban on certain civilian nuclear activities would, however, contradict Article IV of the NPT, according to which Iran has an inalienable right to the procurement and use of civilian nuclear technology. Some experts see this differently. They are of the opinion that a state that has come under suspicion, and in particular has breached its Safeguards Agreement, no longer has full rights under Article IV of the NPT. Iran will not yield to this argument.

The dilemma between compliance with Article IV of the NPT and the military use of installations and material declared as being for civilian purposes could only be solved should Iran voluntary renounce civilian use. The EU-3 managed to convince Iran to at least suspend its uranium enrichment with the Tehran Joint Statement. But in the medium-term it seems futile to expect to sustain a voluntary renunciation, even if there are trade-offs as a motivation to do so.

**Would an Internationalisation of Critical Installations Help?**

Hope has been placed in the proposal of internationalising the operation of critical nuclear installations. Ideally, no one single country would then have physical control over the nuclear material. But already existing international cooperation for uranium enrichment, such as Eurodif or Urenco, have not achieved this. An earlier proposal by South Africa as well as the recent one by Russia envisage that Iran would participate in uranium enrichment without carrying it out on their own territory. Russia proposed in November 2005 that Iran could continue to carry out conversion of UF6 in the country, but would transport the gas to Russia, where it would be enriched and processed into fuel. Iran would get a share of the profit from the sales of fuel rods.

One should not forget, however, that Iran has already had a negative experience with a similar enterprise. Iran entered into a nuclear cooperation agreement with France and bought into the European uranium enrichment consortium Eurodif as a partner. With this, Iran purchased the right to 250–300 tonnes of 3% enriched uranium. In the eighties, Iran showed no interest and did not keep up with its payment obligations under the Eurodif agreement. But when Iran wanted to receive uranium in 1991 there was a legal action with France who no longer felt bound by the contract. Since then, Iran has not gotten its financial share back from Eurodif and France has promised the US that it will not release the enriched uranium that Iran has a claim to. When France, together with other countries, now demands from Iran that it should not enrich uranium itself, one can guess how this is received in Iran.

**Renunciation as an International Norm**

The basic problem might be solved by introducing a global norm of renunciation. Doing without the use of critical nuclear technology has to become a general norm that all countries agree to. Refusing access to technology to a single country like Iran could no longer be seen as a breach of Article IV of the NPT, nor would one country be discriminated against.

The aim of such a norm of renunciation would be to make it impossible to have access to directly usable weapon grade nuclear material through nationally controlled civilian programmes. This would involve the following measures:

- no reprocessing and no further use of plutonium;
- no research reactors that are run on highly enriched uranium;
- the stockpiles of unirradiated plutonium would be burnt in suitable reactors;
- uranium enrichment would be limited to internationalised plants;
- excess stockpiles of highly enriched uranium and plutonium would be stored behind several barriers so that access is made as difficult as possible.

These measures have been proposed on earlier occasions, such as in the concept for a Comprehensive Cutoff Convention7 and in the Model Nuclear Weapons Convention.8

The aspect of non-discrimination by the NPT could be better implemented if the nuclear weapons states were to fulfil their obligation under Article VI and disarm.

**Conclusions**

There is no evidence for the existence of a nuclear weapon programme in Iran. However, Iran did breach its obligations under the Safeguards Agreement as well as under NPT Article III before October 2003 and conducted numerous suspicious activities without reporting them or allowing them to be monitored. All nuclear material and installations that have been found in Iran are now monitored by IAEA inspectors. A cause for concern is the possibility of further or new secret nuclear activities in Iran and that these might
serve a military purpose. This concern is gaining in importance because the IAEA has learnt that it cannot detect most of the undeclared activities without assistance from outside. Thus efforts have been intensified to improve the capabilities to detect secret nuclear activities through using new measurement techniques.

Iran has an unalienable right under Article IV of the NPT to the procurement and operation of civilian nuclear technology. This brings with it the problem of the dual-use of nuclear technology. It acts problematically in more than one way:
- It enables military intentions to be camouflaged by a civil programme.
- It makes it extremely difficult or even impossible to recognise whether indications that are found are in fact evidence of military intentions.
- It induces fear of civilian programmes in which a latent risk of proliferation is slumbering.
- It causes irreconcilable positions that, together with the NPT deal (guarantee of civilian nuclear technology as a trade-off for the renunciation of nuclear weapons) could lead to an escalation that threatens peace.

The only solution that goes further than the current damage limitation attempts is to create a global norm of non-availability of nuclear weapon grade material and to fully implement the norm of a nuclear weapon free world.

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Transcribed from German by Xantbe Hall.

1 Full text of Article IV of the NPT:
   "(1) Nothing in this Treaty shall be interpreted as affecting the inalienable right of all Parties to the Treaty to develop, research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty.
(2) All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also cooperate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world."
2 The separation of 0.2 milligram plutonium is not considered here as materials production. Instead it is seen as a research activity into the possible production of plutonium. However, this path to weapons-usable fissile material was ended in 1992.
3 The Safeguards Agreement has been signed by the IAEA and Iran on May 15, 1974. The IAEA concluded similar agreements, which are used to prevent any diversion of nuclear weapons usable materials from civil nuclear programs, with a majority of all countries.
4 The Additional Protocol has been introduced by the IAEA in 1998 to further strengthen the safeguards measures and is meant for countries who have previously entered into a Safeguards Agreement with the IAEA. Usually, the Additional Protocol enters into force once it has been ratified by the country.
5 A target is material that is exposed to radiation in order to provoke a nuclear transformation inside the material.
6 What is meant here is a further discrimination in the field of nuclear safeguards regarding access to civilian nuclear technology. The NPT contains, however, a fundamental discrimination between nuclear weapon states and non-nuclear weapon states.

Iran Update

Since January 2006, Iran has once again risen to the forefront of international attention amidst a flurry of remarkable developments. On March 29th, the UN Security Council (UNSC) broke its long silence on the matter, issuing a formal warning to Iran and giving the nation 30 days to stop uranium enrichment. The IAEA was assigned to monitor progress, though no consequences were specified for non-compliance. Two weeks later, Iran unexpectedly announced plans to expand the program with the addition of 54,000 centrifuges.

After the 30-day period expired with no sign of yielding, the IAEA submitted an official report to the UNSC. In a last-ditch attempt to avoid imposing substantial economic sanctions on Iran, the so-called P5+1 (China, France, Russia, the U.K., and the U.S.— the five permanent members of the UNSC —, along with Germany) presented Iran with a wide-ranging incentives package on June 6th.

Among the offers of the P5+1 are promises of “substantive” new nuclear technology, assistance in building a new light water reactor, a guaranteed supply of nuclear fuel, and recognition of Iran’s right to nuclear energy. Economic incentives include the modernization of much of Iran’s economy, including the agricultural, telecommunications, aviation, and medical sectors. In return, Iran is asked to re-implement the Additional Protocol to the NPT, “commit to addressing all the outstanding concerns of the IAEA”, and above all, immediately halt all enrichment.

The move represents the most serious attempt to date by the nuclear powers to bring Iran to the table. Its success could drastically ease tensions in the region and start real progress in the resolution of the dispute. How it will be received, though, remains to be seen.

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Wrong Ends, Means, and Needs: Behind the U.S. Nuclear Deal With India

Zia Mian and M.V. Ramana

President George W. Bush and Indian Prime Minister Manmohan Singh issued a joint statement on July 18, 2005, laying the grounds for the resumption of full U.S. and international nuclear aid to India. Such international support was key to India developing its nuclear infrastructure and capabilities and was essentially stopped after India’s 1974 nuclear weapons test. India’s subsequent refusal to give up its nuclear weapons and sign the nuclear Non-Proliferation Treaty (NPT) has kept it largely outside the system of regulated transfer, trade, and monitoring of nuclear technology that has been developed over the last three decades.

The July agreement requires the United States to amend its own laws and policies on nuclear technology transfer and to work for changes in international controls on the supply of nuclear fuel and technology so as to allow “full civil nuclear energy cooperation and trade with India.” In exchange, India’s government would identify and separate civilian nuclear facilities and programs from its nuclear weapons complex and volunteer these civilian facilities for International Atomic Energy Agency (IAEA) inspection and safeguarding. Yet, as they consider the deal and ways to transform its broad framework into legal realities, political elites in each country have ignored some crucial issues.

Policy analysts in the United States have debated the wisdom of the deal. This debate has been rather narrow, confined to proliferation policy experts and a few interested members of Congress, and largely focused on the lack of specific details with regard to the deal, the order of the various steps to be taken by the respective governments, and the potential consequences for U.S. non-proliferation policy. The larger policy context of a long-standing effort to co-opt India as a U.S. client and so sustain and strengthen U.S. power, especially with regard to China, has gone unchallenged. There is also little recognition of how the agreement could allow India to expand its nuclear arsenal.

The deal has incited a wider and more intense debate in India on questions of national security, sovereignty, development, and democracy. Some would like to see as few constraints as possible on increasing the future capacity of India’s nuclear weapons complex, and others question the extent to which nuclear energy can help meet India’s energy needs. Despite the many claims that the social, economic, and political well-being of the people of India will be enhanced by this deal, there has been little attention paid to the issue of whether India needs nuclear weapons at all, the costly failures of the Indian nuclear energy enterprise, and the possible harm for the people of India from a continued expansion of the nuclear complex.

Misplaced U.S. Goals

The nuclear deal has to be seen in the context of efforts over the last 50 years to incorporate India into U.S. strategy in Asia. After the Chinese revolution, the United States came quickly to believe that newly independent India was the only potential regional power that could compete with China for dominance in Southeast Asia. Despite repeated U.S. efforts to use economic and military aid to promote this policy, India’s first prime minister, Jawaharlal Nehru, refused to have his country play this role. He said that a free India would not be a pawn for great powers, and warned that this kind of alliance building by great powers was bad for international relations and could lead to war.

Still, U.S. hostility toward Communist China led to some extraordinary ideas about nuclear cooperation. In the wake of China’s first nuclear weapons test in 1964, senior officials in the Department of State and the Pentagon considered the possibilities of “providing nuclear weapons under U.S. custody” to India and preparing Indian forces to use them. At the same time, the U.S. Atomic Energy Commission was considering helping India with “peaceful nuclear explosions,” which would involve the use of U.S. nuclear devices under U.S. control being exploded in India. These plans were dropped amid growing fears of the consequences of proliferation for U.S. military and diplomatic power, and the United States turned instead to preventing the further spread of nuclear weapons.

The end of the Cold War prompted a rethinking of strategic possibilities and a now infamous 1992 draft Defense Planning Guidance prepared for then-Secretary of Defense Dick Cheney, which declared that “[t]he first objective is to prevent the re-emergence of a new rival. This is a dominant consideration underlying the new regional defense strategy.” It noted, “We must maintain the mechanisms for deterring potential competitors from even aspiring to a larger regional or global role.” In other words, the geopolitical order was to be frozen as it then was, with the United States assured of maintaining its relative superiority in the different regions of the world. A key concern was China.

The first dramatic change in Indo-U.S. relations came during a March 2000 visit by President Bill Clinton to India, less than two years after India’s 1998 nuclear tests. The governing coalition then was dominated by the Hindu nationalist Bharatiya Janata Party (BJP), whose views are strongly anti-Communist, aggressively pro-nuclear weapons, and opposed to the more traditional strategy of nonalignment. The joint statement issued by the two leaders declared that “India and the United States will be partners in peace, with a common interest in and complementary responsibility for ensuring regional and international security. We will engage in regular consulta-
tions on and work together for strategic stability in Asia and beyond.”

Further developing the idea of the United States and India as strategic partners in managing regional and international security, the Next Steps in Strategic Partnership, signed in January 2004, announced that the United States would help India with its civilian space programs, high-technology trade, missile defense efforts, and civilian nuclear activities. The subsequent nuclear deal is but one of the building blocks promised in this larger arrangement. The purpose of the 2004 accord was made clear by a U.S. official who said the “goal is to help India become a major world power in the 21st century. … We understand fully the implications, including military implications, of that statement.” These implications became clearer with the U.S.-India Defense Relationship Agreement of June 28, 2005. The thinking behind this agreement was explained by Robert Blackwill, who served in the first George W. Bush administration as U.S. ambassador to India and then as deputy national security adviser for strategic planning. In a rhetorical question, Blackwill asked, “Why should the U.S. want to check India’s missile capability in ways that could lead to China’s permanent nuclear dominance over democratic India?” Less than a month later, the nuclear deal was announced.

Recruiting India may help reduce the immediate costs to the United States of exercising its military, political, and economic power to limit the growth of China as a possible rival. More generally, the United States sees Asia as central to global politics after the demise of the Soviet Union, and it needs strong regional clients there. The search for allies and friends is all the more important at a time when the United States was criticized because of its invasion and occupation of Iraq. On all these counts, India is seen as a major prize, and support for its military buildup and its nuclear complex seems to be the price the Bush administration is willing to pay.

This goal is, it seems, to be pursued regardless of how it will spur the spiral of distrust, political tension, and dangerous, costly, and wasteful military preparedness between the United States and China, between China and India, and between India and Pakistan. This last dynamic is already coming into view, as Pakistan has demanded from the United States (and been refused) the same deal as is being offered to India, and China wants any exemptions for international nuclear cooperation and trade to be offered not only to India but to be open to others, i.e., its ally, Pakistan. In all these countries, containing about one in three people on the planet, many of whom are very poor, this will amount to a tragic distortion of values and priorities.

**An Errant Debate in India**

Although the nuclear deal has incited a limited policy debate in the United States, it has become a key concern in Indian domestic politics and has elicited three broad positions. First, there are the nuclear hawks who oppose the deal. They see the nuclear energy and nuclear weapons programs as one more or less integrated complex. They see the deal, particularly the proposed separation of civilian and nuclear facilities, as imposing constraints that would make more difficult the creation of a large nuclear arsenal, which they believe is essential for India to be a “great power.” The clearest expression of this view has come from former Prime Minister Atal Behari Vajpayee and others in the BJP. Vajpayee has argued that “[s]eparating the civilian from the military would be very difficult, if not impossible…. It will also deny us any flexibility in determining the size of our nuclear deterrent.” The “flexibility” he desires is the ability to use what may be classified as civilian facilities to increase the pace at which the nuclear weapons program could grow, as well as its eventual size. Similar sentiments have also been voiced by some retired officials from the nuclear complex.

The second position is that of Singh and many other leaders of the Congress Party, which heads the coalition currently governing India. They see the deal as offering recognition of India as a nuclear-weapon state, pointing out that the joint statement says India will have “the same benefits and advantages as other leading countries with advanced nuclear technology, such as the United States.” More practically, they see it as a way to sustain and expand the nuclear energy program while not restricting the building of what they describe as a “minimum” nuclear weapons arsenal. Even though Indian nuclear strategists and policymakers have never defined the term “minimum,” it is used to suggest that India is being restrained in its nuclear ambitions. At the same time, it is made clear that the minimum could increase, depending on circumstances.

Singh explained to the Indian parliament on July 29, 2005, that the deal offers a way whereby “our indigenous nuclear power program based on domestic resources and national technological capabilities would continue to grow,” with the expected international supply of nuclear fuel, technology, and reactors serving to “enhance nuclear power production rapidly.” At the same time, he made it clear that “there is nothing in the joint statement that amounts to limiting or inhibiting our strategic nuclear weapons program.” As an assurance that India would have the final say in implementing the deal, the prime minister announced that, “before voluntarily placing our civilian facilities under IAEA safeguards, we will ensure that all restrictions on India have been lifted.”

A different source of opposition to the deal comes from India’s left-wing parties, which otherwise support the Congress-led government. These parties have traditionally supported the nuclear energy program, but they opposed the 1998 nuclear weapons test and have pressed for India to play a larger role in global disarmament efforts and to do more to reduce nuclear dangers in the region. Their greatest concern is that the deal ties India too closely to U.S. policies. India’s Communist Party leader, Prabodh Panda, said in parliament that the recently concluded agreements with Washington served to reduce India to a “junior partner of the U.S. in fulfilling its global ambitions.” As the first sign of India surrendering its traditional nonalignment and role in representing the Third World, they cite the Indian government’s surprising vote for a U.S.-led resolution against Iran at the September 2005 IAEA Board of Governors meeting, something key U.S. lawmakers and officials had made clear was tied to the nuclear deal.

These positions, which have by and large dominated the debate so far, have many flaws. The first is their shared belief in the success of India’s
nuclear energy program and the need to continue with and expand this effort. This fails to recognize that the deal, in fact, marks U.S. acceptance of a long-standing Indian demand for lifting international restrictions on nuclear cooperation and that this demand is itself testament to the failures of the Department of Atomic Energy.

The second problem is the belief shared by the hawks and the government that nuclear weapons are a source of security. They ignore the essential moral, legal, and criminal questions of what it means to have and be prepared to use nuclear weapons. The only difference between these two camps is on the character and number of the nuclear weapons to which they aspire and how many people in how many cities they are prepared to threaten to kill. The left-wing parties are more ambiguous; they support disarmament but have not called for India unilaterally to give up its nuclear weapons arsenal and ambitions. Some of them even feel Indian nuclear weapons may be needed to hedge against a more belligerent U.S. exercise of power and influence.

Standing outside the political parties is a broad network of social movements in India that have become an increasingly important element in its political life. The most prominent of these, the National Alliance of Peoples Movements, an umbrella group of several hundred organizations and campaigns that support the rights of the poor, women, minorities, farmers, and workers, has come out against the deal because they see it as having been concluded without any public debate; as strengthening an unaccountable, dangerous, and costly Indian nuclear energy and nuclear weapons program; and as undermining important nuclear nonproliferation and disarmament goals.10

Nuclear Energy Failures

On the Indian side, a primary motivation for the deal has been the history of failure of its Department of Atomic Energy to produce large quantities of nuclear electricity. In 1962, Homi Bhabha, the founder of India’s nuclear program, predicted that by 1987 nuclear energy would constitute 20,000-25,000 megawatts of installed electricity-generating capacity.11 His successor as head of the Department of Atomic Energy, Vikram Sarabhai, predicted that by 2000 there would be 43,500 megawatts of nuclear power.12 Neither of these predictions came true.

Despite more than 50 years of generous funding, nuclear power currently amounts to only 3,300 megawatts, barely 3 percent of India’s installed electricity capacity. Indian nuclear capacity is expected to rise by more than 50 percent over the next few years, largely because of two 1,000-megawatt reactors purchased from the Soviet Union in a 1988 deal and now being built by Russia. Even if more such deals were to be made in the future, it is by no means clear that India’s nuclear establishment will be able to keep its promises, let alone contribute a significant fraction of projected electricity demand.

Another of the Department of Atomic Energy’s failures has been in ensuring sufficient supplies of uranium to fuel its nuclear reactors. As an Indian official stated in an interview with the BBC, “The truth is we were desperate. We have nuclear fuel to last only till the end of 2006. If this agreement had not come through, we might have as well closed down our nuclear reactors and by extension our nuclear program.”13 This is not a new crisis; the former head of the atomic energy regulatory board has reported that “uranium shortage” has been “a major problem … for some time.”14

India has been unable to import uranium for its unsafeguarded nuclear reactors because of the rules of the 45-member Nuclear Suppliers Group (NSG), the countries that manage international nuclear trade with a view to preventing proliferation. Apart from two very old imported U.S. reactors, India relies on natural uranium-fueled nuclear reactors, which are based on the two Canadian-designed and -built pressurized heavy-water reactors it acquired in the 1960s. The total electric capacity of these reactors is 2,990 megawatts. At 75 percent capacity, these require nearly 400 tons of uranium every year. The plutonium production reactors, CIRUS and Dhruva, which are earmarked for nuclear weapons purposes, consume perhaps another 30-35 tons annually. We estimate that current uranium production within India is less than 300 tons of uranium a year, well short of the fuel requirements.

The Department of Atomic Energy has been able to continue to operate its reactors by using uranium stockpiled from when its nuclear capacity and thus its fuel needs were much smaller. Our estimates are that, without the nuclear deal, this stockpile would be exhausted by 2007. The department’s desperate efforts to open new uranium mines in the country have met with stiff resistance, primarily because of the health impacts of uranium mining and milling on the communities around existing mines.15

For decades, the department has offered the potential shortage of domestic uranium as justification for a plutonium-fueled fast-breeder reactor program, which has involved costly and hazardous reprocessing facilities to recover plutonium from spent nuclear fuel. Its efforts to build a breeder, however, have not made much progress: the Fast Breeder Test Reactor started functioning in 1985 and has been plagued with problems while the Prototype Fast Breeder Reactor is not expected to be completed until 2010 if all goes accordingly to plan. Poor economics and safety and engineering problems have effectively killed such breeder reactor programs in the United States, France, and Germany, but India may choose to try to follow the example of Japan and proceed with its program, ignoring both the costs and risks of reprocessing and the many problems with breeder reactors.

The dismal state of India’s nuclear energy complex, despite 50 years of determined government support and funding, may offer the clearest proof yet of one of the basic assumptions underlying the NPT. The treaty recognized that developing countries would need a great deal of help if they were to establish nuclear energy for peaceful purposes successfully. That is why Article IV of the treaty calls for a trade-off: providing non-nuclear-weapon states with access to international cooperation with nuclear energy in return for a demonstrated commitment not to develop nuclear weapons. In refusing to sign the NPT and in developing nuclear weapons, India had until now sacrificed the benefits of this international support. Now, through the nuclear deal, the United States has promised India all the help it
needs for its civilian nuclear program, all without signing the treaty or even accepting any limits on its nuclear arsenal.

How Many Bombs Are Too Many?

In particular, the deal promises to allow India access to the international uranium market. If the deal goes through, New Delhi will be able to purchase the uranium it needs to fuel those reactors it chooses to put under IAEA safeguards. This will free up its domestic uranium for its nuclear weapons program and other military uses and would allow a significant and rapid expansion in India’s nuclear arsenal. India is believed to have a stockpile of perhaps 40-50 nuclear weapons, with fissile materials stocks for as many more, and plans that reportedly involve an arsenal of 300-400 weapons within a decade. Realizing these plans will require the production of much larger quantities of fissile material and at much higher rates than India has achieved so far. Such production of fissile materials specifically for nuclear weapons is not constrained by the deal.

India could use its newly unallocated domestic uranium to meet its fissile material needs in several ways. It could choose to build a large plutonium-production reactor to add to CIRUS and Dhruva, its two weapons-grade plutonium-production reactors at the Bhabha Atomic Research Centre in Bombay. CIRUS and Dhruva could continue to produce about 25-35 kilograms of weapons-grade plutonium a year. Another Dhruva-sized production reactor could yield an additional several bombs worth of such plutonium each year.

Another way in which India could increase its fissile material stockpile is to expand its small-scale centrifuge enrichment program and make highly enriched uranium (HEU) for nuclear weapons. So far, it is only believed to have enriched its domestic uranium to make fuel for the nuclear submarine that has been under development since the 1970s and has recently completed testing of its nuclear reactor. India could make HEU both for weapons and enriched fuel for its submarine if it no longer needs to rely on domestic uranium to fuel its power reactors.

There is also the possibility, as hinted at by some hawkish critics, that India’s nuclear power reactors may become part of the weapons complex. For instance, if kept out of safeguards and with sufficient uranium supplies on hand, power reactors could be used to make weapons-grade plutonium by limiting the time the fuel is irradiated. Run this way, a typical 220-megawatt pressurized heavy-water reactor could produce 150-200 kilograms per year of weapons-grade plutonium when operated at 60-80 percent capacity. This could mean as much as an eightfold increase in the existing rate of plutonium production. The penalty to be paid in terms of the increased and less efficient use of uranium would be covered by access to imported uranium to be used in other power reactors. There would no longer be a trade-off between uranium for electricity generation and weapons plutonium production.

Neither does the deal constrain how India uses the weapons-useable materials produced so far. A major source of such weapons-useable material is the plutonium in the spent fuel of the un safeguarded Indian power reactors. Over the years, some 9,000 kilograms of reactor-grade plutonium may have been produced in these reactors, though a large fraction of this plutonium is probably still not separated from the spent fuel. Even though it has a slightly different mix of the plutonium isotopes from the weapons-grade plutonium normally used for weapons, reactor-grade plutonium can be used to make a nuclear explosive. The United States conducted a nuclear test in 1962 using plutonium that was not of weapons grade, and one of India’s May 1998 nuclear tests is reported to have involved such material. An estimated 8 kilograms of such plutonium is needed to make a simple nuclear weapon. If this spent fuel is not put under safeguards as part of the deal, India would have enough plutonium from this source alone for an arsenal of approximately 1,100 weapons, larger than that of all the nuclear-weapons states except the United States and Russia.

Finally, the fast-breeder reactor under construction also will be a source of plutonium. The Department of Atomic Energy has always resisted placing the breeder program under international safeguards and is doing so again when asked to do so as part of the deal. Anil Kakodkar, chairman of the Atomic Energy Commission and secretary of the Department of Atomic Energy, has said that the Prototype Fast Breeder Reactor will not be under safeguards because it is a research and development program and “any research and development programme, we are not going to put under safeguards.” He has also pointed out that “only that which is clearly of no national security significance, only that part will be civilian.” The department’s resistance to safeguards on the breeder program begs the question as to whether this is or ever was intended only for civilian purposes.

Why Nuclear Electricity?

Both Indian and U.S. supporters of the deal claim that the growth of nuclear energy generation capacity in India is a practical and even a necessary way to maintain India’s current rate of economic growth. The evidence suggests otherwise.

According to our estimates, the cost of producing nuclear electricity in India is higher than the non-nuclear alternatives. Construction costs are high, and construction times are long, making the capital cost of a nuclear reactor very high when compared, for example, to coal-based thermal stations. In a country where there are multiple demands on capital for infrastructure projects, including for electricity generation, this makes nuclear power a poor economic choice.

Other considerations that go against nuclear power are the possibility of catastrophic accidents and the problem of nuclear waste. In studying the safety of nuclear reactors and other hazardous technologies, sociologists and organization theorists have come to the pessimistic conclusion that serious accidents are inevitable with such complex high-technology systems. The character of these systems makes accidents a “normal” part of their operation, regardless of the intent of their operators and other authorities. In India, as elsewhere, there have been many small accidents at nuclear facilities. Given its high population density, a nuclear reactor accident in India involving the release of large quantities of radioactive materials could cause
tremendous damage. Finally, there remains the problem that no country has resolved: the disposal of large amounts of waste that will remain radioactive for many tens of thousands of years.

The issue that really needs to be discussed but has hardly figured in the debate is whether India needs any nuclear power plants at all. There are many who believe India would be better off giving up this costly and dangerous technology and finding ways to meet the needs of its people that do not threaten their future or their environment.

A 2003 study by the Confederation of Indian Industry found that there is great scope for improving Indian energy intensity (energy consumption per unit of gross domestic product), which is high compared to other countries, and called for increased cooperation with the United States in this area. It has been estimated that Indian industry could save as much as 20-30 percent of its total energy consumption and that nearly 30,000 megawatts, i.e., more than the total planned nuclear capacity by 2020, could be saved through energy conservation programs. This would also be cheaper than building new generating capacity, especially additional nuclear capacity. This study also noted that, in the 1999 Indo-U.S. Joint Statement on Cooperation in Energy and Related Environmental Aspects, India had declared a goal of a 10 percent share for renewable energy by 2012 and a 15 percent improvement in energy efficiency by 2008 and was seeking U.S. help to meet these targets.

The real challenge facing India is the growing divide between the energy-intensive pattern of development of its cities, with increasing demands for electricity and petroleum, and the continuing dependence on fuel-wood and animal-dung energy by the majority who live in its many villages. Nuclear energy as a large, centralized, and costly source of electricity will do little for meeting the basic energy needs of rural India because access to nuclear energy by the majority who believe India would be better off giving up this costly and dangerous technology and finding ways to meet the needs of its people that do not threaten their future or their environment.

Conclusion

If approved by Congress and India’s parliament as well as the Nuclear Supplier Group, the U.S.-Indian nuclear deal will prove costly and dangerous. It will feed a cascade of mistrust, insecurity, and instability, diverting resources to a fateful military competition that will envelop China, India, Pakistan, and the United States. More broadly, it is difficult to see the deal as anything other than a fundamental rejection of the nonproliferation regime, as it abandons the assumption that access to nuclear fuel and technology must be within the terms of the regime. It undermines the aspirations of the vast majority of nations seeking global and regional nuclear disarmament.

The deal also will create the potential for the rapid buildup of a much larger Indian nuclear arsenal. It will hallucinate a failing Indian nuclear energy program that has had little regard either for the economics or the environmental and health consequences of its activities. It is also likely to offer little real benefit to India’s poor. It is not often that so much harm may be done to so many by so few.


2 Sandeep Pandey, Condemnation of India-U.S. Nuclear Deal, Statement by the National Alliance of People’s Movements, October 26, 2005.


8 T.S. Subramaniam, Identifying a Civilian Nuclear Facility Is India’s Decision, The Hindu, August 12, 2005.


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Rokkasho Reprocessing Plant
The Janus-Like Character of Nuclear Energy

Masa Takubo

The Rokkasho reprocessing plant in the Aomori prefecture, at the northern tip of the main island of Japan, is planned to start plutonium separation testing in December this year (2005). Unlike the uranium testing going on right now, some 400 tons of spent fuel from nuclear power plants are to be processed in this so-called “active testing” to separate some 4 tons of plutonium, enough to make 500 Nagasaki-type bombs, before the start up of the plant in May 2007. Thus the “testing” in reality means the start of operation of the plant.

If started, the Rokkasho plant would become the first commercial-scale reprocessing plant in a non-nuclear-weapon state. The plant’s full annual capacity, to be reached in 2009, is 800 tons of spent fuel. This would mean annual production of eight tons of plutonium, enough to make 1000 Nagasaki-type bombs. The plant is the only one in the world to go into operation in the near future. The start of the operation of the plant, which the Japanese government itself admits is uneconomical, would make it impossible to prevent other countries with the intention of producing nuclear weapons from using it as an excuse to construct similar facilities.

So the fate of the plant could decide the fate of the proposal made by IAEA Secretary General ElBaradei, winner of the 2006 Nobel Peace Prize, for a five to ten year moratorium of enrichment and reprocessing facilities. A regime where only nuclear weapons states and Japan could have reprocessing plants would not be possible to maintain. Japan could not be the only honorary member of the nuclear club.

The Japanese government maintains it is necessary to reprocess spent fuel to utilize the scarce uranium resources to the fullest extent. The ratio of U-235, which can be “burnt” easily, in natural uranium is only 0.7%. The rest is mostly U-238. In ordinary light water reactors uranium enriched to 3-5% U-235 is used. (For bombs uranium is enriched to about 90% U-235.) During operation, a part of the U-238 turns into plutonium. In reprocessing, the spent fuel is dissolved in nitrate solution to separate the plutonium (and if desired also the uranium that was not burnt up) from the highly radioactive fission products. The separated plutonium could be used to make fuel for breeder and light water reactors or to make bombs. The breeder reactor program has been stalled since the sodium fire accident in the Monju prototype breeder reactor in 1995. The plan now is to mix plutonium with uranium to make MOX (mixed-oxide) fuel for light water reactors. The government admits that the uranium thus saved amount only to 10-20%, and that it would come at a very high cost. Even if plutonium is given for free, it is cheaper to use fuel made of enriched uranium at market price because the high radioactivity of plutonium makes the fuel production process very expensive.

The government announced in 1997 that it would start consuming plutonium as MOX fuel in 16-18 reactors by 2010. But this plan also has faced delays due to the disclosure of fabrication of quality control data by British Nuclear Fuels (BNFL) for the MOX fuel to be used by the Kansai Electric Power Company (KEPCO) in 1999, the cover-up of troubles of reactors by the Tokyo Electric Power Company in 2002, an accident at a KEPCO reactor, etc. The end result is the accumulation of more than 43 tons of plutonium possessed by Japan by the end of 2004: 37.4 tons abroad (from contracted reprocessing in UK and France) and 5.7 tons in Japan.

Thus there is no rational need for the hurried start-up of the Rokkasho reprocessing plant from the point of view of saving uranium resources. To save uranium, it is better to store spent fuel for future use in breeder reactors so that more plutonium would be produced rather than separating plutonium now and then consuming it in light water reactors in the form of MOX fuel. Whether the breeder reactor idea is acceptable from the point of view of proliferation – or if it works at all is a separate issue.

The real reason for the urgency of the start-up of the plant is that the nuclear power plants around the country are running out of storage space for the spent fuel. As of the end of March 2004, the total amount of spent fuel stored at all power plants was around 11,000 tons. The total storage capacity, mostly in pools, is around 17,000 tons. In several years, there will be power plants with their storage pool filled up. Thus, the storage pool made next to the Rokkasho reprocessing plant is counted on. The capacity of this pool is 3,000 tons. The total amount received at the pool as of the end of March 2005 is around 1,300 tons. This pool will also be filled up in several years. Thus the idea is to make more space in the pool by sending spent fuel from there to the reprocessing plant (to be turned into different forms of waste to be stored at the same site). However, the amount of the spent fuel from the 53 reactors around the country every year is about 1,000 tons and is expected to reach 1,100 tons. The plant can process only 800 tons a year even at its full capacity as seen above. Therefore, the only way to keep operating the nuclear power plants is to have “interim storage” either onsite or offline. In fact there is a plan now to build an interim dry storage site (for about 5,000 tons) at Mutsu city in the same prefecture of Aomori for spent fuel of the Tokyo
Electric Power Company and the Japan Atomic Power Company. The government made a decision in 1997 to have an interim storage capacity by 2010. There is an argument that if the interim storage is to be considered at all, one could promote it to an extent that there would be no need to operate the reprocessing plant at all.

Although the movement against the Rokkasho reprocessing plant in Japan has mostly been from the environmental and safety point of view, there is a growing criticism against the plant from the proliferation point of view. Control of the spread of reprocessing and uranium enrichment technology was a major issue at the Non Proliferation Treaty Review Conference in May this year [2005] with the suspected nuclear developments by North Korea and Iran, the emergence of a nuclear black market, and with the 9/11 terrorist attacks on the US as a backdrop. The possibilities of countries with uranium enrichment and reprocessing plants going nuclear clandestinely while remaining in the NPT, then leaving the NPT and going nuclear after having acquired nuclear technologies and materials under the disguise of civil programs, terrorists stealing uranium and plutonium produced in these facilities to make nuclear weapons, to sell these to a third country are all feared.

UN Secretary General Kofi Annan said on the first day of the Review Conference, “you must come to grips with the Janus-like character of nuclear energy. The regime will not be sustainable if scores more States develop the most sensitive phases of the fuel cycle and are equipped with the technology to produce nuclear weapons on short notice – and, of course, each individual State which does this will only leave others to feel that they must do the same. This would increase all the risks – of nuclear accident, of trafficking, of terrorist use, and of use by states themselves.”

The US-based Union of Concerned Scientists (UCS) released a statement on May 5, 2005, to coincide with the beginning of the NPT Review Conference which called on Japan to indefinitely postpone the operation of the Rokkasho reprocessing plant. The UCS call was signed by 27 US experts including four Nobel laureates and former Secretary of Defense William Perry (former Secretary of Defense Robert McNamara signed the call later, bringing the number of signatures to 28).

On May 24, 2005, as the NPT Review Conference drew to a close, the Japanese non-governmental organization Peace Boat released a statement titled, “An Appeal to Japan for Leadership Toward Strengthening of the Nuclear Non-Proliferation Regime. Call for an Indefinite Postponement of the Operation of the Rokkasho Plutonium Reprocessing Plant.” Some 180 people, including leaders of peace organizations around the world, signed the appeal in response to a call by representatives of Peace Depot and Peace Boat from Japan and Peace Action, Physicians for Social Responsibility (PSR), and the Arms Control Association from the United States. Late Sir Joseph Rotblat, emeritus president of the Pugwash Conferences, informed about the appeal later, agreed to sign. It has become his will in a way.

The Japanese government should listen to these voices and agree to “lead the world toward the disarmament and non-proliferation of nuclear weapons” by taking “the courageous decision to indefinitely postpone the operation of the Rokkasho reprocessing plant.”

At the 2006 NPT Review Conference in New York, the Union of Concerned Scientists (UCS) issued the following statement on Rokkasho.

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Masa Tabuko’s article was written for the INESAP Information Bulletin in October 2005. Since then, Rokkasho started operation. The Citizens’ Nuclear Information Center http://cnic.jp/ english/ published the following Media Release on March 31, 2006.

A Sad Day for Nuclear Non-Proliferation

Efforts to stem the tide of nuclear proliferation were dealt a huge blow today, as Japan commenced active tests at the Rokkasho reprocessing plant”, said Hideyuki Ban, Co-Director of the Tokyo based Citizens’ Nuclear Information Center. The plant, located in Aomori Prefecture in the north of Japan’s largest island, began separating plutonium from spent nuclear fuel for the first time at 2:58pm Japan time.

“While the world’s attention is diverted by the nuclear ambitions of Iran and North Korea, Japan has strengthened the position of countries which wish to develop weapons-usable technologies. Japan wants to be treated as an exception, but it is ignoring the international ramifications of its actions.” […]

Mr. Ban added, “Besides the proliferation risks, the beginning of active tests also marks the beginning of large-scale radioactive pollution from the plant. It is impossible to operate the Rokkasho reprocessing plant without discharging radioactivity with the liquid and gaseous wastes. The radioactivity released in one day of operation is equivalent to the radioactivity released from a nuclear reactor in one year.

There are benchmarks for the amount of radioactivity that may be released, but there is no guarantee that releases will be kept within these benchmarks. The marine environment downstream from Rokkasho will be permanently degraded and radioactivity released into the atmosphere will reach major cities in Aomori Prefecture, including Aomori, Hirosaki, and Hachinohe.
Statement of the Union of Concerned Scientists

May 5, 2005
A Call on Japan to Strengthen the Non-Proliferation Treaty by Indefinitely Postponing Operation of the Rokkasho Spent Fuel Reprocessing Plant

Minimizing worldwide stockpiles of weapons usable fissile materials – highly enriched uranium (HEU) and separated plutonium – should be a high priority for the international community. Doing so would promote nuclear disarmament and nonproliferation, and help prevent terrorists from acquiring nuclear weapons. Yet Japan is about to join several nuclear-weapons states as a producer of separated plutonium on an industrial scale. At a time when the nonproliferation regime is facing its greatest challenge, Japan should not proceed with its current plans for the start-up of the Rokkasho reprocessing plant.

The official nuclear-weapons states under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) (the United States, Russia, the United Kingdom, France, and China) have all halted their production of plutonium for weapons, and their production of HEU for any purpose. However, France, the United Kingdom, Russia, and India continue to separate plutonium on a large scale from civil nuclear power reactor spent fuel.

As a result of this activity, there continues to be a steady increase in the world stockpile of separated civilian plutonium, which stood at 235 metric tons at the end of 2003. This amount of reactor-grade plutonium is enough to make 30,000 nuclear weapons, each with a destructive power comparable to that of the Hiroshima and Nagasaki bombs. Despite assertions to the contrary, terrorists could use civil plutonium to make potent nuclear weapons with a destructive power equivalent to at least 1,000 tons of TNT.

Many countries, including Germany, Belgium and Switzerland, have decided to end the separation of plutonium from spent fuel for the foreseeable future. Even the United Kingdom, previously one of the principal proponents, is likely to end all reprocessing within the next few years because of the decline in foreign and domestic interest. Indeed, respected voices within Britain have warned of the dangers from Britain’s growing stockpile of separated plutonium. Perhaps most notably, in 1998, Britain’s Royal Society warned that, even in stable Britain, “the chance that the stocks of plutonium might, at some stage, be accessed for illicit weapons production is of extreme concern.”

On December 1, 1997, Japan stated that its nuclear fuel cycle is based on “the principle of no surplus plutonium”. However, by the end of 2003 Japan’s total plutonium stockpile had grown from 24.1 to 40.6 metric tons – enough for some 5,000 nuclear weapons (some 5.4 metric tons are currently in Japan, and the rest is held for Japan at the French and British reprocessing plants).

Despite the existence of this huge plutonium stockpile, Japan’s nuclear utilities plan to begin commercial operation of a new spent fuel reprocessing plant at Rokkashomura in 2007, and to test the plant using spent nuclear fuel beginning in December 2005.

Operating at its design capacity, the Rokkasho plant will separate approximately 8 metric tons of plutonium per year, enough to make 1,000 bombs. The operation of the Rokkasho plant would greatly increase Japan’s domestic plutonium stockpile and postpone for years Japan’s achievement of its stated goal of “no surplus plutonium.” Ultimately, Rokkasho’s operation in the face of large Japanese stocks of surplus plutonium would raise serious concerns about Japan’s commitment to strengthening the NPT.

Because the Rokkasho plant is the first industrial-scale reprocessing plant in a country not possessing nuclear weapons, its planned operation could also undermine international efforts to discourage other countries – including Iran and North Korea – from building their own reprocessing and enrichment facilities.

Japan has shown great wisdom in not joining the “club” of nuclear-weapons states. We urge it to show equal leadership in deciding not to add to the accumulation of excess stocks of separated civilian plutonium. Accordingly, on the occasion of the 2005 NPT Review Conference, we call on Japan to postpone indefinitely the operation of its Rokkasho reprocessing plant, as well as tests of the facility with radioactive materials.

For the list of signatures, see www.ucsusa.org/global_security/nuclear-terrorism/japan-strengthen-the-non-proliferation-treaty.html.


US Tritium Production Resumed

In spring 2004, the Bulletin of the Atomic Scientist reported that since October 2003, the civilian US power reactor 4-, Watts Bar has been unique: Interspersed among its uranium fuel assemblies are numerous pencil-thin, 12-foot-long rods owned by the U.S. nuclear weapons complex. In the storm of neutrons generated by the fission reactions taking place in Watts Bar’s nuclear core, lithium in these rods is slowly being converted to tritium... 18 months later, the first tritium-containing rods were shipped to the Savannah River Site, where the material is extracted. Tritium, which is used to “boost” the explosive power of nuclear bombs, has a relatively short half-life of 12.3 years and must therefore be replaced at certain intervals or the weapon’s yield decreases. Production of weapons-usable material in commercial facilities had been discontinued in 1978 under the Carter Administration. President Bush cancelled the decision, so that a civilian plant is now again being used for weapons purposes in the US.
The North Korean Nuclear Crisis
Negotiating a Way Out

Hui Zhang

After more than two years of negotiations, the six-party talks on the North Korean nuclear crisis on September 19, 2005, finally produced a breakthrough Joint Statement of Principles to denuclearize North Korea. The six parties unanimously reaffirmed in the Statement that “the goal of the six-party talks is the verifiable denuclearization of the Korean Peninsula in a peaceful manner.” However, the six-party talks have made little headway since the Joint Statement was issued. This is because the two key players, the US and North Korea, are still disputing a number of major issues, including the timing and sequencing of North Korean denuclearization. Meanwhile, North Korea continues to be unhindered in its efforts to increase its nuclear deterrence. It can be expected that to negotiate a way out of the current nuclear crisis, the six parties have to resolve in the coming talks the outstanding issues including the light-water reactor (LWR) provision, the highly enriched uranium (HEU) program, timing and sequence, and verification of the implementation of the Joint Statement.

LWR Provision

The LWR provision will continue to be a big issue in the coming talks. While the other parties expressed in the Joint Statement their “respect” for North Korea regaining its sovereign right to acquire LWR technology, the subject of the LWR provision will be “discussed” at “an appropriate time” which is subject to different interpretations. Just after the Joint Statement was issued, Washington implied it would “discuss” the LWR subject only after the North Korean denuclearization, which could mean never. But Pyongyang demands that the LWR provision should occur before disarmament starts.

Pyongyang’s demand for the LWR provision has several reasons.
1) Building trust through deeds: For Pyongyang, the LWR provision is the physical foundation for building trust between itself and Washington. Pyongyang hopes to have a special interaction with Washington during its disarmament process by linking the LWR provision and nuclear dismantlement, as it did in the 1994 Agreed Framework, in which the LWR topic served as the focal point for scheduling several issues including IAEA inspection at two waste sites, the removal of spent fuels, and the dismantlement of nuclear facilities.
2) Political imperatives: Pyongyang argues that LWR provision was already agreed in the 1994 Agreed Framework, so why not just confirm it now? North Korea is not a defeated country, and both South Korea and Japan have large civilian nuclear programs. Why then does North Korea have the right for nuclear energy? Thus, Pyongyang wants to use the LWR provision to find out whether the US respects its sovereignty and to test whether Washington has the political will to give up its hostile policy.
3) Energy security: North Korea has very limited fuel resources, as does South Korea, “no oil, no gas, and very limited coal.” But North Korea has plenty of natural uranium, which could supply nuclear power reactors for hundreds of years. While the South could supply two gigawatts of electricity, the North does not want this offer to replace the LWR project which in its view plays a greater role. It does not want its economy to depend on electricity from the South. Thus, denial of the LWR provision would make North Korean denuclearization difficult. The US and others should commit to the LWR provision, while North Korea proceeds with denuclearization. On the other side, the North Korean “LWR provision first” proposal is also not feasible. The other countries cannot wait for another ten years before North Korea acts. Moreover, Pyongyang must urgently act to modernize its power stations and transmission and distribution systems. Pyongyang should be flexible about the timing of LWR provision. However, such a flexibility should be matched by US concessions on other benefits, in particular the normalization of relations between Washington and Pyongyang.

What North Korea wants most is for the US to give up its “hostile policy” and provide reliable security assurances, acknowledging Pyongyang’s highest priority, namely regime survival. The most tangible and vital security assurance the US can provide is to normalize relations with North Korea as a first step toward integrating it into the international community. Thus, “normalization” is one major step to remove Pyongyang’s deep-rooted security concerns and thus the justification for its nuclear deterrence.

While the Joint Statement stated that Washington and Pyongyang undertook to “take steps to normalize their relations subject to their respective bilateral policies,” the phrase “subject to their respective bilateral policies” is open to interpretation. According to Washington, there will be a long road to normalizing relations with Pyongyang which will include denuclearization, but also discussions on human rights, biological and chemical weapons, ballistic missile programs, conventional weapons proliferation, terrorism, and other illicit activities. Yet Pyongyang wants normalization at a much earlier stage before dismantling its nuclear program and after a freeze. It can be expected that once Pyongyang gets what it most wants, “normalization” and
building more trust, the timing of LWR provision would be much more flexible. Thus, the six-party talks should take a strategy of “normalization at an early stage” in exchange for “LWR provision at a later stage.”

**HEU Issues**

Unlike the already-known plutonium production at Yongbyon, the nature of the North Korean HEU program, the key driver to incite the current crisis, is much less clear. While Washington insists that Pyongyang has a clandestine HEU program, Pyongyang continues to deny such an accusation.

On November 19, 2002, an unclassified CIA report released to US Congress stated that, “North Korea was constructing a plant that could produce enough weapons-grade uranium for two or more nuclear weapons when fully operational – which could be as soon as mid-decade.”

Pyongyang is accused of the following activities that indicate a HEU program:

- an attempt to buy two electrical-frequency converters from a Japanese firm in 1999 and again in 2003;
- acquisition of centrifuge prototypes and blueprints provided by Abdul Qadeer Khan according to his own confession;
- obtaining equipment suitable for use in uranium feed and withdrawal systems as the Washington Times reported in November 2002;
- a 22-ton shipment of high-strength aluminum tubes (usable for vacuum casings for Urenco-type centrifuges) to North Korea, which was blocked by French, German, and Egyptian authorities in April 2003.

However, this evidence is not sufficient to allow an assessment whether Pyongyang was ever successful in getting significant material and equipment, in particular high-strength aluminium tubes, the key material for manufacturing centrifuges. Based on an analysis of steps for a production-scale centrifuge enrichment program, the status of Pyongyang’s HEU program could be estimated as follows: if Pyongyang has a dedicated HEU program, its status could be somewhere between the research and development level and pursuing an experimental pilot facility. Even if North Korea gets enough material and equipment, it would be several years away from producing enough HEU for one or two bombs. However, it is highly doubtful that North Korea has bought enough material for thousands of centrifuges, at least not by April 2003; otherwise the intercepted shipment of high-strength aluminium tubes would not have been necessary.

Moreover, it would now be even more difficult for Pyongyang to get such material, considering the international focus on its nuclear program and much stricter export controls that have been imposed after the nuclear crisis.

It seems to be a fact that North Korea is using its known plutonium production facilities to increase its plutonium stockpile, while the nature of the centrifuge enrichment program is still not clear. Moreover, verification of a centrifuge enrichment program will require more transparency and more intrusive measures, which would be very difficult without more confidence building measures, particularly considering the deep distrust between both sides. Thus, if the dispute over the HEU issue is not to block denuclearization, a “plutonium first” approach, i.e., focusing on the plutonium program at the first stage and then on the HEU program at a later stage, looks more promising in a phased denuclearization process.

In fact, while the Joint Statement did not specifically mention the HEU issue, its “abandoning all nuclear weapons and existing nuclear programs” should be understood to include the HEU program. Moreover, as the Statement mentions, North Korea would observe and implement the 1992 Joint Declaration on the Denuclearization of the Korean Peninsula, which includes “no enrichment and no reprocessing” on the peninsula. Thus, the Joint Statement’s treatment of the HEU issue is smart in that it would not allow this issue to block the whole denuclearization process.

**Timing and Sequence**

The timing and sequencing of the North Korean denuclearization will be a key issue to be detailed in the coming talks. Given the long history of mistrust and animosity between Washington and Pyongyang, North Korean denuclearization will not be achieved in one strike. What is needed is a roadmap that links North Korean denuclearization with the gradual delivery of concrete benefits including security assurances, diplomatic normalization, economic reform, and Northeast Asian security cooperation. The six parties already agreed to take coordinated steps to implement the commitments made in the Joint Statement in a phased manner in line with the principle of “commitment for commitment, action for action.”

Such a roadmap should include a timetable and reciprocal actions each side should carry out at each stage with the goal of a complete denuclearization of the peninsula. For each stage, the roadmap should make clear what North Korea should pledge to do, what inspection and verification provision should be taken, and what benefits North Korea would receive regarding security assurance and economic aid. For example, based on a “plutonium first” approach and considering that the required measures for transparency and verification for each step should range from less to more intrusive, a roadmap with three stages for the North Korean denuclearization could be defined: the first stage would focus on a freeze of plutonium production (with a time frame around six months); the second stage would dismantle all plutonium programs (with a time frame of a few, say, three years); and the third stage would dismantle the HEU program (with a time frame around one year).

For example, when Pyongyang takes the first step of a freeze on plutonium production, other parties should resume their energy aid to North Korea. Washington should consider taking steps toward normalization of relations with Pyongyang including establishing a liaison office, relaxation of sanctions, and removing North Korea from the terrorist list. At the second stage, when Pyongyang dismantles its plutonium programs and rejoins the Non-Proliferation Treaty and safeguards of the International Atomic Energy Agency...
(IAEA), Washington and Tokyo would normalize their relations with Pyongyang. The US and South and North Korea would also negotiate a peace treaty to replace the Armistice Agreement. Meanwhile, the South would supply the North with two gigawatts of electricity until the LWRs start operation. Pyongyang would be helped to become a member of the World Bank and Asian Development Bank and with conducting economic reforms and agricultural development programs. At the last stage, Pyongyang would dismantle its HEU program and ratify the IAEA Additional Protocol. All parties would explore means for promoting security cooperation in Northeast Asia. After Pyongyang dismantles its plutonium programs, it would be provided with the LWR. Also, other countries would provide funds and technologies for the modernization of the North Korean economic infrastructure including reconnecting its railways with the South and Russia.

It is believed that Pyongyang would most likely abandon its nuclear programs once it is guaranteed to get those benefits. Beijing should have delivered a clear message to Pyongyang: nuclear weapons will not serve North Korea's top national interests in the long term. To develop its economy, Pyongyang has to speed up its economic reform. Given that North Korea has very limited resources, reform depends on opening the doors to the international community, and especially to foreign investment, trade, and aid from neighboring South Korea and Japan. However, if Pyongyang maintains its nuclear program, its economy will suffer. Since its neighbors have made clear that they cannot tolerate a nuclear North Korea, there will be no lasting economic cooperation or aid if the nuclear program continues.

Verification

To achieve the goal of the verifiable denuclearization of the Korean Peninsula as the Joint Statement confirmed, each step toward the complete disarmament should be done with adequate transparency and effective verification measures. For example, Pyongyang would declare and freeze all its plutonium production facilities at Yongbyon at the first stage. With the freeze in place, it should be easier to monitor and verify the status of these facilities, as was lined out in the 1994 Agreed Framework. For example, monitoring the shutdown status of a five MWe reactor includes on-site visits and putting tamper-proof sensors on the pressure vessel of the reactor. Also water vapor from the cooling tower of the reactor would be seen on satellite imagery. The status of the closed reprocessing facility can be monitored by on-site means including tamper-proof seals and cameras.

At the second stage, North Korea would begin to dismantle all its plutonium programs. This stage would include three sub-steps:
1) dismantling plutonium weapons and surrendering all its plutonium;
2) moving plutonium materials out of North Korea; and
3) dismantling or decommissioning all facilities associated with the weaponization program and plutonium production.

North Korea should first make a declaration of the total amount of plutonium. However, Pyongyang might prefer to follow the example of South African disarmament, i.e. to first dismantle its bombs, then submit the total amount of plutonium from pits or other stocks, and finally accept verification measures that confirm the termination of its nuclear weapons program. The accuracy of a fissile material balance can generally be verified with pretty high confidence.

To achieve higher accuracy as to the extent of past plutonium production, Pyongyang should provide detailed records of the operating history of its reactors and other plutonium-related facilities. It should also keep all records of its weapons dismantlement and allow interviews with relevant personnel. Pyongyang may choose not to keep or provide all those records. In that case it could agree to other approaches to estimate the total amount of plutonium produced. For example, measurements of total radioactivity of Cs137 and Sr90 in high-level waste would allow an estimation of total plutonium production. Another way to estimate the total plutonium production is to measure the concentrations of some radionuclides (e.g. C-14) in the graphite or steel components of the reactor core.

At the last stage, North Korea would complete dismantlement of its HEU program. From the beginning, North Korea would make a comprehensive declaration of its HEU program including centrifuge design, research and development, procurement, production and operation, and pledge that all associated facilities or items are to be dismantled and decommissioned. Verification of the HEU program depends on the status of the program, such as whether it is producing HEU or not. If the HEU status, as estimated, is somewhere between research and development level and pursuing an experimental pilot facility, it should be relatively easy to verify the declared HEU activities. For example, North Korea should declare and destroy the centrifuge prototypes and blueprints provided by Abdul Qadeer Khan. In addition, other cooperative measures, including interviews with involved persons, should be allowed.

The detection of an undeclared centrifuge enrichment program would be a challenge. At this step, North Korea should have ratified the Additional Protocol to allow more intrusive measures including complementary access and environmental sampling which would make a clandestine nuclear program more difficult. Human intelligence could also uncover a secret nuclear program as shown in the cases of Israel’s and Iraq’s nuclear programs. High-resolution commercial satellite imagery is also making the sky more open. Moreover, the verification provision itself would play a role of deterrence. At this step, it is assumed Pyongyang would have achieved what it wanted most: the full normalization of relations with the US. And given that it would have already dismantled its larger plutonium program, Pyongyang would have no rationale to keep its ambiguity on HEU production, instead, a lack of cooperation would come at a high cost. If Pyongyang took such a risk, it could even lose its chance for its regime.
survival. Finally, it can be expected that disputes between Washington and Pyongyang over compliance issues would be less severe at this stage as both sides have given up mutual “hostile” policies and built more confidence, and China or Russia would also help to settle some disputable issues.

Eventually, a North Korean denuclearization would be achievable verifiably through the proposed three stages, in accordance with the “reciprocal action” principle. The major obstacles for the implementation of a denuclearization are political, not technical. In particular, it would be dependent on whether Washington, which holds what Pyongyang most wants, has such a political will. The last several years have shown that the Bush administration hard line policy will only backfire. It is time for Washington itself to take real actions to negotiate a way out of the nuclear crisis.

1) The six parties unanimously reaffirmed that the goal of the six-party talks is the verifiable denuclearization of the Korean Peninsula in a peaceful manner.

2) The six parties undertook, in their relations, to abide by the principles and policies of the Charter of the United Nations and recognized norms of international relations. The DPRK and the United States undertook to respect each other’s sovereignty, exist peacefully together and take steps to normalize their relations subject to their respective bilateral policies. The DPRK and Japan undertook to take steps to normalize their relations in accordance with the (2002) Pyongyang Declaration, on the basis of the settlement of unfortunate past and the outstanding issues of concern.

3) The six parties undertook to promote economic cooperation in the fields of energy, trade and investment, bilaterally and/or multilaterally.

4) Committed to joint efforts for lasting peace and stability in northeast Asia. The directly related parties will negotiate a permanent peace regime on the Korean Peninsula at an appropriate separate forum.

5) The six parties agreed to take coordinated steps to implement the aforementioned consensus in a phased manner in line with the principle of “commitment for commitment, action for action.”

The views expressed here are the author’s alone.

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Six Nation Joint Statement of Principles

Issued by six nations at talks in Beijing on North Korea’s nuclear program, September 19, 2005

For the cause of peace and stability on the Korean Peninsula and in northeast Asia at large, the six parties held in a spirit of mutual respect and equality serious and practical talks concerning the denuclearization of the Korean Peninsula on the basis of the common understanding of the previous three rounds of talks and agreed in this context to the following:

1) The six parties unanimously reaffirmed that the goal of the six-party talks is the verifiable denuclearization of the Korean Peninsula in a peaceful manner.

2) The six parties undertook, in their relations, to abide by the pur-
NATO’s Nuclear Sharing and Incirlik

Aslihan Tümer

The term “nuclear sharing” refers to the deployment of US nuclear bombs in several European countries under NATO agreement. In addition to the UK, five non-nuclear weapon states – Belgium, Germany, Italy, The Netherlands, and Turkey – are nuclear sharing countries with a total of 480 tactical US nuclear weapons deployed under cooperation agreements. The programs for these free-falling nuclear bombs include maintenance of national dual-capable aircraft as carrier systems for nuclear missions and training of national aircrews in the use of nuclear weapons.

The B61 bombs are easily transportable and fully integrated into the conventional forces. Furthermore, tactical nuclear weapons are not regulated by any arms control or disarmament agreements and are increasingly perceived as “usable.” Combined, this makes them one of the most dangerous weapon types ever produced. At this time, the US is the only country that still deploys nuclear weapons outside its own territory.

According to the US-based Natural Resources Defense Council, 90 of the 480 nuclear sharing bombs are deployed in Turkey. They cannot be employed without an explicit command from the US leadership.

NATO’s 1999 Strategic Concept confirms a continuing commitment to nuclear sharing. A key basic principle of NATO is that of “collective defense,” which means that an attack on one member is considered an attack on all members. Article 5 of the NATO Treaty states that, if one of the members is attacked, each member will take “such action as it deems necessary, including the use of armed force,” to restore security.

The new US policy involves both a willingness to use nuclear weapons first and to use them in response to conventional attacks. US nuclear plans and scenarios also foresee roles for the nuclear weapons deployed in Europe. The decision to execute these plans would be taken by the US President without consultation of the host country. US journalist Seymour M. Hersh has revealed striking facts about these scenarios. According to his article, which appeared in the New Yorker in April 2006, the use of B61 bombs is among those scenarios. This means that NATO member states could be drawn into a nuclear confrontation if the United States became involved in a military conflict where they considered nuclear weapons an option.

The citizens of the European nuclear sharing countries have no official means to question or challenge NATO’s nuclear policy. Accordingly, citizens and non-governmental organizations have resorted to creative ways of informing themselves and expressing their opposition. This is also true in Turkey. Polls reveal, however, that this exercise of democracy is fully in line with the views of the majority of Turkish citizens.

In June 2004, the Turkish survey group Infakto Research Workshop conducted a public opinion survey for Greenpeace Turkey about the attitudes and perceptions of Turkish public opinion on nuclear weapons. The survey covered a nationally representative sample of 629 people through phone interviews.

Among those surveyed, 45% stated that they think there are some nuclear weapons in Turkey. The percentage of participants negating the existence of nuclear weapons in Turkey was about 30%, and the share of participants declining to answer 26%. There was no relationship between the education level of the poll participants and answers to this question.

When respondents believing there are nuclear weapons in Turkey were asked to state who the user/owner of these weapons is, half of them argued that these weapons are under the control of Turkey and one third did not make a statement. The percentage of respondents believing that these weapons belong to the US or NATO is only 10.5%.

About half of the respondents stated that they are “not at all in favor” of having nuclear weapons in Turkey to provide security for Turkey and other NATO members. The survey also found that, as the education level raises, opposition towards nuclear weapons increases.

Significantly, 57% of respondents stated that they would support a government request to remove the nuclear weapons from Turkey. Only 34% of participants argued that they would not support the government in such a request. This ratio is 40% for men but only 28% for women.

Another significant finding of the poll was a strong majority support for the suggestion to make Turkey a nuclear-free zone. A total of 72% said that they support this idea, and the percentage of opponents was only 22%.

Finally, public support for the government to lead an international campaign to disarm all weapons of mass destruction in the world was more than 80%. The tendency towards supporting such a campaign increased with higher education levels.

These findings indicate that the current Turkish policy of hosting nuclear weapons is contrary to public opinion, although many people are kept in the dark about Turkey’s nuclear role within the NATO alliance. Moreover, efforts by the Turkish government to play a leading role in the elimination of nuclear and other weapons of mass destruction would receive overwhelming public support.

Incirlik as a Nuclear Weapons Base

Incirlik, which literally means “fig garden,” was a small village on the outskirts of Adana city with its about 2 million inhabitants. What makes In-
Incirlik so well known is the Air Base immediately bordering the village, where the base was originally a few times larger than the village itself. The village grew in terms of population and size once Incirlik Air Base was opened, especially during the first Gulf War. Over the years, Incirlik became a big village with 20,000 inhabitants, with shop names in English and most people able to communicate in that language.

The presence of US troops in Incirlik has often been in the headlines of Turkish media, and the usage or non-usage of the base in specific military operations has been hotly debated in everyday conversations, in particularly when it came to the decision about Turkey’s contribution to the current Iraq war. The no-war movement of spring 2003 was the biggest mass-mobilizing event in several decades.

Today, Incirlik no longer has fig trees but one of the darkest secrets of the area: the fact that the Air Base hosts 90 nuclear weapons – roughly the equivalent to 1,000 Hiroshimas. In order to bear witness and raise awareness about the nuclear weapons issue in the public of the Adana area, Greenpeace opened a Peace Embassy at Incirlik. Like everywhere else in Turkey, people in Adana have an ambivalent attitude towards this topic: they have no concrete knowledge about the deployment of nuclear weapons at the base, but they have “always suspected” that something might be going on there.

The people of Incirlik are dependent on the base in terms of economy, so any critical comments about the base are perceived as an attack on their main source of economy, and the fact that there are nuclear weapons in Incirlik is usually denied. And if it were true, the US would certainly have brought those weapons only to protect the people of Incirlik. Many people in Incirlik are retired base workers, and they believe that they would surely have heard of any nuclear weapons deployment. Whatever the public reaction to Peace Embassy information, one thing was certain in Incirlik: no one accepts the existence of these weapons.

Case Study: The Cuban Missile Crisis

Most people know about the Cuban Missile Crisis, but only few are aware that it was a milestones in US-Turkish relations. The deployment of US Jupiter missiles in Turkey at the end of 1960 and equipment of these missiles with nuclear warheads in 1962 triggered an international crisis and lead to a real danger that nuclear weapons would actually be used.

Once the weapons systems were assembled, the Soviet comments became harsher. In May 1962, Nikita Khrushchev condemned the stationing of these missiles. On September 11 of the same year, the USSR announced a counter-reaction, which turned out to be the stationing of similar missiles on Cuba.

On October 25, 1962, the USSR representative in Turkey met with the Turkish Minister of Foreign Affairs and demanded that the Jupiters be removed from Turkey. According to the US Ambassador in Ankara, Raymond Hare, however, Turkey was content to host these nuclear bombs, thinking that they were an insurance against a Soviet threat.

The Turkish public was divided, with the opposition and the media very closely following the issue. Some journalists claimed that the US was ready to negotiate (which was true, but at the time Turkey was not informed about the negotiations). Some groups criticized Turkish politics for being too pro-American.

In spite of public doubts, the Turkish Head of State, Celal Gursel, announced that the US could count on its ally Turkey in the Cuban Missile Crisis. Prime Minister Ismet Inönü stressed that Turkey had been closely consulted by the US, and the Turkish government even asked the US for military support in order to be sufficiently equipped against the Soviet threat.

Just a few days later, on October 27, the US and the Soviet Union came to a secret understanding that the missiles would be removed – both from Turkey and from Cuba. The end of the Cuba crisis and the Soviet agreement to withdraw their missiles were publicly announced, and Turkey applauded the US for preventing a war while protecting the Turkish interests. Even in 1963, when the US “proposed” the removal of its Jupiter missiles, Turkey was full of praise, because the US announced that the missiles would be replaced with high-tech submarines. Although the Turkish leadership tried to show a low profile on the matter, over time there were increased public discussions about the fact that Turkey had obviously been a “bargaining chip” in the Cuban Missile Crisis.

While opposition parties asked first questions in the parliament, Turkish Foreign Minister Erkin insisted that Turkey had actually gained in importance for the US due to the stationing of high-tech submarines. According to him, Turkey had become even stronger because its role in any conventional war had increased the strategic value of the country.

The last Jupiter missile was withdrawn from Turkey in April 1963.

Eight year later, Ismet Inönü said in a speech to the parliament: “The Americans told us that they would remove the Jupiters because they were outdated. Instead they would be substituted by Polaris submarines. We learned only later that this was part of the deal with the Soviets. This incident shows that Turkish statesmen should avoid any situation where Americans might drag Turkey in an unwanted crisis and that we better be careful. (…)"

The Cuba crisis had major repercussions in the Turkish public, with the main ones being seriously damaged relations with the US, an increase in the anti-American movement as well as Turkey’s realization of the dangers of one-sided politics.

Nuclear Dangers Today

In recent months there were news reports on possible attacks on the Incirlik Air Base by Iran’s Sāhab-3 missiles, and newspapers ran a story on plans by Al-Qaeda to attack the base. This fed long-standing discussions on potential dangers NATO nuclear weapons might pose to Turkey.
NATO’s Nuclear Sharing and Incirlik

The current deployment of NATO nuclear weapons in European countries reflects a Cold War view and mentality. But the Soviet Union ceased to exist and is therefore no longer a threat, if indeed it ever was. The NATO-Russia Council brings the countries together as equal partners and gives the opportunity to identify and pursue joint actions.

Apparently, the dangers are now perceived to come from the Middle East. But keeping nuclear missiles on the outer edge of NATO territory is at best provocative and increases the security threats in the region as well as globally. By basing nuclear missiles in this region, the US puts the local people at risk, with the Bull’s Eye being right at Incirlik Air Base.

The NATO nuclear weapons should be sent back to the US for dismantling. Not only is this a way to increase the security of Turkey as well as the Middle East, it would also send a positive message to countries in the region and globally by demonstrating the willingness of Turkey to support by words and deeds a nuclear free zone in the Middle East.

Turkey has a unique opportunity to play a positive role in the region and beyond. Sending these nuclear weapons back to the US and moving NATO towards peace-keeping rather than war-making would take us all on a path of peace and true security.

1 Otfried Nassauer, Nuclear Weapons in Europe – A Question of Political Will, Berlin

NATO and Nuclear Sharing

Extract of Final Communiqué

Ministerial meeting of Defence Planning Committee and the Nuclear Planning Group held in Brussels on Thursday, 8 June 2006

1. The Defence Planning Committee and Nuclear Planning Group met in Ministerial Session on 8 June 2006. ... 6. At our Nuclear Planning Group meeting, we reviewed the status of NATO’s nuclear forces and other related issues and activities. We reaffirmed that the fundamental purpose of the nuclear forces of the Allies is political: to preserve peace and prevent coercion and any kind of war. In keeping with this goal, we continue to place great value on the nuclear forces based in Europe and committed to NATO, which provide an essential political and military link between the European and North American members of the Alliance. We recalled that NATO’s nuclear forces are maintained at the minimum level sufficient to preserve peace and stability. We noted with appreciation the continuing contribution made by the United Kingdom’s independent nuclear forces to deterrence and the overall security of the Allies, and reaffirmed the value of this capability. The dangers inherent in the growing risk of nuclear proliferation underscore the importance of NATO maintaining a credible and flexible deterrent posture. 7. In this regard, we note that deterrence and defence, along with arms control and non-proliferation, will continue to play a major role in the achievement of the Alliance’s security objectives. We reaffirmed our full commitment to the Nuclear Non-Proliferation Treaty as the cornerstone of global nuclear non-proliferation efforts and an essential basis for the pursuit of nuclear disarmament. In this context, we expressed serious concern over the possible consequences for security and stability, resulting from instances of non-compliance with the Treaty. We call again on all countries to abide by their commitments in this domain.

Canadian Centre for Treaty Compliance Established

The Canadian Centre for Treaty Compliance, based at the Norman Paterson School of International Affairs at Carleton University, was inaugurated in February 2006 on the initiative of Foreign Affairs Canada and Carleton University. Dr. Trevor Findlay, formerly of the London-based Verification Research, Training and Information Centre (VERTIC), is director.

The centre conducts policy-oriented research into the theory and practice of compliance in respect of international treaties, resolutions, agreements and arrangements. Its initial focus is on treaties and agreements that deal in particular with nuclear, chemical and biological weapons. It pays particular attention to the technical and other means by which compliance is monitored and verified and the effectiveness and efficiency of institutional arrangements for encouraging, facilitating, inducing and enforcing compliance. The centre will publish its work in the new research report series, Compliance Chronicles, which will be released in December 2005 and made available online. In addition to its research and publications, the centre also holds workshops and conferences, engages in various outreach activities and contributes to teaching and other scholarly endeavours at Carleton University and elsewhere. Funding for the Centre is provided by the Markland Group (Lancaster, Ontario, Canada), Foreign Affairs Canada and Carleton University. Project funding has been received from the Weapons of Mass Destruction Commission in Stockholm, Sweden, and the Government of New Zealand.

For more information, please visit www.carleton.ca/npsia/research_centres/cctc_welcome.htm.

Aslıhan Tuner is a disarmament campaigner for Greenpeace Turkey; atumer@diala.greenpeace.org.

1 Otfried Nassauer, Nuclear Weapons in Europe – A Question of Political Will, Berlin


3 “Executing a nuclear option, or even a portion of an option, should send a clear signal of United States’ resolve. Hence, options must be selected very carefully and deliberately so that the attack can help ensure the adversary recognizes the ‘signal’ and should therefore not assume the United States has escalated to general nuclear war, although that perception cannot be guaranteed.” US Joint Chiefs of Staff, Draft Doctrine for Joint Nuclear Operations, Joint Publication 3-12, Final Coordination (2) 15 March 2005; www.wslfweb.org/docs/doctrine/3_12fc2.pdf. After exposure and public discussion of the document, according to information by Hans Kristensen of February 2006, the Draft has been formally cancelled by the US Department of Defense.

4 Seymour M. Hersh, The Iran Plans: Would President Bush go to war to stop Tehran from getting the bomb?, New Yorker, April 7, 2006; http://www.newyorker.com/fact/content/articles/060417fa_fact.


6 [the editor:] The Peace Embassy was opened on May 16, 2005. For a report, see www.greenpeace.org/international/news/peaceembassy.

7 [the editor:] For a detailed account of the Cuban Crisis, see yalelaw.edu/lawweb/avlon/diplomacy/forrel/cuba/cubamenu.html.
Dual-Use in a New Security Environment
The Case of Missiles and Space

Jürgen Scheffran

Advanced technology is an essential element of both the economy and national security. While the dichotomy between civilian and military technology has been more pronounced during the East-West conflict, the boundaries eroded after the end of the Cold War. In the past, the military was often thought to be a pacemaker in many fields of high-tech development, even though the spin-offs remained less than expected. Scarce resources and lack of public acceptance, combined with converging demand profiles, supported the dual-use of civil and military technologies, exploiting the ambivalence of science. Dual-use refers here to those technologies that have actual or potential military and civilian applications. The strategy of “commercial-off-the-shelf” (COTS) development puts more emphasis on spin-in: taking advantage of economies of scale, a technology developed in the civilian-commercial sector is used for military purposes. Modern semiconductor, nuclear, laser, bio, computer, and communication technologies, to mention a few, are employed not only in the manufacture of civilian products but also increasingly in the production of weapons.

Dual-Use and Ambivalence of Science and Technology

Scientific knowledge and technical know-how are essential preconditions for weapons development and sources of proliferation. Their export is widely seen as detrimental to international security. Countries that either want to keep their advantage in military technologies or want to prevent negative impacts on their own security are more ready to control their exports of “sensitive” technologies to “critical” countries. Major suppliers have agreed that certain technologies which are clearly devoted to the development and production of weapons of mass destruction (nuclear, chemical, or biological) and related dual-use items, including delivery systems, should be subject to strict export controls. When the Wassenaar Arrangement replaced the COCOM list in 1996, the export control focus shifted from an East–West to a North–South context, which is also true for the Trigger List of the London Nuclear Suppliers Club, the Australia Group for chemical weapons, and the Missile Technology Control Regime (MTCR).

The changes in the definition of “the enemy” and the shift towards actual warfighting have expanded the tasks for the military which pushes towards a “Revolution in Military Affairs”. To strengthen the supposed technology lead of the United States against potential competitors and adversaries, the US Department of Defense has published since 1989 an annual list of about 20 military-critical technologies (MCTL) which provides a “compendium of existing goods and technologies that DOD assesses would permit significant advances in the development, production and use of military capabilities of potential adversaries.” The MCTL is accompanied by the Developing Science and Technologies List (DSTL) which comprises “scientific and technological capabilities being developed worldwide that have the potential to significantly enhance or degrade US military capabilities in the future.”

In 1997, the Clinton Administration initiated the Dual-Use Applications Program (DUAP) which was designed to focus only on technologies that are potentially useful to the military and by making awards through a competitive selection process. The Bush Administration in turn changed tactics, focusing less on dual-use and more on dedicated military technology.

After the attacks of September 11, 2001, and the declared “war on terrorism,” the parameters changed again. According to Judith Reppy, “the old certainties of the Cold War have disappeared, but the need to control the proliferation of weapons technology has not.” The new security environment “effectively demolished the rigid categories of the Cold War, which had made it possible to frame the problems of dual use as involving promotion and control of military-relevant technologies in a state-based regime with a clearly-defined enemy. The contemporary strategic landscape is much more ambiguous and the list of potentially dual-use technologies much more expansive.”

More attention was paid to biological weapons and the potential danger from developments in biotechnology, the “quintessential dual-use technology”. Jay Stowsky identifies three major trends in the new era: “the shift of technological leadership from the military to the commercial sector, the decline of technological dominance by U.S.-based firms, and the emergence of critical dual-use technologies that can be constituted and thus easily disseminated electronically.”

Conditions have also changed for space systems and related rocket technologies. With the increasing privatization and commercialization of outer space and the emphasis of the Bush Administration on missile defense and space dominance, spacelift moved again to the center of the international security debate. The “missile threat” from emerging military powers such as Iran, North Korea, India and Pakistan competes with the nuclear threat. In both fields dual-use is an essential problem that requires international control efforts to diminish the security risks. In the MCTL, the list of critical space technologies takes the largest part.

Peaceful Purposes and the Military Use of Outer Space

During the Cold War, space technology was a synonym for technological progress and military dominance. Outer
Space became a testing ground for military innovation. The inherent ambivalence of space technologies made it possible to hide military intentions behind the label of “peaceful purposes,” similar to the nuclear sector. The definition of “peaceful” remains controversial. While some insist it means “non-military”, the interpretation of the U.S. government covered only “non-aggressive” acts, which allowed a number of military activities in outer space. Consequently, three quarters of the superpowers’ space objects served military purposes. Since the early 1980s, the budgets for military space projects exceeded the budget of NASA, which despite its peaceful mission also pursued military projects. The 1991 Operation “Desert Storm” in Iraq was labeled the first “space war” because it involved the full arsenal of space systems for military purposes.

There is a close affinity between civil and military space technologies, both of which are facing extreme technical requirements (e.g. high speed, extreme ranges of pressure and temperature, weightlessness, radiation). Space technologies have an inherent dual-use capability and enhance the warfighting capability of the major military powers, contributing to an increased threat to other countries. In many countries ballistic missiles and space launchers were developed and proliferated in conjunction. Satellites acquire and distribute information both for civilian and military purposes in telecommunication, navigation and monitoring. They became essential to carry out such operations as the 1991 Gulf War and the 1999 Kosovo War. The whole space infrastructure can be used for military purposes, including rockets and space vehicles, launchers and tracking systems, and testing and production facilities.

Development of a missile defense system that involves weapons systems for space warfare would push the lines even further. The U.S. Space Command takes a leading role in promoting space dominance, a concept that is not compatible with peaceful uses of space under any interpretation.

As long as the major powers use space systems for their military forces, other countries will follow. Regional powers exploit the dual-use of reconnaissance, communication and navigation satellites to deploy their military force more effectively. An indigenous space reconnaissance ability gives a state an independent, day-to-day observation capability. Space use in the projection of military power increases instabilities and fosters proliferation. Some applications of satellites, however, can contribute to international security and stability, such as arms control verification or crisis prevention and mitigation. Satellite data can be internationalized to prevent unilateral advantages from their use. The question remains where to draw a line between space applications that undermine from those that enhance international security and stability.

**Ballistic Missiles and Space Launchers**

In most cases civilian space launchers were developed after their military counterparts, ballistic missiles. Countries that have placed satellites into orbit also produce military ballistic missiles (except Japan). At present, only two Third World countries, India and Israel, have orbited a satellite. At least eight other countries - Argentina, Brazil, Indonesia, Iraq, Pakistan, South Africa, South Korea, and Taiwan - have initiated civilian space programs for the purpose of building satellite launch vehicles. Even North Korea claimed that its 1998 failed ballistic missile test was to place a satellite in orbit.

Scientific and technological cooperation, including education and training, the exchange of experts, joint experiments, and the acquisition of subcomponents provide a basis for indigenous missile development. The observation of research and development in related fields gives hints as to how far the necessary scientific and technological precursors for indigenous missile production and operation have already developed.

Because ballistic missiles are complex technical systems, their indigenous development or re-development from space launch vehicles is a demanding, time-consuming and costly venture; technical difficulties drastically increase with longer missile ranges. The design of delivery systems requires technical know-how in many fields of research, including propellants and propulsion, guidance and flight control, materials science, and reentry vehicles. Particular components for missile production are necessary but not sufficient for a successful missile program. Missiles contain thousands of components, all of which must be designed, manufactured, and tested carefully if a country is to be confident that they will operate reliably under the stress of combat. Due to the increasing complexity, the number of tests for more advanced ballistic missiles has been gradually increasing.

The exchange between civilian and military space technologies not only refers to complete missile systems but to a larger degree to subsystems, such as propulsion units, heat shields, guidance sets, or electronic equipment. There is an overlap in the infrastructure to develop, test, manufacture, deploy, and operate missiles, including radars, telemetry systems, and testing, production, maintenance, and launch facilities. The personnel of space complexes is also crucial, as they can potentially distribute their knowledge to other countries - a problem that became critical when the scientists and engineers from space and missile programs in the collapsing Soviet Union failed to find new jobs as part of the conversion process.

With the increasing commercialization of space technology, a growing number of private companies have been selling subsystems on the international market and providing assistance in building an indigenous space infrastructure. While developing countries gather basic knowledge for missile development and production from space launchers, experiences and technologies are not always transferable without costs.

Early generations of space launchers and ballistic missiles were very similar and thus could be used interchangeably. Technologies diverged with increasing sophistication and different requirements for civilian and military purposes of rockets. Although component technologies of space launchers and long-range ballistic missiles overlap in many fields (e.g. propulsion units, heat shields, guidance sets, and electronic equipment), differences exist in the trajectory, the rocket size, the payloads, the guidance and propulsion types, launch facilities, and the numbers of test flights.
Satellites and Space Tracking

There are currently more than 800 active satellites in orbit, over 50 percent of which are U.S. satellites. Russia and China follow with 89 and 35 satellites, respectively.\textsuperscript{14} Satellites serve as force multipliers and essential nodes in the global C3I-systems (Command, Control, Communication, and Intelligence), connecting sensors to weapons and soldiers to decision-makers, increasing the efficiency of warfare. Military satellites are often complex, costly, secretive, and better protected against attack than civilian satellites (e.g. by hardening or higher maneuverability). The main satellite functions have an inherent dual-use potential.

1. **Remote sensing and reconnaissance** satellites monitor the earth with multispectral scanners to collect data which are of both civilian and military relevance. They are an important source of information about the state and changes of the earth and could contribute to a more sustainable use of resources. Civilian applications exist in many areas such as agriculture, fishery, environmental monitoring, weather forecasting, geology and resource exploration, cartography, and urban planning. Relevant military applications are target planning, damage assessment, verification of arms control agreements, and observation of enemy territories, facilities and vehicles. Meteorological satellites that measure temperatures, water distribution, and cloud covers are indispensable in real-time weather observation and forecasting for civil and military users worldwide. Electronic reconnaissance satellites intercept the exchange of information for purposes of warfare, industrial espionage, counterintelligence, and verification. Early warning satellites are equipped with infrared sensors to detect the hot exhaust gases of missile launches, but may also detect large fires. Satellites also help in early warning and management of natural disasters, such as storms and floods.

2. **Position finding and navigation** satellites provide precise real-time data on the position of mobile objects on land and sea, in air and space down to a few meters. The Global Positioning Systems (GPS) was developed for the U.S. military and has become highly successful in the civilian sector. Russia is competing with its GLONASS system, while Europe is preparing GALILEO. GPS data can be used by any country to improve the accuracy of its military operations.

3. **Communication satellites** transmit a vast range of data with high speed and assure almost instant global communication, regardless of the distances or positions involved. Computers, communication technologies, and mobile phones have become integrated into a global network with satellites as vital nodes. Civil and military communication satellites use similar technology, but technical demands in the military sector are usually higher with regard to the security of transmission, survivability, operational flexibility, and maneuverability. Satellite capabilities have increasingly proliferated, in particular for reconnaissance. Since the early 1970s, China took a leading role among developing countries. Israel launched its first satellite in 1989 and started satellite reconnaissance with Ofeq 2 in 1990. India has a developed program of civil and military satellites. The proliferation of military satellites could intensify warfare on earth and contribute to an arms race in space. On the other hand, with a growing number of satellite “eyes” it becomes more difficult to hide arms production, war preparation and violation of arms control agreements.

The dual-use of manned spaceflight is less relevant. Space stations have been used for research on zero-gravity, crystallography, and solid state physics. Critics point out that most experiments could be done by automata at much less cost without the presence of human beings in space. Involving human beings in space military activities is risky and costly.

Systems for the monitoring of space activities are inherently dual use. They allow the remote tracking, surveillance, and observation of suspicious activities on earth and in space with optical, infrared, radar, electronic, electromagnetic, and other technology. Since all space objects are launched from earth, they cannot be hidden from space tracking systems. Since several decades, the United States has maintained a global Space Surveillance Network (SSN) under the control of the U.S. Space Command to detect, track, catalog, and identify all objects larger than 10 cm in diameter in Earth orbit, with a primary interest in operational satellites. The SSN includes U.S. Army, Navy and Air Force operated ground-based phased-array and conventional radars as well as optical sensors (telescopes) at 25 sites worldwide. The Ground-Based Electro-Optical Deep-Space Surveillance System telescopes are upgraded to cover objects 5 cm across or larger. Russia operates a similar but less capable system. The European Space Agency maintains the European Space Research Organisation Tracking and Telemetry Network to track their own satellites and those of their industrial customers. These systems could be integrated into an International Monitoring System, which would include a variety of global verification means and make relevant data available to all states as part of an agreement.

Dedicated and Non-Dedicated Space Weapons

Besides dedicated space weapons, there are non-dedicated systems which are designed for other purposes but have the ability to destroy targets in space or from space. How effectively they can be converted into a space weapon depends on technical parameters and cost efficiency of operation, the possible consequences for security, and the options for arms control to restrain their capabilities and monitor their use.\textsuperscript{15}

1. **Maneuverable spacecraft**, whether manned or automated, whether for civilian or military purposes, can be used in an anti-satellite (ASAT) role. They could push targets off orbit, collide with them, employ electronic jamming or laser blinding devices, or release explosives, chemicals, or radioactive materials. In addition to these hostile activities, a manned space vehicle such as the Space Shuttle or the Russian Soyuz could hijack the target in the same way they perform a rendezvous with a space station or satellite. Maneuverability of any spacecraft is confined by fuel availability. Rendezvous have only been performed with cooperative low orbit targets, even in the case of the Soviet co-orbital ASAT test series of the 1970s and 1980s. Dealing with a non-cooperative and fast moving target is difficult and requires precise orbit data and demanding trajectory calculations. A rendezvous is further complicated if the target has a maneuvering capability on its own. Rendezvous maneuvers will become more common for repair (as has been achieved
with the Hubble telescope), upgrading or refueling of space objects. Satellite maneuverability is gaining in importance for cluster missions for distributed reconnaissance and environmental observation, relocation of reconnaissance satellites over conflict areas, steering space objects out of the way of space debris, etc. While currently available only to advanced space-faring nations, experience with space maneuvers could proliferate to more countries or satellite operators. Approaching a target in an ASAT mission could be detected with existing tracking systems and on-board sensors (optical tracking, interpretation of ground communication data, interception of the payload's telemetry signals). To prevent misinterpretation of a non-aggressive rendezvous maneuver as an ASAT attempt, advance notice of maneuvers and rendezvous would be helpful.

2. **Space mines** are maneuverable space objects masquerading as satellites, with their sole purpose to destroy a satellite. Maneuvering and stationing space mines close to other space systems is observable and would raise suspicion. A space mine must change its orbit and trajectory to approach the target satellite for an attack, which would need support from ground- or space-based tracking systems and on-board homing sensors. Alternatively, immediately after its release from the launching vehicle, a space mine could attempt to approach and attach itself to the target satellite, to detonate when the destruction mechanism is triggered. Target destruction could be achieved by a nuclear explosion, conventional explosives, emission of projectiles or shrapnel, and direct collision. A space mine could put at risk a single satellite or – if considerable amounts of shrapnel were released – a larger area or complete orbit. A space mine’s approach could be detected with radar systems in low altitudes and with optical systems in higher orbits as long as space mines are larger than 5-10 cm. Concealing a space mine within a satellite with permitted functions would be difficult to detect until the approach maneuver is initiated. Only pre-launch inspection of payloads could ensure that no such capability is hidden. In order to design reliable space mines and improve approach accuracy, multiple tests would be required. Verification of non-existence of space mines would be difficult, verification of non-use could be facilitated by providing information on any object’s purpose and trajectory prior to launch. Notification of trajectory changes could be made compulsory for all states parties to an ASAT ban.

3. **Microsatellites**, which have an inherent dual-use potential, are increasingly used. Small satellites capable to perform orbital maneuvers and autonomous proximity operations in space could inspect other satellites, diagnose malfunctions, and provide on-orbit servicing. They also have inherent capabilities to act as anti-satellite weapons. NASA, Defense Advanced Research Projects Agency (DARPA) and the U.S. Air Force plan demonstration missions for proximity operations with microsatellites.\(^{16}\) For instance, the Defense Technology Area Plan (2000) called for the ability to “conduct missions such as diagnostic inspection of malfunctioning satellites through autonomous guidance, rendezvous, and even docking techniques.” The Air Force’s Experimental Spacecraft System (XSS) is a series of Air Force Research Laboratory satellites designed to demonstrate imaging applications of proximity operations. DARPA’s Orbital Express is to demonstrate the feasibility of using automated spacecraft to refuel, upgrade, and extend the life of on-orbit spacecraft. NASA’s Demonstration of Autonomous Rendezvous Technology (DART) is an advanced flight demonstrator to rendezvous with a communications satellite of the U.S. Department of Defense and perform several autonomous rendezvous and close proximity operations (the intended rendezvous failed on April 15, 2005).\(^{17}\)

4. **Ballistic missiles**, including space launchers, sounding rockets, and missile defense interceptors, are designed to traverse space and release an object (the payload, warhead, or interceptor vehicle). They also have the potential to destroy a satellite, but the attacking vehicle must approach the target object with high accuracy. Only satellites on specific orbits could be reached from a given launch pad on earth. Even then, an ASAT missile could only attack one satellite at a time. While objects in low orbits could be attacked within minutes, it would take hours to reach the geostationary orbit. Most destructive are nuclear-tipped ballistic missiles. Even though military satellites are hardened against the long-range effects of nuclear explosions, they have little chance to survive an nearby explosion. Non-hardened electronics are highly susceptible to the electromagnetic pulse (EMP). Nuclear explosions in low-earth orbits can produce indiscriminate and long-term damage to space objects through radiation capture in the Van-Allen Belt. If Intercontinental Ballistic Missiles (ICBMs) are equipped with conventional warheads, the military effectiveness is considerably reduced, though some of the disadvantages (e.g. fallout, secondary effects, political damage, escalation risk) of nuclear weapons disappear. With the lower accuracy and impact radius of conventional warheads, a non-dedicated system remains unreliable without a testing program, which could easily be detected by other states.

5. **Missile defense systems**, similar to space weapons, have the mission to destroy military-relevant targets. Technologies for ASAT and for missile defense have much in common. In both cases, interception must either occur in the course of a rendezvous or co-orbital maneuver or by crossing the satellite trajectory with high relative velocity at just the right moment. For their development and production they require various technologies in the civilian sector: computer, laser, material, satellite, and nuclear technologies, to mention just a few. Experience with missile defense tests would increase the confidence of an attacker in system operation for ASAT purposes. With their current series of missile defense tests, the United States is gaining experience that could also be applied to ASAT weapons. At the same time, the U.S. missile defense program proves how difficulty it is to hit an object in space.

6. **Air-launched rockets** have advantages for both commercial and military purposes. Ideally, a missile could hit a satellite just ten minutes after launch from a plane with little early warning. It is hard to distinguish between an ASAT mission and a permitted one, and the non-existence of such systems is difficult to verify. The Pegasus air-launch system is carried aloft by a carrier aircraft to around 13 km. A U.S. Air Force project uses a modified Boeing 747–400F as the carrier for the proposed Space Maneuver Vehicle to lift 3,000 kg payloads to low-earth orbit. Several Russian commercial
enterprises are working on similar projects, e.g. the An-225 Mriya carrier aircraft, the world’s largest heavy lifter with a maximum payload capacity of 260 tons, to launch an expandable, reusable orbiter.

7. **Directed energy weapons**, in particular lasers weapons, are ideally suited for use in outer space. Large distances can be traversed at the speed of light in fractions of a second, and the vacuum creates no attenuation of the beam energy. Laser weapon programs have been conducted for many years and were hampered by physical and technical problems, including high energy requirements, the need for precision targeting, and the lack of system serviceability. The United States is working on ground-, air- and space-based laser systems for missile defense, all with inherent ASAT capabilities. And the Russian Federation has reportedly worked on a space-based laser weapon program. Although directed energy weapons are dedicated weapons, they require a number of technologies from the civil sector. The most effective means to prevent lasers from being used as ASAT weapons is a ban on testing laser weapons. If satellites for collecting and transmitting solar power were built, they might also be used for destructive purposes.

Altogther, non-dedicated systems are a relevant but limited threat to the functioning of space objects. They cannot be completely excluded as long as civil spaceflight continues or ICBMs exist. Arms control can diminish the risk from such systems. States can agree to test or deploy ballistic missiles or space launchers in a way that limits their usability for ASAT missions.

**European Dual-Use Concepts**

While the United States is playing a leading role in promoting the weaponization of space, other parts of the world explicitly pursue a dual-use strategy. A forerunner is the European Union and the European Space Agency. While by its constitution ESA is confined to use spaceflight for “exclusively peaceful purposes,” in recent years it has gradually revised its rejection of the military use of space and pointed to the “security dimension” of space. Space is seen as a “strategic asset” which needs to be exploited by dual-use technology. Within the framework of a Common European Security and Defense Policy (CESDP), the European Union takes space capabilities into account, for instance for decision-making on conflict prevention and crisis management in the context of the so-called Petersberg Tasks. A 2003 “international report” on space and security policy in Europe states that “The development of dual-use technologies calls for a ‘European’ approach to space security, linking the present national defence programs with mainly civilian European programs.”

The Global Monitoring for Environment and Security (GMES) program is a “a joint endeavor by ESA and the European Commission to establish an independent capability for global monitoring, in support of European environment and security goals.”

The consequence would be a more streamlined approach towards technology control that restrains the most dangerous technologies and seeks international cooperation in other fields of dual-use technologies. A similar approach between “shield or share” (Stowsky) has been suggested by Péricles Gasparini Alves to manage the transfer of dual-use of missile and space technologies. He provides a comprehensive survey on the technologies and the selective control regimes, including the 1987 Missile Technology Control Regime (MTCR), which restrains the free access to space technologies, in conflict with the 1967 Outer Space Treaty. The strengths and limits of this regime have been acknowledged earlier as well as the need to go beyond it.

To overcome some of these difficulties, Gasparini Alves suggests great efforts “to demonstrate how practical measures could stimulate the transition from a confrontational relationship to
one which would be based on cooperation. Conceivable mechanisms for cooperation would include increasing transparency of transferred technologies as a first step. In this regard, a step-by-step approach in cooperative initiatives could build confidence between suppliers and recipient States. Such initiatives could prepare the grounds for other measures which would have a more restrictive character, e.g., measures aimed at building security by addressing issues related to dual-use outer space technologies and activities.”

Initiatives would involve confidence- and security-building measures on outer space and a multilateral agreement, “aiming at ensuring the transfer of dual-use outer space technologies while curbing destabilising military use of space technologies.”

Where to draw the line depends on political attitudes and the security context. For proponents of missile defense and space dominance, outer space is inextricably linked to warfare, which would preclude any international control.24 For others, outer space is a common heritage of mankind that needs to be protected by international law for peaceful and sustainable uses.25 Michael Krepon proposes a Code of Conduct to strengthen space security.26 And Detlev Wolter suggests to negotiate a multilateral “Treaty on Common Security in Outer Space” which would include “the prohibition of active military uses of a destructive nature in the common space; a comprehensive package of confidence-building measures with multilateral satellite monitoring and verification systems as well as a protective regime for peaceful space objects based on immunity rules for satellites, such as a ‘rules of the road’ and a ‘code of conduct’.” Such political and legal frameworks need to be combined with concepts for preventive arms control that tackle the dual-use problem in the early phases of research and development.


3 Most recent lists can be found under www.dtic.mil/cmtcl.


20 R. Hagen, op.cit.

21 All quotes from Reppy 2006, op cit.


24 J. L. Dodgen, Space: Inextricably linked to warfighting, Military Review, Jan-Feb, 2006, www.findarticles.com/p/articles/mi_m0PBZ.


26 See Proximity Operations in Space by Michael Katz-Hyman on page 64 of this INESAP Information Bulletin.


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Conversion of Intercontinental Ballistic Missiles
The Case of Russia

Galina Iofina

Russia is currently downsizing its strategic offensive arsenal in accordance with its obligations under the START I Treaty. This process involves elimination of land-based and sea-based missiles, which is usually done by dismantling them and then disposing of the components. There is also an alternative way – ballistic missiles can be used as space launch vehicles (SLV). Conversion of ballistic missiles into space-launch vehicles does not violate any international obligations (and restrictions will not interfere with launches), so it can proceed as long as these projects are commercially viable.

A number of projects that aim to convert missiles into space-launch vehicles began in the early 1990s. Table 1 provides a summary of the project that has been in development since then. Start, Rockot, Dnepr, and Strela are based on land-based intercontinental ballistic missiles (ICBM); Zyb, Shtil, Volna, Priboy, and Visota would be launched from submarines (SLBM). The Riff-MA system would be an air-launched space launcher.

The work on conversion of combat missiles into launchers during the 1990s benefited from a number of space programs that were in development at that time. Some of these programs (for example, the Iridium communication system) called for deployment of large constellations of satellites into low Earth orbits. Converted missiles were a very attractive option, since they provided access to relatively inexpensive launch capacity.

However, the hopes that these programs would support a massive missile conversion effort proved unfounded. Most of them have been scaled down or cancelled, so launches of converted missiles have been rather rare. In particular, Rockot and Start launchers are used to only 17% and 4% of their potential capacity, respectively. This article attempts to consider the factors that contributed to the slow development of a market for converted missiles.

Potential Space Launch Market

All converted missiles are light SLVs. They can carry small space vehicles weighing less than 3.5-4 t to orbits below 2,000 km.

Commercial low orbit satellite systems can be subdivided into three main segments: satellite communication, earth remote sensing, and scientific research.

Analysis of published information on foreign small space vehicles and market research conducted by Russian organizations showed that more than 90 low-orbit space systems are currently under development and will be used until 2015.

In particular, such space systems include Aries, Ellipso, Globalstar, Starinet, Orbcomm, LEO One Worldwide, Taos, and Vitasat. Many of these projects are focused on space vehicles weighing from 0.2 to 0.5 t. On the demand side, when the numbers of space vehicles for each space system is taken into account, one may conclude that the main duty will be on space vehicles with a mass of ca. 0.2-1.3 t, mostly owing to such systems as Aries, LEO One Worldwide, and Teledesic.

On the supply side, there is a considerable potential availability of converted missiles for these missions. According to the Khrunichev Space Center’s estimates of 2000, it is possible to perform more than 40-45 Rockot missile launches over the next five years. Space Forces Major General Aleksandr Vinidiktov, a member of the State Duma, claimed that the current Svobodny launch site capability allows for up to 12 Start launches annually, and even more if additional measures are taken.

Launcher Competition

Currently, there are six major missile conversion programs in Russia: Rockot, Strela, Dnepr, Start-1, Volna, and Shtil-1. Some characteristics of the launchers are shown in Table 2.

Russian commercial launchers of similar specifications that may be considered as main competitors of converted missiles include Cosmos-3M, Tsyklon-2, and Tsyklon-3 (see Table 3). In addition, there is internal competition between missile conversion projects.

An analysis of the data shown in Tables 2 and 3 leads to the conclusion that, first, the launch cost of a converted missile is lower than that of a civilian launcher. The throw-weight of Rockot or Strela is comparable to the throw-weight of Cosmos-3M, and the throw-

<table>
<thead>
<tr>
<th>Missile</th>
<th>Space Launcher</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBMs</td>
<td></td>
</tr>
<tr>
<td>SS-19</td>
<td>Rockot</td>
</tr>
<tr>
<td>SS-19</td>
<td>Strela</td>
</tr>
<tr>
<td>SS-18</td>
<td>Dnepr-1</td>
</tr>
<tr>
<td>SS-18</td>
<td>Dnepr-M</td>
</tr>
<tr>
<td>SS-20</td>
<td>Start</td>
</tr>
<tr>
<td>SS-25</td>
<td>Start-1</td>
</tr>
<tr>
<td>SLBM</td>
<td></td>
</tr>
<tr>
<td>SS-N-6</td>
<td>Zyb</td>
</tr>
<tr>
<td>SS-N-23</td>
<td>Shtil-1</td>
</tr>
<tr>
<td>SS-N-8</td>
<td>Shtil-2</td>
</tr>
<tr>
<td>SS-N-23</td>
<td>Shtil-3A</td>
</tr>
<tr>
<td>SS-N-18</td>
<td>Volna</td>
</tr>
<tr>
<td>SS-N-20</td>
<td>Priboy</td>
</tr>
<tr>
<td>SS-N-23</td>
<td></td>
</tr>
<tr>
<td>SS-N-8</td>
<td>Visota</td>
</tr>
<tr>
<td>Air-launched</td>
<td></td>
</tr>
<tr>
<td>SS-N-20</td>
<td>Riff-MA</td>
</tr>
</tbody>
</table>

Table 1: Conversion of ICBMs and SLBMs into space launch vehicles
weight of Tsyklon-3 is comparable to that of Dnepr. That is why Rockot is comparable in cost with Cosmos-3M. Strela is cheaper than Rockot or Cosmos-3M. Tsyklon-3 is cheaper than Dnepr. However, production of Tsyklon-3 in Dnepropetrovsk, Ukraine, the only place where the missile is produced, has been discontinued. As a result, Tsyklon-3 launchers are no longer used. Launches of Tsyklon-2 that are sometimes carried out use old missiles from storage.

Second, we can see that the reliability of the Rockot and Cosmos launchers is very high and are roughly comparable. However, Cosmos was launched about 750 times\(^6\) while statistics for Rockot are based on the SS-19 ICBM that was test-launched about 160 times. (Rockot itself was launched only eight times, as shown in Table 6). Overall, Cosmos seems to be a more reliable missile.

Reliability is a very important factor for the Start launcher. However, its standing was seriously affected by a Start launch failure in 1995. Although all major systems worked normally, the malfunction of a minor system lead to the failure of the mission.

Similarly, reliability is also an issue for the Volna launcher. Three of five launches of this missile were unsuccessful. Moreover, two of the failures happened because of the missile malfunctioning. In both cases, the missile was attempting to deliver the Cosmos-1 solar sail spacecraft. In the first attempt, the spacecraft failed to separate from the launcher. The next failure was caused by an abnormal engine cut-off – the rocket finished the flight early and the spacecraft failed to reach the correct orbit.

Third, almost all converted missiles use UDMH as their fuel, which is highly toxic and considered harmful to the environment. The only exception is the Start-1 rocket, which uses a solid propellant and therefore usually does not meet serious opposition from environmental groups.  

ICBMs also have significant limitations for launches of commercial satellites that were not designed to withstand strong vibrations and loads. This issue is the most serious for launchers derived from the SS-19 ICBM – its silos are not suitable for conducting commercial launches. To overcome this problem, Russia is building a dedicated launch site for Rockot at the Plesetsk range.

<table>
<thead>
<tr>
<th></th>
<th>Rockot</th>
<th>Dnepr</th>
<th>Strela</th>
<th>Start-1</th>
<th>Volna</th>
<th>Shil-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propellant</td>
<td>UDMH + N(_2)O(_4)</td>
<td>UDMH + N(_2)O(_4)</td>
<td>UDMH + N(_2)O(_4)</td>
<td>Solid propellant</td>
<td>UDMH + N(_2)O(_4)</td>
<td>UDMH + N(_2)O(_4)</td>
</tr>
<tr>
<td>Number of stages(^6)</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Reliability(^6)</td>
<td>0.98</td>
<td>0.97</td>
<td>0.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative cost (1.0 = $ 12 mill.)</td>
<td>1.0</td>
<td>1.66</td>
<td>0.83</td>
<td>0.5</td>
<td>0.05</td>
<td>0.41</td>
</tr>
<tr>
<td>Payload mass (Hcr = 200 km), metric tons</td>
<td>1.6</td>
<td>3.6</td>
<td>1.3</td>
<td>0.42</td>
<td>0.12</td>
<td>0.5 (i=51.60)</td>
</tr>
<tr>
<td>Launch site</td>
<td>Plesetsk, Baikonur</td>
<td>Baikonur</td>
<td>Svobodnyy</td>
<td>Svobodnyy</td>
<td>submarine</td>
<td>submarine</td>
</tr>
<tr>
<td>Initial mass, metric tons(^6)</td>
<td>107</td>
<td>211</td>
<td>105</td>
<td>47</td>
<td>34</td>
<td>40.3</td>
</tr>
<tr>
<td>Developer(^7)</td>
<td>Khrunichev Space Center</td>
<td>International space company Kosmotrans</td>
<td>NPO Mashinostroenie</td>
<td>Research and development Complex Mit</td>
<td>SRC Academician V.P. Makeyev DB</td>
<td>SRC Academician V.P. Makeyev DB</td>
</tr>
</tbody>
</table>

Table 2: Characteristics of converted missiles

<table>
<thead>
<tr>
<th></th>
<th>Cosmos-3M</th>
<th>Cyclone-2</th>
<th>Cyclone-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propellant</td>
<td>UDMH + N(_2)O(_4)</td>
<td>UDMH + N(_2)O(_4)</td>
<td>UDMH + N(_2)O(_4)</td>
</tr>
<tr>
<td>Number of stages</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Reliability</td>
<td>0.97</td>
<td>0.98(^{10})</td>
<td>0.98(^{10})</td>
</tr>
<tr>
<td>Relative cost (1.0 = $ 12 mill.)</td>
<td>1.0</td>
<td>1.25(^{11})</td>
<td>1.25(^{11})</td>
</tr>
<tr>
<td>Payload mass (Hcr = 200 km), metric tons</td>
<td>1.5</td>
<td>2.9(^{12})</td>
<td>3.6(^{12})</td>
</tr>
<tr>
<td>Launch site</td>
<td>Plesetsk</td>
<td>Baikonur</td>
<td>Plesetsk</td>
</tr>
<tr>
<td>Initial mass, metric tons</td>
<td>109</td>
<td>180</td>
<td>189.5</td>
</tr>
<tr>
<td>Developer</td>
<td>Aircraft company Polet</td>
<td>Yuzhnaya Design Bureau</td>
<td>Yuzhnaya Design Bureau</td>
</tr>
</tbody>
</table>

Table 3: Characteristics of civilian launchers
Environmental Problems

It has been mentioned above that all considered missiles except Start-1 use UDMH as fuel. UDMH is hazardous for the environment and for people. Let us consider the influence of this environmental factor on the progress of missile conversion programs.

Converted missiles are launched from three launch sites: Baikonur (Kazakhstan), Svobodnyy (Russia, Amursk region), and Plesetsk (Russia, Arhangelsk region). At all three sites, launch programs have been criticized by environmental groups and local officials concerned about the impact of launches on the health of local residents.

Only four launches of Start rockets have taken place from the Svobodnyy launch site since it became operational. After the failed Start launch in February 2001, soil, snow, and plants around the accident area were examined and the laboratory results showed that none of the controlled substances exceed normal background levels.

In March 2003, the Main Administration of Natural Resources in the Arhangelsk region conditionally banned the Rockot from the Plesetsk launch site, with the ban becoming effective on June 1, 2003. For this reason, Rockot launches were delayed several times. The main requirement of the local administration for resuming the launches was implementation of a set of measures for the environmental protection of the site. The ban imposed by the administration interfered with Russia’s obligations under a number of contracts with foreign customers. Eventually, actions were taken and the Chief State Inspector for Environmental Protection in the region gave his permission for Rockot launches to be resumed again.

Prospective Launchers

Currently, there are no light space launchers that use environmentally ‘clean’ fuel. However, many projects are aimed at the creation of such a launcher. For example, the Khruunikhev Space Center is developing a new environmentally clean family of Angara rockets. Angara-1.1 and Angara-1.2 are supposed to be future carriers of the light class. The costs of the Angara project are estimated at US$ 500 million. According to one source, only half the costs will be covered by the federal budget, the rest is supposed to be paid by commercial investors. RSC (Rocket and Space Corporation) Energia constructs the new light oxygen-kerosene rockets Kvant and Kvant-1. The project costs are estimated at US$ 146.5 million. The Riksha project, carried out by the Kompomash corporation, is estimated to cost US$ 135 million. The aerospace system Vozdushniy Start is being jointly developed by Kompomash and the aircraft company Polet on a commercial base. The team plans to spend US$ 150-170 million.

One may notice from the comparison of the cost and payload capabilities that the prospective launchers will represent a better alternative to all existing missiles. The environmental factor may also offer the future launchers a decisive advantage.

New Tasks for Converted Missiles

Anticipating the future competition, developers of converted missiles are studying new market niches. Launches of remote sensing and research satellites to low orbits bring a fairly small income. The only field of space activity that offers prospects for a high and relatively stable income are launches to the geostationary earth orbit (GEO; 36,000 km above earth), which is commonly used for communication satellites.

Russian designers hope to gain their share of the geostationary market by offering a non-standard solution – a ‘spiral way’ to GEO. Several Russian companies are developing their own satellites in order to implement this method. It includes three steps. First, a light rocket (Strela or Rockot) puts the satellite into an appropriate low orbit. Then, the upper stage puts it on a highly-elliptical orbit. Finally, the satellite uses its own electric engine to get to GEO.

It is also possible to use Dnepr for a maneuver like this. The company Kosmotras develops one-stage (ST-3) and two-stage (ST-1) upper stages that could carry out this maneuver.

An estimate of the costs (including for the launch) shows that putting a small satellite into GEO would not exceed US$ 18-25 million. The launch costs of a small satellite with a weight of 500-520 kg is shown in Table 5.

<table>
<thead>
<tr>
<th></th>
<th>Angara-1.1</th>
<th>Angara-1.2</th>
<th>Riksha</th>
<th>Vozdushniy Start</th>
<th>Kvant-1</th>
<th>Kvant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propellant component</td>
<td>oxygen kerosene</td>
<td>oxygen kerosene</td>
<td>oxygen kerosene</td>
<td>oxygen kerosene</td>
<td>oxygen kerosene</td>
<td></td>
</tr>
<tr>
<td>Relative launch value 1.0 = US$ 12 mill.</td>
<td>1.28</td>
<td>1.57</td>
<td>0.91</td>
<td>1.66</td>
<td>1.91</td>
<td>2.5</td>
</tr>
<tr>
<td>Payload mass (Hr = 200 km), metric tons</td>
<td>1.6</td>
<td>3.6</td>
<td>1.15</td>
<td>2.0</td>
<td>1.8</td>
<td>4.1</td>
</tr>
<tr>
<td>Launch site</td>
<td>Plesetsk</td>
<td>Plesetsk</td>
<td>Plesetsk, Svobodnyy</td>
<td>Air launch</td>
<td>Plesetsk, Baikonur, air launch</td>
<td>Plesetsk, Baikonur, air launch</td>
</tr>
</tbody>
</table>

Table 4: Prospective launchers
Table 5: Putting small space vehicles into GEO with different rockets

<table>
<thead>
<tr>
<th>Rocket</th>
<th>Number of simultaneously launched spacecraft</th>
<th>Launch cost for a spacecraft, $ million</th>
<th>Number of days for getting to GEO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tyklon-4</td>
<td>3</td>
<td>13.3</td>
<td>65</td>
</tr>
<tr>
<td>Dnepr-3</td>
<td>4</td>
<td>10-15</td>
<td>130</td>
</tr>
<tr>
<td>Strela, Rocket</td>
<td>1</td>
<td>10</td>
<td>120-147</td>
</tr>
<tr>
<td>Proton-M/Briz-M</td>
<td>6</td>
<td>14-16</td>
<td>1</td>
</tr>
</tbody>
</table>

As can be seen from Table 5, launches with converted missiles will be cheaper than those using civilian launchers. However, the time required to put a satellite into GEO by converted rockets would be significantly longer.

Table 5

One of the limitations is the short remaining service life of the missiles. In particular, the SS-19 (Rockot) ICBM can only be used until 2007, the SS-18 (Strela) until 2010, the SS-19 (Rockot) until 2012.\(^\text{27}\)

1 Ruban O., Conversion of military missiles as seen by an attached journalist, Expert, No 22 (329), 2002.
3 Technical report on the first part of the SR <Dialog Project>; Exhibit collection on TEO project, Exhibit 2: Main design work and cooperation decisions in building small connection satellites by D. Paison (executive manager), A. Boreiko, A. Gurko, O. Zh. shev for their help with this article.
5 Birkin I. et.al., op. cit.
7 Data is taken from official company sites.
10 Kopic A., Ukraine space at exhibition in Moscow, Novosti kosmonavtiki, No. 8, 2002.
11 Afanasiev I., Crash of “Cyclone-3”, Novosti kosmonavtiki, No. 8, 2002.

I would like to thank Eugene Miasnikov, Pavel Podvig, and Timur Kadychev for their help with this article.

Appendix: See next two pages

Galina Iofina is a graduate student at the Moscow Institute of Physics and Technology; giofina@gmail.com.
<table>
<thead>
<tr>
<th>Date of launch</th>
<th>Launcher</th>
<th>Spacecraft</th>
<th>Country/client</th>
<th>Customer</th>
<th>Mission of satellite</th>
<th>Place of launch</th>
<th>Orbit parameters</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.11.1990</td>
<td>Rockot</td>
<td>Test</td>
<td>Russia</td>
<td>Russia</td>
<td>Experimental</td>
<td>Baykonur</td>
<td>suborbital</td>
<td>success</td>
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<td>Plesenk</td>
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**Conversion of Intercontinental Ballistic Missiles**
The Consequences of Using Kinetic Energy Anti-Satellite Weapons

Wang Ting

The goal of this article is to achieve a better understanding of the impact of using kinetic energy anti-satellite weapons (KE-ASAT) on the space environment. The lifetime of space debris produced when a KE-ASAT hits a Low Earth Orbit (LEO) satellite is calculated. In the calculations, NASA's spacecrafts and rocket bodies breakup model and the latest atmosphere model NRLMSISE-00 are applied. The results show that the use of KE-ASAT against a satellite orbiting the earth above 800 km would cause a considerable threat to spacecrafts.

Introduction

KE-ASATs are designed to exploit the destructive kinetic energy that is released when a mass impacts a satellite at extremely high speed. The ASAT weapon could be based on land, in the air, or in space. KE-ASATs have been developed, tested, and deployed in the past and are likely to be used in a future space war. In October 1985, the aging satellite P78-1 was destroyed by a KE-ASAT launched from an F-15 aircraft in a U.S. Air Force ASAT test. Apart from dedicated ASAT weapons, the ground-based interceptors already deployed as part of the U.S. Ballistic Missile Defense system as well as the planned space-based missile defense interceptors could also be used as KE-ASATs.

When a KE-ASAT traveling at hypervelocity collides with a satellite, a large amount of debris is produced. A lot of the debris would not fall into Earth's atmosphere quickly, but rather pose a long-term threat to manned and unmanned spacecrafts.

In this paper, the lifetime of debris caused by a hypervelocity impact of a KE-ASAT with a LEO satellite is calculated. The results show that if the engagement occurs 800 km or more above the Earth, most of the debris will remain in orbit for more than ten years and overall debris population will be significantly increased.

Current Debris Environment

To better understand the impact of a KE-ASAT on the overall space debris environment, it is necessary to first introduce the current situation.

Space debris is the term for any human-made object in orbit that no longer serves a useful purpose. It comes in the form of discarded hardware, abandoned satellites, and object breakup.

An object larger than 10 cm in diameter, which is commonly referred to as a large object, can be routinely detected, tracked, and cataloged by the U.S. space surveillance system. The United States space surveillance system currently catalogues 9,000 objects larger than 10 cm. Roughly 800 of these objects are active satellites, all the rest is debris.

The collision probability between space assets has so far been rare, but a few incidences have occurred. In 1996, e.g., the French military satellite Cerise had its stabilization arm severed by a briefcase-sized portion of an Ariane rocket. And as early as July 1981, the Russian Kosmos 1275 military navigation satellite experienced an unexpected breakup, generally thought to have been a result of space debris.

Calculation Method and Assumption

The whole debris lifetime calculation, as outlined in Figure 1, can be divided into two parts. The first is to use a satellite breakup model to calculate the debris status immediately after a KE-ASAT engagement, which includes the number, separation velocities, and area-mass ratio of the debris objects. Secondly, on the basis of that information and a lifetime algorithm, the lifetime of every piece of debris is calculated and statistical results are achieved. A precise atmosphere model which requires geomagnetic and solar flux data is the key element of that calculation.

Satellite Breakup Model

The satellite breakup calculations used in this study are based on NASA's breakup model.

To calculate satellite breakup, the first step is to determine whether a collision between the KE-ASAT and a target satellite is catastrophic, mean-

Figure 1: Calculation Process
ing both the weapon and the satellite are totally destroyed and converted to debris fragments. According to NASA's model, "If the relative kinetic energy of the smaller object divided by the mass of the larger object is equal to or greater than 40 J/g, then the collision is catastrophic." That means 1 kg mass with a relative speed of 10 km/s could result in a complete breakup of a 1.250 kg satellite. The mass of the KE-ASAT used in the 1985 test was 16 kg, and the dry mass of a kinetic energy vehicle of the missile defense system is about 20-40 kg. Therefore, for a satellite with a mass below 10 tons, a KE-ASAT engagement will be catastrophic. However, if the weapon does not directly impact the satellite bus and hits a solar panel or an antenna instead, a catastrophic collision will not occur. But in this study, these cases are not considered.

In the second step, using the formulas listed in Johnson's paper and considering the laws of conservation of mass and momentum, the mass-ratios and relative speeds of debris produced in the engagement can be obtained. The scenario is determined by the drag coefficient of debris required for lifetime calculations. Kessler shows that the coefficient is approx. 2.2. The direction of the relative velocities of the debris is assumed to be uniformly distributed in a sphere.

The number of large fragments (debris diameter >10 cm) and debris separation speeds are shown in Figures 2 and 3. It is obvious that a considerable amount of debris will be produced after satellite breakup. In addition, most of the debris will not immediately fall into Earth’s atmosphere, because, as compared with their speed in orbit (>7 km/s for LEO satellites), the relative speed of most debris is very small as compared to its orbit speed.

### Space Debris Lifetime Calculation

After satellite breakup, every piece of debris has a different velocity, which equals the original satellite velocity plus the relative velocity received during breakup, and thus enters into a different orbit (Figure 4). Some fragments will enter into orbits that cross Earth or insert them into the high-density atmosphere; these objects have a short lifetime. The others will enter into long lifetime orbits. More seriously, as time goes by they will spread out into nearby orbits and threaten other satellites due to the impact of perturbation forces.

Through calculating the lifetime of every piece of debris, we can determine the distribution of debris lifetime.

The algorithm used for calculating debris lifetime is a semi-analytical method that considers atmospheric drag and J2 gravity perturbations. The method applies a series of simplified assumptions, which significantly increases the calculation speed but leads to calculation errors. The difference in calculation results between the semi-analytical method and the complete analytical method, which considers all kinds of perturbation forces, is indicated in Table 1. The comparison shows about 2% error in the results of the semi-analytical method. Since the aim of these calculations is not to find the lifetime of special pieces of debris but the whole debris lifetime distribution, the precision of the semi-analytical algorithm is enough.

The atmosphere model is very important in these calculations, because the atmospheric drag is the main factor that determines debris lifetime.

In this study, four atmosphere models are compared: USSA 76, CRIA 61, MSIS 77, and NRLMSIS 00. The widely used USSA 76 is a static atmosphere model, which means all the atmospheric parameters remain constant. The only factor that affects the model is altitude. CRIA 61, MSIS 77, and MSIS 00 are time-varying models, which consider more real world effects. In this study, CRIA 61 and MSIS 77 are simplified. Only solar flux and altitude data are necessary for these two models. The NRLMSIS 00 model is one of the latest atmosphere models; it requires not only solar flux data but also geomagnetic data, time, longitude and latitude data.
According to Tables 2 and 3, the different atmosphere models lead to quite different calculation results. The maximum difference appears between USSA 76 and NRLMSIS in Table 2. The reason is that the former is a static model (i.e., it does not consider sun activity variations).

The activity of the sun, which is represented in solar flux, strongly affects the atmosphere density at high altitude. As shown in Figure 5, with an increase of solar flux, atmosphere density above 300 km will increase significantly. At some altitudes, the difference of density is more than 1000 per cent. Solar flux data varies widely, but approximately repeats itself every eleven years or so, as shown in Figure 6. That means, in some years, the air density is very high and debris de-orbits rather quickly. If the lifetime of debris is shorter than the solar flux period, the time at which it is produced will strongly affect its lifetime.

Although the effect of solar flux is partly eliminated in calculating long lifetime debris, USSA 76 still as has a huge error.

The simplified models CRIA 61 and MSIS 77 consider solar activity; however, their results still have a huge error relative to the latest model, NRLMSIS 00. The main reason is that geomagnetic data, another key element, are not considered in those simplified models. Therefore, NRLMSIS 00 is applied for the calculation, although it requires a considerably higher computation effort.

### Results and Conclusions

The aim of the calculations described above is to calculate the lifetime of debris caused by an attack of KE-ASAT. The Engagement times are selected at 1980 and 1986 because the former corresponds to a solar flux maximum year, which means high atmosphere density and short debris lifetime; the latter is the opposite.

The calculation results for the lifetime of debris particles that are created by catastrophic breakups of satellites with a mass of 1, 2, 5, and 10 tons, respectively, are shown in Figures 7 (debris size >10 cm) and Figure 8 (debris size 1-10 cm), both for debris with a lifetime of more than 1 and 10 years, respectively.

The calculation results show that two-thirds of the large debris created in an engagement at 1,000 km will remain in orbit for more than ten years. When the breakup occurs at 800 km, the number goes down to 40%. Moreover, if a big satellite (>10 tons) breaks up, the overall number of large debris will increase by 30% to 50% for more than ten years. Even in the case of a small satellite (1 ton) breakup, the population of large debris will still increase by up to 10%.

For a KE-ASAT engagement at around 600 km, the lifetime of debris is highly dependent on the time the engagement occurs. About two thirds remain in orbit for several years if the breakup happens in a low solar flux year; in a high flux year, three quarters of the debris will decay within a year.

If the engagement happens on a low orbit (400-500 km altitude), the atmospheric drag will cause the fragments to de-orbit relatively quickly - typically within weeks or months. Because the number of fragments is large, however, there is still a significant risk of collisions while they remain in orbit.

### Table 1: Error of semi-numerical algorithm (Conditions: semi-major axis: 6,878.135 km; eccentricity: 0.02; inclination: 98.5 deg; drag coefficient: 2.0; atmosphere model: USSA 76)

<table>
<thead>
<tr>
<th>Atmosphere Model</th>
<th>Area/Mass</th>
<th>Debris Lifetime (Numerical Method)</th>
<th>Debris Lifetime (Semi-Numerical Method)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>USSA 76</td>
<td>0.1</td>
<td>70 days</td>
<td>68.5 days</td>
<td>2.1%</td>
</tr>
<tr>
<td></td>
<td>0.05</td>
<td>140 days</td>
<td>137.5 days</td>
<td>1.8%</td>
</tr>
<tr>
<td></td>
<td>0.01</td>
<td>693 days</td>
<td>687 days</td>
<td>0.9%</td>
</tr>
<tr>
<td></td>
<td>0.0025</td>
<td>3433 days</td>
<td>3456 days</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

Table 2: Difference of calculation results among different atmosphere models, short lifetime (Conditions: semi-major axis: 6,878.135 km; eccentricity: 0.02; inclination: 98.5 deg; area-mass ratio: 0.05; calculation start time: Jan 1, 2002)

<table>
<thead>
<tr>
<th>Atmosphere Model</th>
<th>Debris Lifetime</th>
<th>Difference as to NRLMSIS 00</th>
</tr>
</thead>
<tbody>
<tr>
<td>USSA 76</td>
<td>137.5 days</td>
<td>154.6%</td>
</tr>
<tr>
<td>CRIA 61</td>
<td>44.5 days</td>
<td>17.6%</td>
</tr>
<tr>
<td>MSIS 77</td>
<td>28.5 days</td>
<td>47.2%</td>
</tr>
<tr>
<td>NRLMSIS 00</td>
<td>52 days</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table 3: Difference of calculation results among different atmosphere models, long lifetime (Conditions: semi-major axis: 7,178.135 km; eccentricity: 0.02; inclination: 98.5 deg; area-mass ratio: 0.05; calculation start time: Jan 1, 2002)

<table>
<thead>
<tr>
<th>Atmosphere Model</th>
<th>Debris Lifetime</th>
<th>Difference as to NRLMSIS 00</th>
</tr>
</thead>
<tbody>
<tr>
<td>USSA 76</td>
<td>35.2 years</td>
<td>37.5%</td>
</tr>
<tr>
<td>CRIA 61</td>
<td>16.5 years</td>
<td>35.5%</td>
</tr>
<tr>
<td>MSIS 77</td>
<td>20.5 years</td>
<td>19.9%</td>
</tr>
<tr>
<td>NRLMSIS 00</td>
<td>24.9 years</td>
<td>0%</td>
</tr>
</tbody>
</table>


7 Ibid. p. 1379.

8 Donald J. Kessler and Burton G. Cour-Palais, Collision Frequency of Artificial Satellites: The Creation of a Debris Belt, Journal of Geophysical Research, Vol. 83, Issue A6, pp. 2637-2646, 1 June 1978. In Kessler’s paper, the ratio is 115 instead of 1,250; this paper does not adopt the number, because Kessler’s paper is relative old.

9 Stephen Karl Remillard, Debris Production in Hypervelocity Impact ASAT Engagements, Thesis presented to the Faculty of the School of Engineering of the Air Force Institute of Technology, North University, December 1992, p. 64.


14 Wang Ting and Dong Yunfeng, An Algorithm for the Orbital Lifetime of Space Debris from a Spacecraft Breakup Event, Space debris research, Special 2006, pp. 31-37.

15 The complete numerical method still has errors, because even the most accuracy atmosphere model still has 10% error. Moreover, the attitude of debris, which also effects the lifetime, is hard to determine and is not considered in the calculations.


18 The history of solar flux and geomagnetic data used in this study is downloaded from ftp://ftp.stk.com/pub/STKData/CentralBodies/Earth.

19 Although the solar flux is impossible to measure from the Earth’s surface, solar radiation with a wavelength of 10.7 cm can be used to determine the solar flux. For more information see David A. Vallado, op.cit., p. 533.

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Proximity Operations in Space
The Case for a Code of Conduct

Michael Katz-Hyman

Twelve hundred kilometers above the Pacific Ocean an intricate dance is about to take place. A small 50 kg satellite approaches ever so slowly towards an oblong shaped communication satellite. Their dance involves no humans and no direction from the ground; however, the steps to their dance have been choreographed hundreds of times over during weekly meetings and computer simulations. The smaller satellite will approach its partner, coming within six meters, before backing away and circling around her. Once complete, the satellite will move away, completing the difficult orbital ballet it was designed for.

This kind of autonomous operation can be essential in space – certainly not necessarily a bad thing nor should it surprise anyone. Close proximity operations, autonomous or human controlled, are a promising method that could be used to reduce both the costs and the danger of human repair missions. As long as satellites or other space operations require on-orbit assistance, proximity operations will be part of space flight and exploration. But close proximity operations could also be a prelude to space weapons – a fact that has received an increased amount of attention recently.

Not as Planned

The dance described actually occurred on April 16, 2005… but failed. The satellite slowly approached its partner and came within 20 meters. However, flight controllers on the ground, who were not controlling the rendezvous but merely monitoring it, knew something was wrong. The satellite computers were indicating that it had placed itself into a “retirement phase” and was moving itself into an orbit that would eventually lead to it burning up in the atmosphere.1 The mission was over. It wasn’t until four days later that flight controllers knew what actually happened – a collision.

The small satellite, which was called DART – Demonstration of Autonomous Rendezvous Technology – bumped into an experimental communication satellite known as MUBLCOM. Initially ground controllers just thought the satellite ran out of fuel as it approached MUBLCOM and bailed from the mission early so as to avoid a disaster. But shortly thereafter engineers at Orbital, the company which built both the $95 million DART and the MUBLCOM satellite,2 noticed that MUBLCOM was in a higher orbit than it was before the encounter. Four days later US Air Force Space Command, which maintains surveillance on over 10,000 objects in space, confirmed this observation.3 DART hit MUBLCOM and pushed it into a higher orbit. Luckily, for both craft, no damage was detected.4

The accident demonstrates the dangers of close quarters operations of satellites. Due to extremely high launch costs, still currently around $10,000 per kilogram, designers and engineers design satellites with the lightest materials possible, which means they are also very fragile. Combine this with the fact that satellites in low earth orbit are traveling at speeds exceeding seven kilometers per second, a collision in space can be catastrophic.

This case illustrates a subtle, but extremely important fact of operations in space. When something goes wrong it may take days or even months before you know what happened and why (in some cases you may never know). The main space surveillance networks run by the US and Russian governments are not perfect, there are large gaps in the number of sensors in the southern hemisphere, and many times satellite orbital data is not updated for days.5

One of Many

DART is far from being the only close proximity satellite in space. In the United States, there are a number of other autonomous or human controlled spacecraft that are being designed to inspect or repair satellites. Unlike DART, some of these are military projects. XSS-11 (Experimental Satellite Series), which was launched in April 2005, has been conducting “proximity operations” around various spacecraft and pieces of debris.6 Another satellite called ASTRO (Autonomous Space Transport Robotic Operations) is being built by Boeing for the Defense Advanced Research Projects Agency (DARPA) of the US Department of Defense to test the possibility of on-orbit servicing.7 All three of these programs have been mentioned as possible precursors to a “service tug” that may be used to de-orbit the Hubble Space Telescope when its mission eventually ends.8 In addition, as long as there are space shuttles or space stations, close proximity operations in space will be a fact of life.

Outside the United States, other nations are also working on autonomous operations in space and satellites designed to operate in close quarters. Russia, in fact, already has the ability to conduct autonomous docking operations with its Soyuz and Progress spacecraft – used to ferry crew members and supplies to the International Space Station.9 The European Space Agency (ESA) is also working on an autonomous cargo supply ship much like Progress called the Automated Transfer Vehicle.10 Private industry is also investing in proximity operations that could have a number of uses. Surrey Satellite Technology of the United Kingdom launched SNAP-1 in 2000, which has the ability to perform “remote inspection.”11 The SNAP-1 satellite was also...
launched on the same rocket as a Chinese satellite, Tsinghua-1, which led to some speculation that China was also working on proximity operations.12

Ambiguity of Intention

Any satellite that is capable of moving close to a satellite is capable of impacting the satellite or interfering with it. This is well understood within the US Air Force, and a 1999 committee tasked with advising the Air Force on microsatellite work recommended “the deployment, as rapidly as possible, of XSS-10-based satellites to intercept, image and, if needed, take action against a target satellite.”13

It is also reasonable to infer that any nation with advanced space capabilities can adapt a satellite with onboard navigation equipment to attack another satellite. A direct ascent style weapon may be even easier, using a medium-range ballistic missile and a pellet cloud or simple homing vehicle. Nations with this capability would include not only the United States which last tested a direct ascent weapon in 1985, but Russia, which had its own co-orbital anti-satellite program in the 1970s, China, and perhaps France, Japan, and India.

The existence and maturation of technologies for close proximity operations that are inherently dual-use – they can be used for peaceful as well as hostile purposes in space – is obviously a hard problem. The difference between a satellite performing proximity operations and one performing kinetic kill anti-satellite warfare is only the fact that the former does not impact its target.

Dual-use operations in space could fuel offensive military space programs, lead to hedging strategies that erode cooperation, and reduce a nation’s space assurance. We define space assurance as the political strategy and physical environment that best ensures space is used for commercial, scientific, and military benefit.14 This erosion of space assurance will especially be the case if there are no rules that distinguish between satellites used to attack versus satellites that are designed to inspect and repair or codes that govern how responsible nations are to operate in space.

The Code of Conduct

Codes of conduct, or rules of the road, are well tested methods to codify what many times are de facto behaviors of responsible actors. From local traffic laws to international agreements on responsible handling of missile components, codes and rules promote responsible behaviors while clarifying those rules which are inappropriate to break.

By encouraging responsible behaviors and setting a precedent for mitigating dangers, nations have been able to ensure both safe passage and freedom of action on the ground, in the air, and at sea. One prime example of such set of rules was laid out in the 1972 Incidents at Sea Agreement (IncSea). Signed by the heads of the navies of the United States and the Soviet Union, the agreement formalized a number a rules and codes for military ships operating in close proximity. Under the agreement, ships operating near vessels of an opposing navy would ensure that they did not interfere with the formations of that navy. It also ensured that navies would not use bright search or signal lights to blind the bridges of opposing ships or simulate attacks on opposing ships.

IncSea went a long way to easing some of the tensions of the Cold War and was so successful that more than thirty other navies adopted similar agreements.15 Even in the mid 1980s, when Soviet-American relations were at a low point, the US Secretary of the Navy credited IncSea as making naval cooperation one area of relations “better rather than worse” and that the number of incidents at sea was “way down” from its previous levels in the 1960s and 1970s.16 IncSea was also agreed to at the executive level and in the United States did not require a contentious and lengthy ratification process. Even though the agreement was conceived under this informal framework, it continues to have the same standing as a treaty under international law.

Space deserves a similar agreement. In 2004 the Stimson Center, in conjunction with NGO experts in the United States, drafted a Model Code of Conduct for Responsible Space Faring Nations.17 While the Center is currently in the process of drawing in NGOs and legal and technical experts from other nations to draw up a more rigorous Code, the initial draft serves as a possible blueprint for what rules of the road in space may look like. The Model Code lays out a number of rules which would have a security-enhancing and stability-increasing effect on operations in space, including the use of autonomous satellites and proximity operations.

Avoid Collisions and Pre-notify Dangerous Maneuvers

Dangerous maneuvers can be misinterpreted as attacks or preparation for attacks. In addition, they can lead to debris generation if a collision occurs. Minimizing and notifying other states of planned maneuvers which may come close to other satellites is key. Under the Model Code, space-faring nations agree to avoid such dangerous maneuvers. If a mission requires a satellite to approach or to dock with another nation’s spacecraft, nations agree to pre-notify each other of such maneuvers.

In the case of autonomous satellites and proximity operations, having clear guidelines on the proper behavior of satellites along with an improved space surveillance network will enhance the security of on-orbit satellites. One way to implement this would be with special caution areas around satellites. This would not prohibit close proximity operations but states maneuvering a satellite within the special caution zones would need to pre-notify and explain their actions. On the sea, this has meant that not only do naval ships not enter such areas without notification, but when they are near such areas they keep an open channel of communication. While the technical implementation of such areas in space would be challenging, they would provide an extra buffer in between very fragile satellites.

Debris Mitigation and Traffic Management

The US Air Force Space Surveillance Network currently tracks nearly 10,000 named objects in space and approximately 4,000 pieces of unnamed or unidentified space junk.18 While the majority of such space trash is from second stage rockets bodies and vari-
ous other launch debris, collisions in space may soon exceed these problems. Some studies have also suggested that small amounts of additional debris in certain orbits could also cause such orbits to have so-called “runaway environments,” meaning the rate of debris generation by collisions exceeds the rate of debris removal from an orbit by natural processes. While more scientific research must be conducted on debris, it is clear that our goal should be to minimize any debris creation, especially creation of such debris in orbits with lengthy decay times or already high populations.

Simons’ Model Code of Conduct calls on nations to follow the debris guidelines set out by the Inter-Agency Space Debris Coordination Committee. This includes ensuring satellites have the ability, like DART, to move themselves into a decaying orbit or into a graveyard orbit before its end-of-life. NASA has been a leader in mitigation, publishing guidelines that apply to all missions in 1995, and the US Department of Defense follows guidelines laid out in December 2000. The European Union has also agreed to a Code of Conduct on space debris, with the French Space Agency (CNES) as its charter signatory. Russia and Japan also have debris mitigation standards.

A full international code of conduct should also encompass developing space faring nations such as India and China. While some may argue that such mitigation procedures increase the cost of space activity, this must be balanced with the fact that it will be increasingly more expensive to deal with space debris as the problem gets worse.

In tandem with debris mitigation, the Model Code also calls on nations to implement traffic management in earth orbit. Currently the 140 year old International Telecommunications Union (ITU) only manages orbital slots in the geosynchronous orbit – no such organization manages low earth orbits. As a general rule, in low-earth orbit, satellites stay in predictable orbits (sometimes with the help of station-keeping engines). However, with the introduction of autonomous or navigable satellites a comprehensive management system should be established to ensure satellites do not collide, are not placed in overly crowded orbits, and to resolve electromagnetic spectrum assignment disputes between nations.

**Simulated Attacks and Space Weapons**

A set of rules of the road that build up confidence between nations operating in space, thereby creating an environment of space assurance, would be undermined if space weapons were flight-tested or deployed. Tests of these weapons may also create debris further exacerbating the problems highlighted above.

International cooperation is essential to today’s space operations. Nations, including the United States, rely on each other to distribute costs, provide expertise, and to launch and track satellites. Flight-testing or deploying weapons in space or simulating attacks in space will undermine cooperation by undermining nations’ confidence in their space assets. It will also undermine cooperation on the ground, as nations adjust their own force postures in response to strategic considerations in space.

**Rules of the Road Increase Security**

Established and agree-upon rules in space will increase security for all nations. If there are understood acceptable behaviors of satellites it will be easier to identify when nations break such rules. It will also be politically easier to form coalitions to respond to such breaches. It will encourage nations to invest in the peaceful uses of space and to develop spacecraft that are potentially transformational, such as autonomous satellites, but not strategically provocative since they will adhere to responsible behaviors. Rules of the road which prevent dangerous actions will increase space assurance and therefore a nation’s ability to operate in space. In short, rules of the road increase the freedom of action of nations as opposed to limit it.

A Code of Conduct would enhance, not restrict, a space-faring nation’s benefits and capabilities in space. It would not preclude prohibited actions – no legal code can prevent illegal acts – but the code would clarify illicit behavior as well as promote good behavior. In the case that a nation or actor breaks such rules, states will have the political and military means to take action. Most space faring nations have residual capabilities that could be ground-tested for anti-satellite missions, and can act as a hedge against unwise choices of other nations. This is in addition to already demonstrated jamming capabilities and an ability to target ground stations with conventional weapons.

We live by codes of conduct that govern most walks of life, from traffic codes to penal codes. Most nations, including the United States, also support codes of conduct to ensure the safe operation of military forces on the ground and at sea in addition to codes which support the non-proliferation of missiles and weapons of mass destruction materials. A Code of Conduct for space would not have to be negotiated like a treaty at the United Nations Conference on Disarmament, which requires its 66-member body to reach consensus to even begin negotiations. Interested space faring nations can agree to a code on a bilateral or multilateral basis in any combination of countries they choose. Furthermore, these codes can also be at the executive level, not requiring a formal ratification process such as the one required in the United States.

Outer space deserves rules of the road and those concerned with the safety and security of satellites should work hard to convince nations of this important goal. International cooperation, scientific achievement, and economic growth all depend on a robust and safe environment in space. As new technologies are developed that increase the capabilities and opportunities of this realm, we would be wise to consider and implement responsible rules for how such technologies should be used.

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3. Brian Berger, Fender Bender: NASA’s DART Spacecraft Bumped Into Target
Common Security in Outer Space and International Law

by Detlev Wolter

As long as the US government is fundamentally challenging international law, it appears hopeless to call for its and the peaceful use of outer space. With his comprehensive study Common Security in Outer Space and International Law, Detlev Wolter has created a compendium for international space law which facilitates the access to a wealth of literature and enters conceptual new ground.

Wolter’s historical perspective shows that during the Eisenhower era in 1957, the USA submitted a memorandum on arms control in space to the UN to ensure that outer space would be used exclusively for peaceful purposes. Despite the Outer Space Treaty, the military use of space continues until today but a weaponization of space can still be prevented. Against the imperatives of power and particular interests, Wolter’s focus is the “Common Heritage of Mankind.” He emphasizes the application of the concept of “Common Security” developed by Egon Bahr and Dieter Lutz, then assesses alternative proposals by governments and non-governmental organizations, including those for a space weapons ban by US and German scientists.

The legal standards and criteria present the basis for an evaluation of the missile defense plans of the Bush Administration which contributed to the abrogation of the Anti-Ballistic Missile Treaty in 2002. With the threat scenarios of a Pearl Harbor in space and the quest of the US Space Command for space dominance, the Outer Space Treaty is at stake. As an alternative, Wolter substantiates the common security interests as a chance for a cooperative strategy change which includes: “the prohibition of active military uses of a destructive nature in the common space; a comprehensive package of confidence-building measures with multilateral satellite monitoring and verification systems as well as a protective regime for peaceful space objects based on immunity rules for satellites, such as a ‘rules of the road’ and a ‘code of conduct’.” He suggests the negotiation of a multilateral “Treaty on Common Security in Outer Space,” accompanied by the establishment of an International Organisation which will monitor the implementation of the agreement.

It is desirable that this approach finds its way into the negotiations at the Geneva Conference on Disarmament on the Prevention of an Arms Race in Space which has been blocked for many years. The general aims are shared by many states.

Jürgen Scheffran


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Avoiding The Nuclear Precipice

Turning Away from the Nuclear Abyss

■ David Krieger

“Is elimination of nuclear weapons, so naïve, so simplistic, and so idealistic as to be quixotic? Some may think so. But as human beings, citizens of nations with power to influence events in the world, can we be at peace with ourselves if we strive for less? I think not.” Robert S. McNamara, former US Secretary of Defense

“I believe that despite the enormous odds which exist, unfailing, fierce intellectual determination, as citizens, to define the real truth of our lives and our societies is a crucial obligation which devolves upon us all. It is in fact mandatory. If such a determination is not embodied in our political vision we have no hope of restoring what is so nearly lost to us – the dignity of man.” Harold Pinter, 2005 Nobel Lecture

The world is following a sure and steady path toward the nuclear abyss. It is being led in this direction not so much by small rogue states as by the most powerful of all states, the United States of America. US nuclear policies are placing the world on a collision course with disaster. The US seeks to deter and inhibit states deemed to be unfriendly to US interests from developing nuclear arsenals, while at the same time turning a blind eye to the nuclear programs of states deemed to be friendly to US interests. Moreover, US policies assume an unquestioned right for the US and other established nuclear weapons states to maintain this status. Such continued and blatant double standards cannot hold.

The US initiated a war against Iraq on the false premise that it had programs to create nuclear and other weapons of mass destruction. Further, the US has developed contingency plans for the use of nuclear weapons against Iraq, Iran, North Korea, Syria, and Libya. At the same time the US protects Israel’s nuclear program from international censure, and seeks to change US non-proliferation laws in order to provide nuclear materials and technology to India and Pakistan, two countries that developed nuclear weapons outside the Non-Proliferation Treaty (NPT).

The only real hope to avoid lurching into the nuclear abyss is that people throughout the world, and particularly those in the US, will demand that these weapons be abolished before they abolish us. It is a daunting task, but one that is necessary if we are to save civilization and life on earth. In light of the modest gains that have been achieved to date in relation to the enormity of the challenge presented by nuclear weapons, the task is all the more essential.

Deterrence Is a Failed Strategy

For most of the Nuclear Age, the security of powerful nations has rested upon a theoretical construct known as deterrence. Deterrence theory posits that nuclear attacks can be prevented by the threat of nuclear retaliation. For the most powerful nations, the theory has spawned threats of massive nuclear retaliation, sufficient to destroy not only the attacking nation, but likely civilization and much if not all life on Earth.

One of the great fallacies of strategic thinking in the Nuclear Age is that deterrence theory is based upon rationality. The theory holds that a rational actor will not attack an enemy that could massively retaliate against one’s own country. But what would happen if there were irrational actors in the system? What would happen, for example, if the leader of a small nation in possession of nuclear weapons believed irrationally that he could attack a more powerful country with impunity? What would happen if a leader was suicidal and didn’t care about the prospects of retaliation? In such cases, deterrence would fail and the nuclear threshold would again be crossed with devastating consequences that cannot be fully foreseeable.

In addition to being a theory based upon only rational actors, deterrence theory requires that it must be physically possible to retaliate against an attacker and that a potential attacker must understand this. Thus, deterrence theory has no validity against a non-state terrorist organization such as al Qaeda. Should such an organization obtain nuclear weapons, deterrence would be of no avail. The only security against a terrorist nuclear attack is prevention – preventing nuclear weapons or the materials to make them from falling into the hands of terrorists. There is no tolerance for error.

In the case of non-state extremism, security cannot rest upon deterrence. This means that a powerful country does not increase its security by adding to the quality or quantity of its nuclear arsenal. Rather, the opposite is the case. The fewer nuclear weapons there are in the world, the less possibility there would be for one or more of these weapons to fall into the hands of an extremist organization. The same is true of weapons-grade nuclear materials.

Nuclear Weapons and Power

The advent of nuclear weapons represented a enormous leap in the power of weaponry. The development of these weapons by elite scientists during World War II successfully tapped the potentially vast power inherent in Einstein’s theory, E=mc², for destructive purposes. While humans have always devised destructive weapons, nuclear weapons moved the bar of destructiveness to new heights. With nuclear weapons, a single weapon could destroy a city, as demonstrated at Hiroshima and Nagasaki. Those who created or obtained these weapons seemed to possess a unique and special power of death over life. In the aftermath of World War II, this power
was possessed at first only by the United States, but over the next decades other countries would join the nuclear club: the Soviet Union, United Kingdom, France, China, Israel, India, Pakistan and, most recently, North Korea.

But the power conferred by nuclear weapons is ghostly and illusory, for it cannot be used without causing death and destruction on such a massive scale that the attacker would be branded by all the world as cowardly and inhuman. In the case of the use of nuclear weapons at Hiroshima and Nagasaki, the US justified its attacks both to its own people and to the world as necessary to end a long and brutal war in which it had been the victim of an unprovoked attack. Since then, nuclear weapons have dramatically increased in power, but the ability to use the weapons has been curtailed by psychological constraints against such massive killing. This has been true even when a nuclear-armed country is losing a war, as was the case with the US in Vietnam or the Soviet Union in Afghanistan.

Nuclear weapons are more useful to relatively weak actors than to those who are already powerful in other ways. For example, they may give North Korea the ability to deter the United States, and Pakistan the ability to deter India. Beyond the possibility of deterrence, nuclear weapons in the hands of an extremist organization would provide the potential to bring even the most powerful countries to their knees by destroying their cities.

**The Logic of Self-Interest**

A further negative consequence of reliance upon nuclear weapons is that a nuclear weapons state must not only be concerned with safeguarding its own nuclear arsenal and weapons-grade nuclear materials, but must also be concerned with the capacity of all other nuclear weapons states to protect their arsenals and nuclear materials. It must be assumed that extremist groups would seek to prey upon the weakest links among the states in possession of nuclear weapons.

It is in the self-interest of the most powerful states to lead the way to nuclear disarmament. The logic for this position can be set forth as follows:

1. Large nuclear arsenals are like dinosaurs in having little adaptability to changing strategic circumstances.
2. The more powerful the nation in conventional terms, the less utility for security is provided by a nuclear arsenal.
3. Weaker countries, particularly those threatened by more powerful adversaries, have the greatest incentive to develop nuclear arsenals for purposes of deterring a nuclear armed adversary.
4. The more states that develop nuclear arsenals, the greater the danger will be that these weapons or the materials to make them will fall into the hands of non-state extremists.
5. Non-state extremists will not hesitate to use these weapons against far more powerful states without fear of retaliation.
6. It is strongly in the security interests of powerful states to minimize the possibility of nuclear weapons falling into the hands of extremist groups.
7. The nuclear policies of the most powerful nuclear weapons states must have zero tolerance for nuclear weapons or materials from any state falling into the hands of extremist groups.
8. Preventing extremist groups from obtaining nuclear weapons can only be achieved by dramatically reducing the number of nuclear warheads in the world and bringing the remaining weapons and materials to make them under effective international control.
9. To achieve this will require a high degree of international cooperation with leadership from the principal nuclear weapons states.
10. Only the United States, as the world's most militarily powerful state, can effectively initiate such cooperative action, and it is strongly in US security interests to do so.

**A Failure to Heed Warnings**

From the very beginning of the Nuclear Age, prophets have warned of the dangers to humanity. The warnings have been passionate and numerous. They have come from individuals in all walks of life – scientists, philosophers, and generals. Albert Einstein warned, “The unleashed power of the atom has changed everything save our modes of thinking, and thus we drift toward unparalleled catastrophe.”

But such warnings seem to have fallen on deaf ears among our political leaders. Despite the end of the Cold War, reliance on nuclear weapons for the security of powerful nations has not diminished. The United States appears intent upon developing a Reliable Replacement Warhead (RRW), a move that will ensure not only the reliability but the continuation of the US nuclear arsenal for many decades into the future. In doing so, we are sending a message to other nuclear and potential nuclear weapons states that these weapons are useful. With the US abandonment of the Anti-Ballistic Missile (ABM) Treaty, Russia has improved the capabilities of its missile delivery system to assure that its nuclear-armed missiles would not be intercepted by the US missile defense system. China has responded by modernizing and expanding its nuclear arsenal.

In the sixty years of the Nuclear Age, there has been no fundamental shift in thinking among those in possession of nuclear weapons. The weapons are deemed necessary to prevent others from initiating a nuclear attack, even in post-Cold War circumstances in which nuclear weapons states do not view each other as enemies, with the exception of India and Pakistan. Rather than seize the opportunity to dramatically reduce and dismantle their nuclear arsenals, the principal nuclear weapons states seek to assure the reliability of the weapons and their delivery systems. In doing so, they fail to close the door on nuclear proliferation to other states and extremist organizations. They leave open the possibility of future nuclear attacks.

**A Unique Responsibility**

On the fifth anniversary of the United Nations Millennium Summit, Kofi Annan, the Secretary-General of the United Nations, issued a report, *In larger freedom: towards development, security and human rights for all.* In
this report, the Secretary-General stated, “...the unique status of nuclear-weapon States also entails a unique responsibility, and they must do more, including but not limited to further reductions in their arsenals of non-strategic nuclear weapons and pursuing arms control agreements that entail not just dismantlement but irreversibility. They should also reaffirm their commitment to negative security assurances. Swift negotiation of a fissile material cut-off treaty is essential. The moratorium on nuclear test explosions must also be upheld until we can achieve the entry into force of the Comprehensive Nuclear Test Ban Treaty.”2 The Secretary-General urged the parties to the Non-Proliferation Treaty to endorse these measures at the 2005 NPT Review Conference, but unfortunately the nuclear weapons states, led by the United States, exercised their power in such a way as to assure that the Review Conference ended without agreement and in failure.

The “unique responsibility” of the nuclear weapons states falls to them both because of their power and because of their obligations. The Non-Proliferation Treaty itself lays out the basic responsibility of the nuclear weapons states: “…to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament...”3 Following the entry into force of the NPT in 1970, the US and Soviet Union continued to improve their nuclear arsenals for the next three decades. But at the 2000 NPT Review Conference, they agreed to 13 Practical Steps for Nuclear Disarmament, including an “unequivocal undertaking ... to accomplish the total elimination of their nuclear arsenals...”4 This promise, like others made over the years, proved to be little more than words, as the US worked against progress on nuclear disarmament in the Geneva-based Conference on Disarmament and at the 2005 NPT Review Conference.

The ICJ Opinion

In 1996, the International Court of Justice issued an Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons. The Court found that “the threat or use of nuclear weapons would generally be contrary to the rules of international law applicable in armed conflict, and in particular the principles and rules of humanitarian law.”5 The Court went on to indicate its inability to determine the law in the particular instance when the survival of a state was at stake. It found that “in view of the current state of international law, and of the elements of fact at its disposal, the Court cannot conclude definitely whether the threat or use of nuclear weapons would be lawful or unlawful in an extreme circumstance of self-defence, in which the very survival of a State would be at stake.”6 It is important to note that the Court was not saying that under such circumstances the threat or use would be lawful, but only that it could not make that determination.

The Court then took the unusual step of going further than asked and unanimously concluding, “There exists an obligation to pursue in good faith and bring to a conclusion negotiations leading to nuclear disarmament in all its aspects under strict and effective international control.”7 The Court left no doubt that the nuclear disarmament commitment set forth in Article VI of the Non-Proliferation Treaty was a legal commitment binding upon the nuclear weapons states.

Barriers along the Path

There have been legal and moral barriers, as well as those of practicality and security, along the twisted path leading to the nuclear abyss. But despite promises, obligations and apocalyptic warnings, the nuclear weapons states continue to move surely and steadily down this deadly path. Legal, moral and practical barriers have not been sufficient to move the leaders of nuclear weapons states to step away from this path. It is perhaps worth contemplating what might lead to a change in direction.

Changing Direction

Determining what needs to be done is not the difficult part of the task. Many important proposals have been put forward for changing directions and moving away from the nuclear abyss. One example of these was the seven-step proposal by Mohamed ElBaradei, the Director-General of the International Atomic Energy Agency and the 2005 Nobel Peace Laureate. He called for the international community to take the following seven steps:

1) A five-year hold on additional facilities for uranium enrichment and plutonium separation;
2) Speeding up existing efforts to modify the research reactors worldwide operating with highly enriched uranium and converting them to use low-enriched uranium, not suitable for making bombs.
3) Raising the bar for inspection standards to verify compliance with Non-Proliferation Treaty obligations.
4) Calling upon the UN Security Council to act swiftly and decisively in the case of any country withdrawing from the NPT.
5) Urging states to pursue and prosecute any illicit trading in nuclear material and technology.
6) Calling upon the five nuclear weapon states that are parties to the NPT to accelerate implementation of their “unequivocal commitment” to nuclear disarmament.
7) Acknowledging the volatility of longstanding tensions that give rise to proliferation, in regions such as the Middle East and the Korean peninsula, and take action to resolve existing security problems and, where needed, provide security assurances.8 ElBaradei emphasized that all steps required a concession from someone, and that none would work in isolation. As ElBaradei stresses, concessions must come from all, including the nuclear weapons states, which must change their policies.

At present, the nuclear weapons states seek to prevent proliferation, but are failing to fulfill their disarmament obligations. They seem content to live indefinitely in a world of nuclear “haves” and “have-nots.” This is a short-sighted perspective, one that is not sustainable. Until this is recognized by the leaders of the nuclear weapons states,
there is not much hope to achieve a balanced approach to preventing nuclear proliferation and achieving nuclear disarmament.

**The Need for Leadership**

If the world is going to move in a new direction, away from the nuclear abyss, certain qualities of leadership will be needed. These include:

- **Imagination**: the ability to imagine the consequences of remaining on the path we are on.
- **Respect for human dignity**: the recognition that nuclear weapons and human dignity are incompatible.
- **Vision**: the ability to see another way forward, a world in which security can be obtained without reliance on nuclear weapons.
- **Courage**: the willingness to challenge the business-as-usual ingrained attitudes of the defense establishment and its so-called security experts.

One notable leader of a nuclear weapons state, Mikhail Gorbachev, came to office with these qualities and proposed in the mid-1980s that nuclear weapons be abolished by the year 2000. Unfortunately, he was not in a position to act alone, but needed the support of the United States. He came close to achieving this when he met with US President Ronald Reagan at the Reykjavic Summit in 1986. The two leaders talked seriously about eliminating all nuclear weapons, but their agreement faltered on the issue of missile defenses, which Reagan was committed to implementing and Gorbachev feared.

We cannot count on another political leader to emerge with these qualities. Rather than waiting for such a leader to come along and save humanity, ordinary people must become leaders and create the necessary political will that leaders of nuclear weapons states will have no choice but to act nobly and in the interests of all humanity. Awakening the people of the world to accept this responsibility is the work of civil society organizations committed to these issues. It is certainly the greatest challenge of our time.

5. Advisory opinion of the International Court of Justice on the legality of the threat or use of nuclear weapons, United Nations General Assembly, A/51/218, 15 October 1996, p. 36.
6. Advisory opinion of the International Court of Justice, op.cit p. 37.
7. Ibid.

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At the Nuclear Precipice: Nuclear Weapons and the Abandonment of International Law

Conference held by the Nuclear Age Peace Foundation in cooperation with the University of California Division of Social Sciences and Westmont College, February 23-25, 2006, in Santa Barbara, California/USA

Welcome
- Shirley Mullen, Provost of Westmont College
- Dr. David Krieger, Nuclear Age Peace Foundation

■ Panel I: Standing at the Nuclear Precipice
  - Moderator: Dave Dionisi
  - Jackie Cabasso, Still Standing on the Nuclear Precipice After All These Years: Why? A Critical Look Back at the 1990s
  - Col. Alan Harrington, US Defense Strategy at the Nuclear Precipice
  - Dr. Daniel Ellsberg, Out of the Nuclear Closet: Preventive War, Preemption and Selective Proliferation
  - Dr. David Krieger, Turning Away From The Nuclear Abyss

■ Panel II: Consequences of the Abandonment of International Law
  - Moderator: Alice Slater
  - Prof. Richard Falk, NPT Illusions and International Lawlessness
  - Amb. Thomas Graham, Nuclear Weapons Policy and International Law
  - Hon. Douglas Roche, Illegal In Any Circumstances Whatsoever
  - Asli Bali, Standing at the Nuclear Precipice: Iran

■ Panel III: International Strategies for Changing US Nuclear Policy
  - Moderator: Amb. Thomas Graham
  - Dr. Wade Huntley, Roadmaps to Disarmament: A Strategy for the Second Nuclear Era
  - Matt Martin, NATO Nuclear Weapons: The International Face of US Nuclear Policy
  - Dr. Jürgen Scheffran, Strengthening International Security Through International Law: The Case of Nuclear, Missile and Space Weapons
  - Alice Slater, The Inalienable Right To Peaceful Nuclear Power: A Recipe For Chaos
  - Mairead Maguire, Personal Responsibility and Nuclear Weapon

■ Panel IV: Domestic Strategies for Changing US Nuclear Policy
  - Moderator: Jackie Cabasso
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  - Greg Mello, The Way is the Goal: Disarmament Now
  - Pamela Meidell, Mayors for Peace Emergency Campaign
  - Prof. Mike Intriligator, Rethinking U.S. Nuclear Weapons Policy
Standing at the Nuclear Precipice: Iran

Aslı Ü. Bâli

The Nuclear Non-Proliferation Treaty (NPT) underwent its most recent five-year review session in May 2005. There were numerous proposals on the table to strengthen non-proliferation mechanisms, reinforce disarmament commitments, close loopholes in the verification and monitoring procedures associated with the regime, and create more effective multilateral arrangements for the management of fissile materials. Despite the urgency of the issues addressed by these proposals, none were adopted and the review session was widely regarded as a failure.¹

Perhaps even more puzzlingly, despite the fact that the United States "repeatedly declared that nuclear proliferation, including the risk of terrorists obtaining a nuclear weapon, is the biggest single threat to the United States, the administration decided against sending Secretary of State Condoleezza Rice to the conference, leaving arguments to midlevel diplomats."² The source of the dispute at the conference was the bargain at the heart of the NPT framework: non-proliferation in exchange for disarmament and civilian nuclear energy cooperation. The breakdown of the conference reflects an international climate in which non-nuclear weapons states are unwilling to accede to additional demands for the limitation of their access to the nuclear fuel cycle, while the nuclear weapons states fail to implement their disarmament commitments under Article VI of the NPT and, more specifically, those commitments undertaken at the 2000 NPT Review Conference.

With the failure of the 2005 NPT Review Conference, the existing non-proliferation regime status quo will remain in effect until at least the next review conference in 2010. The regime as it currently stands is comprised of NPT obligations, the inspections regime established under the NPT Safeguards Agreement and, for countries that have ratified additional obligations, the stricter inspection regime of the Additional Protocol. While this regime is widely credited with averting a world of rapid proliferation in the sixty years following the invention of atomic weapons, it is under increasing strain. As an example of the fraught politics of non-proliferation compliance and enforcement, this paper will examine the emerging crisis over Iran’s nuclear energy program.

The Iranian case is conventionally understood as an enforcement problem. Iran, like all non-nuclear weapons state parties to the NPT, has two obligations under the treaty: not to manufacture or acquire nuclear weapons (Article II) and to accept safeguards, implemented by the IAEA, to prevent the diversion of nuclear energy to military uses (Article III).

Because enforcement of the Article II obligations of non-nuclear weapons states would require unacceptable intrusive inspections, there is no specific enforcement mechanism for this obligation. Rather, the reporting obligations of countries and the IAEA’s monitoring and verification authority associated with Article III are designed to ensure that declared nuclear energy facilities are being operated according to relevant safety requirements and that there is no diversion of fissile materials from permitted civilian facilities. The IAEA discovered since 2002 that Iran had failed, over an extended period, to comply with some of its reporting obligations. While there has been no concrete evidence of the diversion of nuclear materials to weapons program or other military use, Iran was in non-compliance with its obligations under the Safeguards Agreement.

Following the revelations that countries like Iraq and North Korea had developed clandestine nuclear weapons programs despite their IAEA Safeguards Agreements, the IAEA adopted an Additional Protocol for broader inspections that would enable the Agency to monitor not only declared facilities but also to uncover the presence of undeclared facilities. From 2003 until 2006, Iran voluntarily complied with the Additional Protocol inspections regime.³

While Iran has permitted extensive inspections of its nuclear facilities since 2002, such inspections were not deemed to be an adequate confidence-building measure to permit Iran to proceed with its civilian nuclear energy program. Although the IAEA has certified that none of the declared nuclear materials in Iran have been diverted to military purposes and has found no evidence of a militarized nuclear program in Iran, outstanding questions about the Iranian program persist. As negotiations to persuade Iran to forgo the development of an indigenous nuclear fuel cycle have stalled, the Iranian government decided in early 2006 to resume limited uranium enrichment activities, prompting a decision by the IAEA Board to have the Agency report on the Iranian dossier to the Security Council.

Alternatives to the Current Approach in the Iranian Case

The present course on the Iranian nuclear file appears to be one of confrontation and referral to the Security Council for possible coercive action to force Iran to desist in its efforts to develop a domestic nuclear fuel-cycle. Such coercive efforts are unlikely to succeed. When the North Korean nuclear file was brought before the Council, the result was censure by the Council but no further action, undoubtedly due to Chinese reticence on permitting more coercive measures to be adopted. While Iran may not be shielded on the Council from coercive intervention to the same degree, any effort to undertake stiffer coercive measures will likely be viewed in much of the developing world as the application of a double standard. In an

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international context in which numerous nonnuclear weapons states have been permitted to develop domestic fuel-cycles and where countries that have developed known nuclear weapons capacity outside of the treaty regime have faced few sanctions for their efforts, a confrontational approach to the Iranian case raises the specter of inconsistency.

Beyond the Iranian case, numerous developments over the last decade have undermined the bargain underlying the NPT. For illustrative purposes, here are six examples of such developments.

- First, the open testing of nuclear weapons by India and Pakistan heralded the first addition to the list of nuclear weapons states since the NPT came into force.
- Second, the withdrawal of North Korea from the Treaty, exercising its Article X rights, set a dangerous precedent of a country developing a latent nuclear capacity within the treaty system and then exercising a “break out” option by withdrawing.
- Third, the United States decision to withdraw from the Anti-Ballistic Missile (ABM) Treaty, continue investment in a missile defense program and the design of “useable” mini-nukes undermined the credibility of the disarmament commitments it made at the 2000 NPT Review Conference.
- Fourth, the failure of the 2005 NPT Review Conference to strengthen the non-proliferation regime has exposed the conflict between the “haves” and the “have-nots” under the treaty.
- Fifth, the decision by the U.S. to engage in a civilian nuclear cooperation agreement with India, despite India’s status as an illicit nuclear weapon state, undermined the claim that membership in the NPT and agreement to forgo weapons is the exclusive basis for such cooperation.
- Finally, the adoption by both the American and French governments of nuclear doctrines that permit the use of nuclear weapons against non-nuclear weapons states undermines the argument that nuclear weapons are chiefly intended as a nuclear deterrent (the “no first use” standard) and the claim that non-nuclear weapons states enjoy a security guarantee that they will not be attacked with nuclear weapons so long as they are party to the NPT.

In addition to these six developments, the proposal of new measures by the Bush administration to limit access to the nuclear fuel cycle for countries that do not currently have enrichment and reprocessing capabilities further antagonized non-nuclear weapons states that fear the addition of further discrimination within the non-proliferation regime. Escalating the confrontation over the Iranian case by taking it to the Security Council may further harm the NPT regime. In this section I will consider the alternatives to a Council enforcement action in dealing with the Iranian nuclear file.

No Military Option

Before considering the various multilateral options available, it is worth addressing reports that both the United States and Israel are developing contingency plans for unilateral (or possibly bilateral) air strikes against Iranian nuclear installations. There are two strong reasons to doubt the effectiveness of air strikes as a means of deterring the Iranian nuclear program.

First, few analysts believe that air strikes would be able to destroy all of Iran’s nuclear program — while strikes may result in a delay of Iran’s nuclear development, Iran would retain the capacity to develop an indigenous fuel cycle. Unlike Libya, for example, Iran has not developed its nuclear program strictly through the acquisition of turn-key equipment on black markets. Rather, Iran has developed a domestic nuclear engineering capacity that would very likely survive strikes. It is this indigenous knowledge base, more than the physical infrastructure of Iranian nuclear facilities, that is the basis of the Iranian nuclear program.

Secondly, strikes against Iranian facilities would very likely trigger a rally-round-the-flag effect that would consolidate domestic support for an accelerated nuclear program. Indeed, one of the strongest motivators for Iran’s current nuclear program is likely the desire to acquire a virtual deterrent by evolving a latent weapons capacity in response to Iran’s threat perceptions.

The best way to slow Iran’s nuclear program is to alter its threat perception. This is the reason that prominent commentators have argued for providing Iran with security guarantees as part of any negotiation over its nuclear program. Engaging in strikes would, of course, have the opposite effect of security guarantees — it would confirm Iran’s view that it is surrounded by hostile states or forces with nuclear capacities and validate the view that Iran requires a nuclear deterrent for its domestic national security.

In addition to these considerations, unilateral strikes against Iran would be an extremely difficult undertaking. Iran’s territory is mountainous with a rugged terrain. The country is almost triple the land mass of Iraq with four times the population. Further, the Iranian shoreline permits it substantial control over access to the Straits of Hormuz through which a substantial portion of the world’s oil supply is shipped. Following its brutal experience in the Iran-Iraq war, Iran has also developed an arsenal of missiles that are capable of reaching a wide variety of targets in the Middle East. Iranian ties with significant factions in Afghanistan, Iraq, Lebanon and Palestine are also sources of concern. Finally, Iranian nuclear facilities are widely dispersed across the country and have large underground components.

In order to effectively strike at Iran’s nuclear program, it would be necessary to disable Iran’s ability to use missiles in retaliation and to secure the Straits of Hormuz in addition to destroying its nuclear facilities. Such a military undertaking has been estimated by some military analysts to require over 500 separate strikes in an operation that would take several days. Other analysts have suggested that the Israeli air force may not have the conventional bombing capacity to undertake such air strikes. Reports emerged in February [2006] that the Pentagon had commissioned urgent contingency plans for aerial strikes on Iran, to be delivered directly to the office of Defense Secretary Donald Rumsfeld. The reality remains that as a result of Iran’s strategic economic posi-
tion and its links to other actors in the region, there is no good military option against Iran’s nuclear program, whether unilateral or multilateral. Any military approach would run the risk of starting a nuclear confrontation in the Middle East, provoking a serious fuel shortage in the world economy and destabilizing countries from Afghanistan to Israel-Palestine.

What then are the principal alternatives to a coercive, confrontational or military approach to the Iranian case? While this is a complicated and multi-dimensional question, in the remainder of this section I will consider the following four principal alternatives: the current Russian enrichment proposal together with limited Iranian enrichment; multinational participation and controls over an enrichment program within Iran; the development of a much stricter on-site inspection system within Iran to monitor permitted civilian enrichment activities; and the long-term development of a multilateral fuel cycle control regime applied on an equitable basis. The key to any viable proposal is a compromise that permits some symbolic degree of enrichment with “objective guarantees” of the non-diversion of enriched uranium to military uses and the appearance of a non-discriminatory resolution to the current stand-off.

Options for Effective Multilateralism

The principal option for a negotiated solution to the Iranian nuclear program on the table prior to the reporting of Iran’s nuclear file to the Security Council was the Russian proposal to develop an enrichment facility located in Russia as part of a joint venture with Iran.

The idea underlying this proposal is that the Iranians would be able to participate economically through an equity stake in the facility and a guaranteed nuclear fuel supply, while limiting Iran’s access to an indigenous enrichment capacity. The strength of the proposal lies in addressing Iran’s concerns about the stability of its market access to nuclear fuel. The shortcoming, however, is that if the Iranians are not permitted access to sensitive technologies at the facility, the proposal does not address the Iranian demand that it be permitted to engage in limited enrichment research on its own soil.

The Iranian argument against the proposed joint venture should it have no access to the underlying technologies is presumably that it does not offer greater security than Iran’s earlier equity investment in the French Eurodif enrichment facility. In the Eurodif case, Iran had an equity stake in the facility but as a result of changes in political circumstances it was denied access to the nuclear fuel supply in which it had invested.

Recent reports confirm that the obstacle to reaching agreement on the Russian proposal is the “red line” declared by the United States and Europe that there can be no compromise on permitting Iran limited domestic enrichment capacity restricted to research under strict IAEA inspections and controls. This opposition to limited Iranian enrichment is based on the desire to close the “loophole” in the NPT that permits countries to develop enrichment technologies within the treaty regime that might contribute to a latent weapons capacity. While this loophole is an appropriate source of concern, singling out Iran as the one case in which this loophole is to be closed is a risky strategy. Failure to secure a negotiated solution in the Iranian case may do greater damage to the already wounded non-proliferation regime than a compromise would.

To find a compromise that will take most enrichment activities out of Iran while permitting a face-saving symbolic domestic capacity that enables the Iranian government to claim that it has relinquished its “inalienable right” to pursue a domestic fuel cycle may be the best available course. Such a compromise should then be followed by a multilateral initiative to strengthen the inspections regime across the board in a fashion that appears equitable and nondiscriminatory. Perhaps through discussion under the aegis of the Security Council, a compromise position that would enable Iran to accept the Russian proposal may yet become possible.

A second alternative to the Russian proposal might be to locate an enrichment facility in Iran but under direct multilateral control. Under this scenario, Iran would invite foreign investment and participation in any enrichment facility on its territory. Arrangements for the multinational controls on the facility might even extend to installing “black box” enrichment technologies in the facility, to be operated by multinational staff that would not, however, have access to the technical specifications of the centrifuge configuration necessary for enrichment.

The model of a multilateral arrangement for the ownership of the facility, perhaps including regional participation by some of the Gulf Arab states, would be an attractive option, particularly if the provision of “black box” technology could be rendered truly proliferation-resistant. Moreover, Iranian President Ahmadinejad has frequently invited multinational investment in Iran’s nuclear energy sector, which might enable Iranian officials to place a multinational facility within a framework acceptable to the hard-line leadership of the current Iranian regime.

Iran has also offered to place any limited enrichment capability it would be permitted to operate under strict on-site, in-person 24-hour IAEA monitoring. This option might be pursued in conjunction with the Russian proposal or in its place. Iran’s oft-stated willingness to accept extremely intrusive inspections to meet the standards of “objective guarantees” that it is operating a proliferation-resistant nuclear energy program may enable an acceptable compromise to be reached that would set an excellent precedent for strengthening monitoring and verification standards under the nonproliferation regime while simultaneously providing strong safeguards against the diversion of fissile materials under cover of a civilian energy program in the Iranian case.

The final, more long-term option would be to seek to develop a regional or global arrangement to produce or guarantee reliable access to nuclear fuel on a proliferation-resistant basis. If such an arrangement were limited to guaranteeing supply, it would closely parallel the recent pro-
posal by IAEA Director-General Mohamed ElBaradei who has argued for the creation of a fuel bank as a last-resort supplier and the adoption of “objective, apolitical nonproliferation criteria” to guarantee fuel supplies such that a country that meets its NPT obligations should be assured of access to nuclear fuel.12

The better alternative may be a multinational alternative to the indigenous fuel cycle. This would entail the creation of regional or international fuel cycle centers, either through the conversion of existing national facilities in the case of regions where such facilities exist, or through the construction of new facilities. Such centers could be developed on the Eurodif model, whereby recipient states would have an equity share in the facility but would not have access to sensitive technologies. Alternatively, they could be developed on the Urenco model that would permit members to share resources, access to technologies and expertise on the fuel cycle.

The course of the Iranian nuclear dispute suggests that the United States and Europe would strongly prefer the Eurodif model while most developing countries would prefer the Urenco model. These issues would need to be addressed in the event that such multinational fuel cycle centers are seriously considered as a solution for meeting the increasing energy needs of developing countries while addressing concerns about the dual-use potential of sensitive enrichment technologies. However, the adoption of such a solution will likely not materialize in time to present a serious alternative to resolve the dispute over the Iranian nuclear program. That said, many analysts believe that Iran is a decade away from a complete indigenous fuel-cycle that would give it a latent weapon capability.13 With a timeline of a decade or more, it may be possible to consider this alternative, even in the Iranian case.

Iran and the Damage to the Non-Proliferation Regime

The Iranian case has drawn attention to an issue that has been of concern to non-proliferation advocates for years – the potential to develop a civilian nuclear energy program in compliance with the NPT and then exploit the dual-use nature of nuclear fuel cycle technology to acquire a latent weapons capacity or to develop an actual arsenal. Most commentators have focused on this aspect of the Iranian case, however, to the exclusion of other, less apparent damage that has been done to the non-proliferation regime as a result of the handling of the Iranian file since 2002.

The Iranian case has been interpreted by developing countries as calling into question their right to civilian nuclear energy programs under the NPT. This perception combined with the failure of nuclear weapons states to engage in serious disarmament and the lack of meaningful technical cooperation between the weapons states and others under the Treaty represents a serious and less well-studied threat to the bargain underlying the regime.14 The energy needs of the developing world in the next century are clearly going to require the rapid development of alternatives to fossil fuel consumption. Developing world energy consumption will set the stage for a century in which the expansion of the use of nuclear energy is a near certainty.15

Under these circumstances, the developing world is watching the course of the Iranian case very closely to determine the extent to which the Iranian precedent will limit their rights under Article IV of the NPT.

If the developing world perceives a new form of discrimination being introduced to the NPT regime – one which distinguishes between states permitted to have a nuclear fuel-cycle and others – the costs of membership in the NPT may come to be seen as outweighing the benefits. Particularly when set beside the nuclear weapons states record of compliance with their disarmament commitments, and more recent developments in which some states are even considering expanding and modernizing their existing nuclear arsenals, further restrictions on the rights of non-weapons states under the NPT regime may undermine its legitimacy and credibility in much of the developing world.

Should the current crisis with Iran result in an Iranian withdrawal from the NPT, the non-proliferation regime may not be able to withstand the damage. The worst fears of non-proliferation experts that the Iranian case might trigger a cascade proliferation effect, particularly in the Middle East, would then become far more plausible. As a result, the stakes of promoting a nuclear-free Middle East are higher today, perhaps, than they have ever been. Yet the prospects for a WMD-free zone in the region are grim.

For this reason, it is imperative to find a way to resolve the conflict over the Iranian nuclear file within the NPT framework. The recent moves to report the Iranian file to the Security Council are unhelpful in this regard. The Council has already been weakened by the course of the military intervention in Iraq. For instance, the introduction of American intelligence regarding Iran’s nuclear program will be reminiscent of the case for intervention against Iraq in a way that may delegitimize the role of the Security Council in this case. Finally, as discussed above, the Council is not an attractive forum for resolving the Iranian crisis precisely because there are no good options available to the Council for action to unblock the current impasse. Moving the Iranian file to the Council absent an IAEA report that Iran is in violation of its Article II obligations under the NPT (to forgo acquisition or production of nuclear weapons) is premature.

Instead of continuing to take a relatively ad hoc approach to the Iranian case, it would be far more beneficial to view the Iranian case in the context of a broader effort to strengthen the NPT monitoring and inspections system as well as non-weapons states’ incentives to remain within the Treaty regime. In the words of UN Secretary-General Kofi Annan, “we cannot continue to lurch from crisis to crisis, until the regime is buried beneath a cascade of proliferation.”16 “Treating the Iranian case as an opportunity to move towards a proliferation-resistant global nuclear fuel-cycle is perhaps the best alternative to the present course. By putting the emphasis on long-term solutions applicable beyond the Iranian case, a more
sustainable approach to the regime as a whole may be possible. While a good interim solution for the current Iranian crisis would be to pursue a modified version of the Russian proposal, with strong support from the United States and Europe, including security guarantees, the long-term emphasis should be on a broader approach. Working towards a proliferation-resistant fuel cycle regime at the international level will require a balanced and non-discriminatory approach.

Within Iran's own region, such an approach would also have to bear in mind the present threat perceptions of the states of the region. For instance, developing a multilateral fuel cycle solution in the Middle East will only be feasible if it is accompanied by a commitment to achieving a weapons-of-mass-destruction-free zone in the region. Otherwise, incentives to defect will remain difficult to deter.

Iran remains a decade away from being able to enrich sufficient quantities of uranium for militarized use—the international community should pursue a nonconfrontational solution to the problem while time still permits. One key will be shifting Iran's threat perception both by providing it with security guarantees and by abandoning an approach that sets the Iranian case apart from all others. The IAEA's Director-General has publically argued that the international community must “abandon the unworkable notion that it is morally reprehensible for some countries to pursue nuclear weapons but morally acceptable for others to rely on them for security—and indeed continue to refine their capacities and postulate plans for their use.”

Policy makers reviewing options for dealing with the Iranian case would do well to heed this cautionary advice. The doctrine of preemption, even where designed to curtail proliferation, will in all likelihood exacerbate proliferation as other states seek to acquire weapons as a deterrent.

Rather than adopting a confrontational approach that may stimulate proliferation, the Iranian case presents an important opportunity for the international community to find a diplomatic solution within the NPT framework that will set a positive precedent for developing multilateral approaches to the management of the global fuel cycle.

1 See, e.g., David E. Sanger, Month of Talks Fails to Bolster Treaty, The New York Times, May 28, 2005, page A1 (noting that the “month-long conference at the United Nations to strengthen the Nuclear Nonproliferation Treaty reached Friday in failure, with its chairman declaring that the disagreements between nuclear-armed and non-nuclear states ran so deep that ‘very little has been accomplished.’”).

2 Ibid.

3 Iran has signed the Additional Protocol but the Iranian parliament has refused to ratify the agreement until it is assured that Iran’s “legitimate right” to a civilian nuclear energy program including uranium enrichment facilities is recognized by the IAEA. Moreover, as a consequence of the decision to refer the Iranian nuclear dossier to the United Nations Security Council, as will be discussed further below, Iran has suspended its voluntary compliance with the stricter inspections under the Additional Protocol as of February 2006.

4 Of course, neither India nor Pakistan are NPT signatories, but are nonetheless bound by the broader nonproliferation norm attending to the numerous WMD-related conventions to which they are parties, as well as the positions taken on proliferation by the US Security Council.

5 The Bush proposal was widely seen as crafted to ensure access to domestic fuel-cycles to U.S. allies—such as Japan, Taiwan, South Korea, Germany, Belgium, the Netherlands and Brazil—while denying it to much of the developing world and specifically Iran. The text of President Bush’s announcement of the new policy on February 11, 2004 at the National Defense University is available at www.whitehouse.gov/news/releases//2004/02/20040211-4.html.

6 In this sense, the U.S. military strategy in the Middle East has been, to some degree, too successful. Iran’s strategic motivations for seeking a nuclear deterrent have certainly been strengthened by the presence of U.S. forces in Iraq, Afghanistan and the Persian Gulf. American agreements for the use of bases in Central Asia have also exacerbated the Iranian perception of encirclement. When Israeli and Pakistani nuclear weapons and the presence of NATO air bases and arsenals in Turkey are added to this equation, it is clear that without security guarantees it will be difficult to persuade Iran to abandon nuclear research.

7 See, e.g., comments of retired Air Force Colonel Dan Gardner, who has taught strategy for the U.S. Department of Defense at its National War College, as reported in the Wall Street Journal, Carla Anne Robbins and Greg Jaffe, Why U.S. Wages Diplomacy with Defiant Iran, Wall Street Journal, February 3, 2006, page A4 (quoting Gardner as stating that air strikes on Iranian nuclear facilities would require “upwards of 500 air-strikes [separate strikes.] That is not an overnight operation. It is at least three or four days.”

8 For instance, the former Israeli forces chief of strategic planning, Shlomo Brom, was quoted in one article as stating that the logistics of air strikes against Iran would pose a significant obstacle for the Israeli air force. Will Israel Strike Iran?, Newsweek, February 13, 2006. Further, recent reports have suggested that the U.S. is trying to blunt the likelihood of Israeli unilateral action by extending a defensive shield over Israel. Dan Williams, US shield blunts Israeli military option on Iran, Reuters, February 9, 2006. On the other hand, Israel may pursue other tactics to sabotage the Iranian nuclear program and/or assassinate Iranian nuclear scientists along the lines of its efforts to disrupt the Iraqi nuclear program prior to the Israeli strike on the Osirak facility. See, e.g., Terrence Henry, Can sabotage and assassination stop Iran from going nuclear?, Atlantic Monthly, December 2005.

9 Philip Sherwell, US prepares military blitz against Iran’s nuclear sites, Sunday Telegraph (UK), February 12, 2006 (noting that “strategists at the Pentagon are drawing up plans for devastating bombing raids backed by submarine-launched ballistic missile attacks against Iran’s nuclear sites as a ‘last resort.’... They are reporting to the office of Donald Rumsfeld... ‘This is more than just the standard military contingency assessment,’ said a senior Pentagon adviser. ‘This has taken on much greater urgency in recent months.’


11 For instance, in his address to the UN General Assembly in September 2005, President Ahmadinejad stated that “as a further confidence building measure and in order to provide the greatest degree of transparency, the Islamic Republic is prepared to engage in serious partnership with private and public sectors of other countries in the implementation of uranium enrichment program in Iran.” President Mahmoud Ahmadinejad’s address to the United Nations General Assembly, September 17, 2005, available at www.un.org/webcast/ga/60/statements/iran-050917eng.pdf.

12 On El-Baradei’s comments regarding such a proposal, see David Holley, Nuclear Chief Offers a Nonproliferation Plan: Promise at New Fuel, L.A. Times, October 6, 2005.

A credible Alliance nuclear posture and the demonstration of Alliance solidarity and common commitment to war prevention continue to require widespread participation by European Allies involved in collective defense planning in nuclear roles, in peacetime basing of nuclear forces on their territory and in command, control and consultation arrangements.” NATO’s Strategic Concept (1999) Americans and Europeans alike could be forgiven for attributing the policy statement quoted above to perhaps the Cold War of the 1960s. Fifteen years after the end of the Soviet Union and the breakup of the Warsaw Pact, most of the populations on both sides of the Atlantic would be surprised to learn that this is current doctrine.

International leverage points for changing US nuclear policy are difficult to quantify. Not only do international actors hold no official standing they do not hold elected office in the United States, they are not constituents to any US elected official but we live in an age that seems particularly hostile to international armchair quarterbacking. In searching for strategies to affect US nuclear policy then, it may be helpful to turn attention to fora in which international actors wield decision-making power cooperatively with the United States – and one of the most recognizable of these institutions is NATO. As it happens, NATO is also an integral component of US nuclear policy.

Background Nuclear weapons have played a key role in NATO’s military strategy since its inception in 1949. NATO’s current Strategic Concept (1999) states that the “fundamental purpose of the nuclear forces of the Allies is political: to preserve peace and prevent coercion and any kind of war.” And NATO sub strategic weapons not only provide a nuclear umbrella for Europe, they are also seen as symbolic of the transatlantic link between the United States and its European allies. In 2006, the United States is the only nuclear weapons state that bases any portion of its nuclear arsenal on foreign soil. According to a February 2005 report by the Natural Resources Defense Council (NRDC), the United States continues to deploy approximately 480 nuclear weapons at eight bases in six NATO countries. Five of these six countries – Belgium, Germany, Italy, the Netherlands, and Turkey – are non-nuclear weapons states under the terms of the Non-Proliferation Treaty (NPT). These countries host US B61 ‘gravity’ bombs that, in the event of nuclear war, could be delivered by aircraft and pilots belonging to the host nation. Previously Greece also participated in nuclear sharing, but in 2003 US nuclear weapons were reportedly withdrawn from the country. The United Kingdom also hosts US nuclear weapons, USAF aircraft and pilots. Along with the submarine-based nuclear weapons, NATO nuclear weapons are the forward tip of the US nuclear arsenal.
Legal Issues

The question of the legality of NATO nuclear weapons hinges on the interpretation of several of the articles of the NPT. There is a long history of debate surrounding the question of transferring nuclear weapons to non-nuclear states. NATO’s nuclear sharing arrangements were at the center of negotiations between the United States and Russia on Articles I and II of the NPT in the mid-1960s. Article I of the NPT states that “Each nuclear-weapon State Party to the Treaty undertakes not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices directly, or indirectly.”

Article II completes the circle by imposing similar restrictions from non-nuclear states on the receiving end: “Each non-nuclear-weapon State Party to the Treaty undertakes not to receive the transfer from any transferor whatsoever of nuclear weapons or other nuclear explosive devices or of control over such weapons or explosive devices directly, or indirectly.”

NATO nuclear sharing expressly bases US nuclear weapons within five non-nuclear countries and explicitly sets out chain of command instructions whereby those nuclear weapons could be transferred to the basing countries in time of need. As such, NATO nuclear sharing appears to breach both Article I and II of the NPT. For its part, NATO asserts that nuclear sharing is compatible with the NPT because it predates the NPT. However, not all parties to the NPT were made aware of the NATO arrangements at that time. Although nuclear sharing was not challenged in the 1960s, it has been subsequently challenged and is being questioned today.

Developments Since the 2000 Review Conference

The 1995 Review NPT Principles and Objectives for Nuclear Non-Proliferation and Disarmament contain a number of commitments relevant to NATO, such as the establishment of additional Nuclear Weapon-Free Zones (NWFZs) and the need for strengthened security assurances for non-nuclear weapons states. Similarly, the 2000 NPT Review Final Document includes:

- the need for further unilateral reductions in nuclear arsenals;
- increased transparency;
- further reduction of non-strategic nuclear weapons;
- measures to reduce the operational status of nuclear weapons systems;
- and a diminishing role for nuclear weapons in security policies.

This call for a “diminishing role for nuclear weapons in security policies” followed concerns about NATO’s Strategic Concept, which describes nuclear weapons as the “supreme guarantee” of Allied security.

In June 2004, NATO published two fact sheets, which it claims demonstrate the “radical” and “far reaching” steps the Alliance has taken to adapt its nuclear policy, by reducing the number of nuclear weapons in Europe since the end of the Cold War. However, the figures recently published by NRDC indicate that the number of US nuclear warheads based in Europe has remained static at about 480 since the 1994 US Nuclear Posture Review. After three subsequent NPT Review Conferences, fifteen years past the end of the Cold War, and five years after 9/11, NATO nuclear policy has remained static for the past twelve years.

However, US, UK, and French nuclear policies have not remained equally static. Far from reducing the role of nuclear weapons, the United States is now pursuing the development of new nuclear weapons under the aegis of the Reliable Replacement Warhead program and enhancing the role of nuclear weapons in counter-proliferation and preventive war strategies. The United Kingdom is scheduled to announce a decision on whether to replace their sole nuclear platform – Trident – and preparations would seem to indicate a path closely hewing to the US position. Indeed, the US and UK were scheduled to conduct a sub-critical nuclear test at the Nevada Test Site on February 23, 2006, as part of ongoing cooperative efforts. France has matched these actions with rhetoric, with President Chirac recently stating that France reserves the right to use nuclear weapons against any who would threaten the use of WMD against it. France has also announced that it has modified its nuclear arsenal to improve its strike capability and increase missile range. NATO may come under pressure to adopt similar policies.

Taken as a whole, these activities bring into serious question the commitment of the United States, the
United Kingdom, and France toward fulfilling their obligations under Article VI of the NPT, which mandates pursuing in good faith negotiations toward disarmament.

International Strategies for Influencing US Nuclear Policy

Perhaps surprisingly, there has recently been considerable grumbling among high-level European officials on the subject of the continuing presence of US nuclear weapons in Europe. Last March, the Belgian Senate unanimously adopted a resolution calling for “the gradual withdrawal of the American tactical nuclear weapons from Europe as fulfillment of Article VI of the NPT.” In April 2005, the German Liberal party, the FDP, introduced a resolution to the Bundestag similarly calling for the removal of US nuclear weapons from Germany. Subsequently, a number of prominent German politicians have repeated the call and a new resolution has been introduced in 2006. Also in April 2005, a Norwegian Parliament Foreign Affairs Committee member from the ruling party reiterated the desire to see US nuclear weapons removed from European soil.

Prospects for Progress

NATO does not publish details on the number of nuclear weapons remaining in Europe, despite the member states’ commitment to transparency in the 2000 NPT Final Document. The continued presence of US nuclear weapons has, in part, also resulted in Russia declining to discuss their “tactical” nuclear weapon holdings and dismantlement. NATO claims that it is in “full compliance” with the negative security assurances (NSAs) issued by the United States, the United Kingdom, and France on the eve of the 1995 NPT Review Conference.

However, NATO’s refusal to rule out first use of nuclear weapons is a major obstacle to further steps to strengthen NSAs. It also effectively gives a green light to NATO military planners to prepare for the option of using nuclear weapons first. NATO’s policies have also proved a serious obstacle to any possibility of a Nuclear Weapons Free Zone in Central Europe.

NATO could play an important role in strengthening the NPT by supporting:

■ ratification of the Comprehensive Test Ban Treaty (CTBT);
■ efforts to negotiate a Fissile Material Cut-Off Treaty (FMCT);
■ the establishment of an ad hoc committee on nuclear disarmament at the Conference on Disarmament;
■ the adoption of a no-first use policy;
■ negotiations with Russia on the verifiable elimination of sub-strategic nuclear weapons and on warhead accounting; and,
■ the withdrawal of the remaining US nuclear weapons from Europe.

Unfortunately, the latest communiqué from the ministerial meeting of the Defence Planning Committee and the Nuclear Planning Group from June 2005 upheld NATO’s nuclear role and failed to mention any of these items. It is clear from continuing European actions, however, that the issue remains very much alive.

A 2005 poll shows that ¾ of the German public wants nuclear weapons out of Germany. In January 2006, the Norwegian Ministry of Finance excluded seven companies from the country’s Government Pension Fund–Global – selling approximately US $500 million in shares – due to their involvement in the production of nuclear weapons. A majority in the United Kingdom oppose the development of a follow-on to Trident, when presented with the estimated cost.

The next NATO summit of Heads of State will be held in Latvia at the end of 2006, and is expected to focus on “NATO’s transformation, taking stock of what has been accomplished and charting the way ahead for the Alliance.” Informal meetings of Foreign and Defence Ministers will be held in 2006 in April, and June. Each of these meetings presents opportunities to discuss nuclear sharing and the various steps toward progress that could be taken.

In the challenging realm of international influences on US nuclear policy, changing US policy through NATO may be one of the more attainable goals. Prominent European government officials are already sympathetic and activated; significant portions of European populations are uncomfortable with the current posture; the current policy is hampering non-strategic reductions in Russia and harming our overall relationship with Russia; nuclear sharing makes broader negotiations on non-proliferation (i.e., Iran) more difficult; forward-based nuclear weapons have little or no strategic value in the current political environment; and even US military officials have questioned the continued utility of NATO nuclear sharing.

Scaling back and eliminating NATO nuclear policies would be a significant change in US nuclear policies. It would realign US nuclear forces on a footing much more in keeping with the other nuclear powers and also necessarily change the role of non-strategic nuclear weapons in US nuclear planning. Further, continued efforts on the part of European leaders and those who support and influence them may actually provide a bright spot in otherwise disturbing and worrisome trends in nuclear weapons policies.

NB: This paper borrows heavily from British American Security Information Council papers and presentations that I co-authored with Nigel Chamberlain and Carol Naughton for the 2005 NPT Review Conference.

This paper was presented at the 2006 International Law Symposium, “At the Nuclear Precipice. Nuclear Weapons and the Abandonment of International Law” held by the Nuclear Age Peace Foundation on February 23-25, 2006.

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Avoiding The Nuclear Precipice

Nuclear Weapons Policy and International Law

- Thomas Graham

Paul Nitze was the archetypical Cold Warrior and nuclear weapon strategist. As the author of the National Security Council (NSC) 68 report on Unites States Objectives and Programs for National Security commissioned by President Truman in 1950 he helped set the ground rules for the Cold War and the thermonuclear confrontation. In this Report he wrote in 1950: “In the absence of effective arms control it would appear that we had no alternative but to increase our atomic armaments as rapidly as other considerations make appropriate.” But in addition to being an outstanding national leader, Paul Nitze was someone who could recognize change and respond to it. In the last op-ed that he wrote at the age of 92 in 1999, entitled A Danger Mostly To Ourselves, he said: “I know that the simplest and most direct answer to the problem of nuclear weapons has always been their complete elimination. My ‘walk in the woods’ in 1982 with the Soviet arms negotiator Yuli Kvitsinsky at least addressed this problem on a bilateral basis. Destruction of the arms did not prove feasible then but there is no good reason why it should not be carried out now.”

Senator Sam Nunn in an article in the Financial Times in December 2004 pointed to the immense danger that exists as a result of the fact that fifteen years after the end of the Cold War the United States and Russia still maintain, on fifteen minutes alert, long-range strategic missiles equipped with immensely powerful nuclear warheads capable of devastating each other’s societies in thirty minutes. In 1995 Russia mistook the launch of a test rocket in Norway as a submarine-launched nuclear missile aimed at Moscow and came within two minutes of ordering a retaliatory nuclear strike on the United States. Senator Nunn said in his article that our current nuclear weapon policies, which in effect rely on the deteriorating Russian early warning system continuing to make correct judgments as it did during the Cold War, “risks an Armageddon of our own making.” And former Defense Secretary William Perry, a scientist not given to exaggeration, said not long ago that in his judgment there could be a greater than 50 per cent chance of a nuclear detonation on U.S. soil in the next decade.

NPT – Centerpiece of World Security

The nuclear Non-Proliferation Treaty (NPT) is the centerpiece of world security. President John F. Kennedy truly feared that nuclear weapons might well sweep all over the world. In 1962, there were reports that by the late 1970s there would be 25-30 nuclear weapon states in the world with nuclear weapons integrated into their arsenals. If that had happened there would have been many more such states today – in September of 2004, the Director General of the International Atomic Energy Agency (IAEA), Mohamed ElBaradei, estimated that more than 40 countries now have the capability to build nuclear weapons. Under such conditions every conflict would carry with it the risk of going nuclear and it would be impossible to keep nuclear weapons out of the hands of international terrorist – organizers they would be so widespread.

But such weapon proliferation did not happen and the principal reason that it did not was the negotiation of the NPT and its entry into force in 1970, buttressed by the policies of extended nuclear deterrence the nuclear umbrella – followed by the United States and the Soviet Union with their Cold War Treaty Allies. Indeed since 1970, at least until now, there has been very little nuclear weapon proliferation. In addition to the five nuclear weapon states recognized by the NPT – the United States, Britain, France, Russia and China – three states, India, Pakistan, and Israel, and perhaps North Korea have built nuclear weapon arsenals – but India and Israel were already well along in 1970. This is far from what President Kennedy feared.

But the success of the NPT was no accident. It was rooted in a carefully crafted central bargain. In exchange for a commitment from the non-nuclear weapon states (today more than 180 nations, most of the world) not to acquire nuclear weapons and to submit to international safeguards to verify compliance with this commitment, the NPT nuclear weapon states pledged unfettered access to peaceful nuclear technologies and undertook to engage in nuclear disarmament negotiations aimed at the ultimate elimination of their nuclear arsenals. It is this basic bargain that for the last three decades has formed the central underpinnings of the international non-proliferation regime.

NPT Erosion

However, one of the principal problems with all this has been that the nuclear weapon states have never really delivered on the disarmament part of this bargain and the United States in recent years appears to have largely abandoned it. The essence of the disarmament commitment was that the eventual elimination of nuclear weapon arsenals – the nuclear weapon states would agree to a treaty prohibiting all nuclear weapon tests, would undertake obligations to drastically reduce their nuclear arsenals and would significantly reduce the role of nuclear weapons in their security policies.

None of this has been accomplished 35 years later. As Mohammed ElBaradei has said: “we must abandon the unworkable notion that it is morally reprehensible for some countries to pursue weapons of mass destruction and acceptable for others to rely on them for security … if the world does not change course, we risk self destruction.”
And now the other side of the bargain has begun to fall apart. India and Pakistan eroded the NPT from the outside by each conducting a series of nuclear weapon tests in 1998 and declaring themselves to be nuclear weapon states. India, Pakistan and Israel maintain sizable unregulated nuclear weapon arsenals outside the NPT. The U.S.-India joint declaration last July [2005], which among others things implicitly recognized India as a nuclear weapon state contrary to the NPT, has not helped.

North Korea withdrew from the NPT in 2003 and may have built up to eight or nine nuclear weapons. The Democratic People’s Republic of Korea (DPRK) has now agreed in principle to return to the NPT and to negotiate an end to its nuclear weapon program, but even if this should some day happen, under current international arrangements can we ever be certain that North Korea has in fact declared and eliminated whatever nuclear weapons they may have? The A.Q. Khan secret illegal nuclear weapon technology transferring ring based in Pakistan has been exposed but who can be sure that we have seen more than the tip of the iceberg? Iran is suspected of having a nuclear weapon program and admitted in late 2003 that contrary to its IAEA Safeguards Agreement it failed to report its acquisition of uranium enrichment technology. Negotiations have not yet resolved this issue. […]

And why might Iran want the nuclear fuel cycle and the attendant option to construct nuclear weapons? Such a capability seems to be seen by some as the hallmark of a modern state and a number of states already have this capability. States such as Brazil and, recently, Ukraine have emphasized its importance. Such a capability would of course significantly enhance Iranian military and political influence in the Middle East region.

Given Iranian government past and present links to terrorist organizations, the threat of providing such organizations with a nuclear weapon – unlikely to be realized in my opinion – could enhance Iran’s clout in the world – as perhaps seen from Teheran. And there are security concerns. Iran faces nuclear weapon states on three sides, as well as American military forces on three sides and is a charter member of the “Axis of Evil.” But finally and perhaps arguably most important in the end, it is because Iranians are a proud people, heirs to the Persian Empire, and they seem to want respect more than anything else, according to Ken Pollock in his recent book The Persian Puzzle.

The nuclear program is very popular in Iran. It appears that some countries believe that ultimately the only way that they can gain respect in this world, as President Lula of Brazil declared during his election campaign, is to acquire nuclear weapons or at least be seen as able quickly to do so. During the Cold War, nuclear weapons distinguished Great Powers from other countries. The permanent members of the Security Council are the five recognized nuclear weapon states. Forty years ago Great Britain and France both asserted that status was the real reason that they were building nuclear weapons. This high political value of nuclear weapons has not changed since the Cold War. India asserted in 1998 that it was now a big country, it had nuclear weapons. The world significantly lost interest in Ukraine once it gave up the nuclear weapons left on its territory after the collapse of the Soviet Union. The political value of nuclear weapons probably will remain high and may in the end cause the NPT to fail, unless of course over time it can be drastically reduced. Likely the only way that this can happen is for nuclear weapons to be delegitimized. This is what was supposed to happen pursuant to the central bargain of the NPT which increasingly appears unlikely to be realized.

In view of all this it may now simply be too late to attempt to change the course of nations and return to policies which will strengthen and support the NPT and the international non-proliferation regime. With the potential breakdown of the NPT and the ensuing likelihood of widespread nuclear proliferation that President Kennedy so rightly feared an increasing possibility, with nuclear tension a growing threat with thousands of strategic nuclear weapons still on high alert and a Russian early warning system continuing to decline in effectiveness, it may be too late for nuclear arms limitation. In the interest of the security and safety of us all, perhaps a way must be found to proceed directly to the elimination of nuclear weapons, as Paul Nitze suggested over six years ago.

A Possible Cause for Action

A possible course of action could be for the President of the United States to call for an extraordinary session of the United Nations General Assembly and ask to address the Assembly. In his speech the President could call for the world-wide elimination of nuclear weapons and request that the Security Council be charged to carry out this task. The Security Council could then call for the negotiation of a treaty to eliminate nuclear weapons. This would require world-wide intrusive on-site inspection and probably security guarantees to a number of states such as Israel, Iran, Pakistan and North Korea on the edge of conflicts and where nuclear programs are or may be present. North Korea would return to the NPT as a non-nuclear weapon state. There would need to be an agreement by all states to apply economic and, if necessary, military pressure to any state that did not comply with this program or that subsequently violated the negotiated arrangements.

In an interim stage the five NPT nuclear weapon states and the three other longtime holdouts from the NPT would be required to eliminate almost all of their arsenals down to very low levels.

A second and later stage would require elimination of weapons, but these eight states would be allowed to keep a relatively limited amount of nuclear explosive material (highly enriched uranium or plutonium) which could be converted into a small number of weapons as a hedge. This could amount to roughly enough material for five weapons each for India, Pakistan, and Israel, fifteen weapons each for Britain, France, and China and thirty weapons each for the United States and Russia. The material would be maintained under very high levels of national security protection at designated depositories and also be under international safeguards implemented by IAEA inspec-
tors. Under various programs all other nuclear explosive material would be eliminated worldwide.

Such an arrangement would take a long time to negotiate and even longer to implement but we must try for the hour is late. A final stage, years in the future, could be the verifiable elimination of the retained fissile material.

Some might say that this is unrealistic, how could we ever hope that the United States government would even contemplate such a thing? I would say in response that we must remember that it is only governments that can eliminate nuclear weapons, not civil society. So we must press for and hope for the best and remember that nothing good is ever impossible. Who would have thought that the zero missile option proposed by President Reagan in 1981 would ever happen? Who would have thought the Cold War would end in the foreseeable future? Who would have thought that the Soviet Union would cease to exist? But all of these things did happen.

The United States Must Regain

Trust

But in order to achieve the elimination of nuclear weapons and to establish a peaceful and secure world community in the 21st century, the United States must lead; there is no alternative. But for this to happen the United States must be believed and trusted. On September 12, 2001, the United States had the trust and support of the entire world. Now, in the wake of exaggerated intelligence claims; rejection of international treaty arrangements such as the Comprehensive Nuclear Test Ban Treaty, the Ottawa Convention on land mines, the International Criminal Court, the Kyoto Protocol on global warming, and others; an invasion of Iraq opposed by the world community; rejection by some of the rules of international humanitarian law and the Geneva Protocols on the treatment of prisoners of war; and the prison scandals in Iraq and elsewhere; that support and trust is gone and the United States is reviled and feared in many quarters of the world.

Senator John McCain said a few months ago that “America’s position in the world is at an all-time low.” How can we regain the trust of the world community? How can we return to our historic destiny of keeping the peace and fostering the development of the community of nations, democracies, free market economies, the international rule of law, international institutions, and treaty arrangements?

Among other things we should:

First, end our intervention in Iraq in the best way that is possible and practical. The future of Iraq belongs to the Iraqis, we cannot ensure it for them, only the Iraqis can build a new Iraq. At an early date we must firmly and carefully turn over the struggle against the insurgency to the Iraqis as urged by former Defense Secretary Melvin Laird in his article in an issue of Foreign Affairs a few months ago. Our presence is what feeds the insurgency, he notes, and our steady, gradual, but inexorable withdrawal would strengthen the confidence and ability of the Iraqi security forces to stand up to the insurgency.

Second, to recognize that in the wake of the Cold War the world has fundamentally changed, the nation state system that has dominated international life for the last 350 years is rapidly deteriorating. Perhaps some 50 to 70 nations around the world are inexorably slipping into the category of failed states.

We cannot go it alone. Since the end of the Cold War there has been roughly one major nation building intervention every two years. Poverty, disease, cultural misunderstandings, and machinegun societies around the world are central national security threats; these are the principal causes of international terrorism and the primary weapons in the battle against terror and declining world order are economic, political, social, cultural, and diplomatic, and only rarely military.

Reconstruction in failed states is one thing, it is relatively well understood but in many cases development, of necessity involving institution building, is essential to return failed states to a level where they can function. But to quote the well-known historian Francis Fukuyama “any honest appraisal of where the ‘state of the art’ lies in development today would have to conclude that although institutions may be important we know relatively little about how to create them.” But one thing that we do know is “Coalitions, in the form of support from a wide range of other countries and international organizations … are important for a number of reasons.”

And third, for over fifty years the United States pursued a world order built on rules and international treaties that permitted the expansion of democracy and the enlargement of international security. Earlier this year in a speech before the American Society of International Law, the Secretary of State said that when the United States respects its “international legal obligations and supports an international system based on the rule of law, we do the work of making this world a better place, but also a safe and more secure place for America.” We should take such steps as ratifying the Comprehensive Nuclear Test Ban Treaty, joining the Ottawa Land Mine Convention, becoming a part of the International Criminal Court, and establishing ourselves again as strong advocates of the international rule of law.

In this way we can regain our historic role and we can and will effectively lead the world community to a safe, secure, stable, and just Twenty-first Century.

This paper is an abridged version of a presentation the author gave at the 2006 International Law Symposium, “At the Nuclear Precipice. Nuclear Weapons and the Abandonment of International Law” held by the Nuclear Age Peace Foundation on February 23-25, 2006. The complete text is available at www.wagingpeace.org/menu/programs/international-law/annual-symposium/2006_papers/ graham-thomas_nap-2006-international-law-symposium.pdf

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Roadmaps to Disarmament
A Strategy for the Second Nuclear Era

Wade L. Huntley

The Non-Proliferation Treaty (NTP) Review Conference in May 2005 ended in utter stalemate, producing no new ideas or proposals for strengthening the NPT regime or for confronting the crucial challenges of expanding nuclear dangers that the world today faces. The failure of the existing nuclear states to move genuinely toward their NPT nuclear disarmament commitments, combined with problematic compliance with NPT safeguards among many key non-nuclear states, have placed the NPT regime under unprecedented pressure. This paralysis highlights the present stagnation of global efforts to move meaningfully toward comprehensive nuclear disarmament.

Roadmaps to Disarmament

This paper outlines a new citizen-based initiative to rekindle nuclear disarmament by compelling all governments with extant or latent nuclear weapons capabilities to generate and publish “roadmaps” delineating how they would achieve disarmament. These roadmaps would then become the basis for transnational debate aimed at constituting a single public global roadmap. Roadmaps would overcome four principal obstacles to current disarmament efforts:

- Roadmaps would dispel the impression that nuclear disarmament is utopian – too distant and indefinable ever to be achieved.
- Roadmaps would be a constant reminder of the end to which all arms control and non-proliferation efforts are aimed.
- Each country’s individual roadmap would be a visible permanent metric of that state’s progress.
- The global roadmap would link all states in a sequential ordering clearly identifying which are “next” to take defined steps, preventing paralysis.

A New Nuclear Disarmament Strategy

Many governments today – both with and without nuclear weapons – are seduced by misplaced faith in the power and prestige of nuclear capabilities. Such governments have become increasingly ambivalent about the goal of nuclear disarmament.

Hence, nuclear disarmament cannot be achieved solely through inter-governmental mechanisms such as the NPT. Nuclear disarmament is now also very much about superseding the prerogatives of governments. This suggests the need to conceptualize the challenge of nuclear disarmament as a global public policy issue related to human security. It also suggests that a new disarmament initiative cannot be expected from governments – it must come from the people.

A new strategy to press governments to respond to the conditions of this new nuclear era must begin by reviving the global public’s sense of the urgency to meet the considerable nuclear dangers the world still faces. Because governments have become so quiescent, this strategy would aim to mobilize popular power to compel governments to act meaningfully to achieve nuclear disarmament.

The United States bears a particular responsibility for leadership. Given today’s global political realities, real progress toward nuclear disarmament requires the United States to take a leading role. Yet its government is among the most recalcitrant.

Therefore it is in the United States that popular power most requires mobilizing. Although opinion polls in the United States as much as elsewhere show broad public support for a world without nuclear weapons, few Americans consider nuclear abolition possible or realistic – the nuclear “status quo” has become an increasingly entrenched way of thinking.

Hence, the US public must be the primary focus of a new strategy to compel governments to action.

Drawing National Roadmaps

The central feature of this new disarmament process would be to compel all governments with extant or latent nuclear weapons capabilities to generate and publish roadmaps delineating how they would achieve nuclear disarmament.

Developing a national roadmap would not oblige any state initially to dismantle a single nuclear weapon. This is an advantage, because governments could not logically resist undertaking this small disarmament measure on grounds of national security, as happens with efforts to obtain other measures dealing with capabilities directly (such as de-alerting). The call to develop nothing more than a plan for disarmament would be non-threatening in the short term to even the most ardent defender of nuclear weapons.

At the same time, disarmament roadmaps would act powerfully to reverse popular perceptions that nuclear disarmament, if desirable, is implausible or utopian. Nuclear arms advocates feed this perception by blithely dismissing nuclear disarmament as “unrealistic” in a dangerous world. Roadmaps, embodying a finite set of criteria and steps to achieve disarmament, would by their nature clear away the fog obscuring the path from today to a nuclear weapons-free world. Thus, demanding nuclear roadmaps would reinvigorate the idea of nuclear abolition in the public discourse. It would democratize the nuclear debate again, as was done during the nuclear freeze campaign of the 1980s – except now focusing on eliminating nuclear weapons rather than merely halting their buildup. Generating the roadmaps would begin the necessary process of national and international planning for nuclear disarmament, and create official
government documents spelling out how to proceed.

Because the roadmaps would be compelled not just from the nine nuclear-armed states but also from states with latent nuclear capabilities, all countries would bear an equal responsibility to the obligation. In the United States, where the popular movement to compel these roadmaps should begin, the objective would be to achieve federal legislation requiring the US government to prepare a disarmament roadmap and specifying the detailed criteria that roadmap would meet.

**Roadmap Terms**

Each state producing a roadmap would specify its material and political prerequisites for disarmament, and detail specific plans for verifiably eliminating all elements of its nuclear capabilities. This would include the irreversible dismantling of existing nuclear arms and verifiable restriction of all nuclear weapons development capacities of peaceful nuclear facilities.1

For states with nuclear weapons, issues to be addressed would include:

- The technical facilities, capabilities, and procedures required to verifiably eliminate the nation’s nuclear arsenal and securely dispose of the fissile materials contained in them.
- The timeline for phased dismantlement and disposition of these physical capabilities.
- The technologies and procedures necessary to allow international verification of nuclear disarmament while ensuring that the verification process itself does not risk proliferation of sensitive nuclear knowledge. For both states with nuclear weapons and other states possessing latent nuclear weapons capabilities, issues to be addressed would include:
  - The national capacity to prepare a complete accounting for all fissile materials in the nation’s territory.
  - The procedures or policies to provide high confidence that no state is hiding nuclear material or weapons, while claiming either to have eliminated its nuclear arsenal or to have never possessed one in the first place.
  - The level of confidence the state would require in disarmament verification before it could verifiably dismante the last nuclear weapon or put the last kilogram of fissile material under IAEA safeguards.
- The national security conditions required to eliminate all national need for reliance on nuclear weapons and nuclear deterrence, through security assurances under irreversible international agreement where possible or through conventional force substitutes where necessary.
- Economic conversion mechanisms to provide adjustment assistance, alternative employment opportunities and income security for the people and communities that now depend on nuclear weapons systems for their livelihood.

Publication of these national reports would create a matrix of conditions for global nuclear disarmament. The cumulative list would no doubt be daunting. But the existence of these national roadmaps would initiate global dialog and debate toward combining them into a single roadmap to disarmament.

The existence of the concrete roadmaps would also curb extremes of the current debate over the prospect of global nuclear disarmament. Nuclear arms advocates, faced with a finite set of criteria for disarmament, would no longer be able to blithely dismiss nuclear disarmament as a utopian aspiration without real meaning in the practical world. At the same time, proponents of disarmament would face directly the difficult technical and political security challenges that would have to be overcome to achieve nuclear abolition.

After a suitable period of dialog, an international conference would be convened to knit together the roadmaps into a single global plan for nuclear disarmament capable of receiving universal support. This conference would be convened under the authority of the UN Security Council, either under the auspices of the UN Conference on Disarmament, the IAEA, or as an independent process. The conference would meet without an expiration date until the global roadmap is achieved.

Alternatively, the roadmap plans could be framed in the context of existing international responsibilities, such as the disarmament obligations of all NPT members under Article VI of that treaty2 and the International Court of Justice (ICJ) ruling that there exists a duty to pursue and conclusively achieve nuclear disarmament. The roadmap plans could also be implemented as a series of reciprocal independent initiatives, following the model of the 1991 U.S.-Soviet reductions; such initiatives could complement more multilateral processes by sustaining momentum of practical disarmament steps.

The resulting roadmap will be complex, and its timeline for achievement would likely be extended. Implementation of the roadmap would be fraught with challenges as international conditions continue to evolve in unpredictable ways. But with a roadmap in hand specifying reciprocal steps by all states, progress could be carefully metered and monitored, and accountability for setbacks fairly allocated.

**A Civil Society Strategy**

Building momentum for nuclear roadmaps would require a vast and sustained commitment of citizen involvement. Civil society mobilization should begin in the United States, but would ultimately be initiated in all countries with existing or latent nuclear weapons capabilities. In the United States, the strategy would focus on insisting that the US government develop a disarmament roadmap. The ultimate aim would be to have a Congressional mandate requiring the government to produce a detailed roadmap according to a fixed timeline (perhaps attached as a binding amendment to defense authorization legislation).

The civil society strategy could follow two simultaneous tracks.

- **Model Resolution.** In the United States the strategy would focus on developing a model resolution: a simple statement describing the purpose of the disarmament roadmap, obliging the government to produce a meaningful roadmap and outlining what the criteria of the roadmap should be. The campaign would encourage adoption of the model resolution by citizens groups, religious bodies, government councils and agencies, professional associations, trade unions, business groups, service organizations, and other civil society groups. The goal would be to gain the endorsement of thousands of such groups, so that vir-
Roadmaps to Disarmament

A further stage of this strategy would involve presenting the resolution to voters in non-binding ballot measures. This second phase could begin after the first is already under way and could be tested in a pilot project in a few localities.

**Independent Roadmaps.** In addition to demanding that governments develop disarmament roadmaps, citizens groups could develop their own roadmaps. They could publicize or update the best of the existing plans for disarmament, such as the 1996 Canberra Commission report. They could hold citizen hearings and invite expert testimony on why and how governments should proceed toward the elimination of nuclear weapons. People could be encouraged to learn about and develop proposals for nuclear disarmament. To demonstrate the viability of renouncing nuclear weapons, the campaign could produce reports and analyses examining the experiences of countries such as South Africa and Ukraine that gave up nuclear weapons after acquiring or developing them.

This activity would serve several purposes:
- Educate millions of people on both the need for and practicality of nuclear disarmament.
- Invest in these people the commitment to work for the elimination of nuclear weapons.
- Demonstrate the viability of governmental roadmaps, further underlining the plausibility of nuclear disarmament.
- Increase popular pressure for governments to adopt roadmaps.

**Questions and Challenges**

Several questions and challenges remain to be addressed.

It is quite conceivable that the U.S. government and other nuclear weapons states will simply refuse to develop the required nuclear roadmaps, or will produce documents asserting that disarmament is impossible. These governments are, after all, more ambivalent about disarmament than ever before.

The campaign can anticipate this resistance by assuring that the requirements for roadmaps are established in binding law, and that the requirements for the roadmaps are highly specific. More importantly, the campaign must develop sufficiently strong levels of political support to mobilize pressure for the government to fulfill its obligation to plan for disarmament. This depth of support may require years to generate, and the campaign should attempt to require a legally binding disarmament roadmap from Congress only after it has already developed a very broad base of public support.

The next challenge would be to insure that governments producing roadmaps actually implement them. There are many progressive plans that are never implemented because of political resistance from entrenched vested interests.

The response to this resistance would be to refocus the campaign on the new goal to “start the plan” by focusing on implementation of the first steps provided in the plan, whatever they may be. At this stage the campaign would direct its momentum toward ensuring that elected officials remain accountable for seeing that implementation of the roadmap is fulfilled.

It is important to remember that the very process of building the campaign for nuclear roadmaps will change the public debate and prompt a range of responses from political adversaries and third parties. Typically, as such campaigns generate momentum, efforts emerge to undercut them through compromise. During the nuclear freeze campaign, for example, congressional moderates responded by generating pressure on the Reagan administration to adopt a more flexible arms control negotiating policy toward the Soviet Union. A disarmament roadmaps campaign must be prepared for similar responses.

An intricate problem will emerge if a transformation of the US position is achieved, but governments of other nuclear-armed or nuclear-capable states fail to reciprocate. Each state’s roadmap, including that of the United States, will likely be tied to conditions requiring other states to act as well. No state will be able to fully implement its roadmap without reciprocity.

This problem is the reason for international coordination of the roadmaps, either through an international conference or other means, to link the roadmaps to one another, spelling out the sequencing of reciprocal implementation. The integrated global plan will in itself provide a powerful political instrument to pressure governments to follow through with commitments, because each stage of implementation of the global plan would be universally known and the state(s) responsible for the next steps evident to all. No state could deny, as they can today, that it is “their turn” to act.

But the United States, as the world’s preeminent power, has an assurance of security exceeding all other states. This provides it with latitude of action enabling it to “go first.” Moreover, US preeminence today sets the tone for global politics. Current policies entrenching US commitment to retaining its nuclear capabilities endorse and embolden proliferation ambitions worldwide. A reversed US posture firmly forewarns any reliance on nuclear threats would dramatically deflate the image of nuclear weapons as a useful currency of world power. Increased US support for existing international institutions aiming to curb nuclear proliferation would further impinge the abilities of smaller countries to resist global pressures to adopt and follow their own disarmament roadmaps.

Ultimately, if other states fail to reciprocate, the disarmament process will stall. But if the United States is fulfilling a genuine leadership role, mobilizing global civil society to begin pressuring other states to follow through will be a much more achievable objective than at present.

Perhaps the most important challenge will be sustaining the required level of citizen commitment and involvement over the several years that will be necessary to achieve the objective of an integrated global roadmap. This problem cannot be “solved” but it can be managed by establishing a series of achievable interim goals and objectives that will give citizens a sense of empowerment to continue the campaign toward the longer range objective. Gaining approval for roadmap resolutions will provide opportunities for achieving interim objectives. Each church body or professional organization that adopts the civil society resolu-
tion will provide a victory for those who organize for it. Winning voter referendums and campaigns on behalf of the resolution will provide an even greater sense of empowerment. These victories will build upon one another as the campaign gradually acquires momentum for the challenge of pressuring Congress and the federal government.

Interim victories also can be achieved by linking the long-range effort to short-term campaigns against, for example, the development of new nuclear weapons. The recent effort to block the bunker buster (successful for the moment) advances the longer range goal. The campaign will also address other interim challenges and opportunities as they arise, constantly linking short-term efforts to the long range objectives. This linkage, in turn, will help cement the shorter-term gains. By combining short and long term efforts in this manner, the campaign can empower its supporters with interim successes while building momentum over the long term to abolish nuclear weapons.

Conclusion

Nuclear disarmament has always been not only an ultimate goal, but also a vision with practical consequences for nearer-term arms control and nonproliferation practices. The vision reminds us that arms control and nonproliferation are means to a greater end, not simply instruments to curb the greatest dangers of a nuclear status quo. Sustaining global nuclear disarmament as the ultimate objective is a prerequisite for any arms control and nonproliferation achievements to be sustainable. In other words, to be realistic, solutions even to immediate nuclear challenges must aim to advance nuclear disarmament.

But today, we face a cruel paradox: success in mitigating the greatest nuclear dangers of the Cold War era has made it easier for governments to disassociate the nearer-term means from the ultimate end. Some nuclear dangers of the emerging second nuclear era are more potent than those of the first. But these nuclear dangers are also different in kind, and not strictly comparable. Now more than ever, these dangers are tied to threats to use nuclear weapons to instill fear and seek gain in specific social and political contexts.

Here emerges a second paradox: although the responsibility of states to pursue disarmament is broader, the diminution of the prospect of massive nuclear war has made the world appear to be “safer” for governments to embrace nuclear capabilities (extant or latent) as currencies of power and prestige. Governments of states possessing nuclear weapons increasingly regard arms control not as a means to disarmament but as an instrument only to curb the greatest dangers of a nuclear status quo. Governments of incipient nuclear weapons states increasingly regard nonproliferation not as a means to disarmament but as an instrument only to prevent new entrants into the nuclear “club.” Both sets of governments, grasping the short-term “fix” nuclear weapons seem to offer, have abandoned the long-term imperative of nuclear disarmament.

For this reason, civil society efforts to rekindle a global movement toward nuclear disarmament are as vital as ever. More than before, such efforts must now also recognize the depths to which nuclear weapons and nuclear threat-making are enmeshed in global security structures, and must therefore also offer progressive new forms of global governance that create security structures sustainable in a non-nuclear world. The imperative of nuclear disarmament is today inseparable from the need to establish new forms of global governance independent of the sovereign state system and based on principles of law and democratic accountability.

Realizing practical progress toward nuclear disarmament, however incremental, sustains the viability of this vision. Such progress further constitutes that vision by adding depth and substance to it, and transmits to future generations the requisite knowledge and skills, and imagination, to carry forth that imperative.

We know that, with wisdom and conviction, real near-term progress can be made. The experiences of the early 1990s, among others, have proven that. We also know that the ultimate goals, if distant, are not utopian. In the words of William Arthur Ward, “If you can imagine it, you can achieve it. If you can dream it, you can become it.”

This essay reflects substantial contributions by David Cortright, Fourth Freedom Forum.

1 Some of the subsequent criteria are drawn from George Perkovich, et al., Universal Compliance: A Strategy for Nuclear Security, Report by the Carnegie Endowment for International Peace, March 2005, pp.145-57. The present proposal broadens the disarmament concept of Universal Compliance by calling for participation by all countries with potential nuclear weapons capabilities, not just with fissile material stocks, and by including in the roadmaps each country’s security and political as well as material prerequisites.

2 Note that the non-universality and discriminatory basis of NPT membership may limit its applicability as a legal framework to which roadmap-based disarmament obligations could be attached.

3 States are unlikely to go away any time soon, and will remain the loci of decisions to develop nuclear weapons and utilize nuclear threats. But globalization is already producing new forms of transnational non-governmental communication and action that impinges state sovereignty and constitutes incipient alternative global governance mechanisms. These mechanisms can be nurtured and grown to supplement domestic efforts and effectively increase all states’ accountability for nuclear weapons decision-making.

4 Thoughts of a Christian optimist, vol. II: The words of William Arthur Ward


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Joseph Rotblat: From Los Alamos to Pugwash

Mel Watkins

Born Jozef Rotblat in Warsaw, Poland, in 1908, he died Sir Joseph Rotblat in London, England, August 31, 2005.1 He lived long and died in his sleep. We should all be so lucky.

He got what he deserved. For his was a remarkably good and productive life. Indeed, it deserves to be thrice celebrated. First, for one of most principled acts of the twentieth century, a lonely act of great moral courage. Second, for using his skills as a nuclear physicist to help rather than hurt people. Third, for building a movement which, in its day, arguably lessened the risk of nuclear war.

His life did not start well, though he preferred not to talk about it. “The first world war turned Europe into a charnel house triggering, among other things, a wave of anti-Semitism that swept away his family’s business and position. Rotblat grew up as an increasingly deprived, often hungry and sometimes physically abused child in the breadlines of a starving nation.” The obituary in the Guardian concludes: “These years forged Rotblat’s unsparing ideals of world peace and of the use of science for the benefit of man and the planet.”

In spite of the difficulties, Rotblat got his doctorate in experimental physics from the University of Warsaw and in 1937 became assistant director of its Atomic Physics Institute. When nuclear fission in uranium was discovered in 1939, he began working on it in Warsaw. By happy coincidence, for he was Jewish, he moved to Liverpool for a year to work with the physicist James Chadwick – who had discovered the neutron – two days before Hitler attacked Poland. Sadly, his wife, who was ill and was to join him, and who was also Jewish, did not survive the Nazi invasion, a fact he did not learn till 1945 though British intelligence had known since 1941. He never remarried. Pugwash was to become his family.

Rotblat, more so than most scientists at that time, had doubts about working on a weapon of mass destruction but, sharing the common fear that Hitler was building an atomic bomb, he joined the British bomb project with the code name of Tube Alloys, and then, when the Americans assumed full responsibility, the Manhattan Project in Los Alamos. Though a resident of the U.K., Rotblat was still a Polish citizen. Told that he would have to take out British citizenship in order to work on the Manhattan Project, he refused. Chadwick, now head of the British mission to Los Alamos, had to intervene directly with General Leslie Groves, the army head of the Manhattan Project, and give his word on Rotblat’s “integrity.”2 There was evident a stubborn streak in Rotblat which was shortly to serve him well.

The prospect of a madman like Hitler having the bomb was surely a powerful and for most a compelling argument for the Allied effort to beat him or match him. Still, it is worth noting that some, albeit a few, physicists said “No” from the outside, including such distinguished names as the German Max Born who was one of the greatest physicists of the twentieth century and who also found refuge in Britain; the Austrian Lise Meitner who was co-discoverer of nuclear fission and spent the Second World War in Sweden; and the Italian Franco Rasetti who was an intimate of Enrico Fermi who went to the U.S. to build the bomb while Rasetti chose to go far off the beaten path to Laval University to found a physics department and retool himself as a paleontologist.

With his wonderful sense of humour, but also by way of explaining what he had done, Rotblat liked to smile and say that the bomb was a deterrent before it even existed. Indeed, he would sometimes claim credit for being the first to see the bomb as a deterrent, and that therefore he thought it would never have actually to be used. “My scenario never envisaged that we should use it, not even against the Germans.”3 But he came quickly to know that he had been wrong, terribly wrong, that the bomb should never have been built in the first place. The bomb was used against Japan which had no bomb in what Rotblat saw as “a wanton and barbaric act.”4 For the rest of his life, as the bomb proliferated and grew quantitatively and qualitatively, he insisted that without abolition of nuclear weapons only luck could save us from their eventual catastrophic use.

As to Hitler’s bomb, it was at the beginning of the war a prospect that could hardly be ruled out. Still, the fatal flaw in this line of reasoning is that by late 1944 it was known to those on the inside, from the American intelligence unit Alsos that followed Allied forces through France into Germany, that there was no German bomb project, nothing even close to it. (They also scooped up German scientists to make sure the Soviet Union didn’t get them – evidence of an embryonic Cold War mindset so closely linked to the bomb that it’s impossible to say which is cause and which is effect.) Rotblat learned of this directly from his mentor Chadwick who, as head of the British mission to Los Alamos, was close to British intelligence, and at whose Los Alamos home Rotblat roomed.

The Legacy of Joseph Rotblat

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In the thousands of pages that have been written about the bomb it’s hard to find a clear answer to the question of which scientists working on the Manhattan Project knew there was no German bomb project and when they knew it. In the rumour mill of the Manhattan Project, many of the scientists appear to have suspected what Rotblat knew. Logically, those who were building the bomb because of Hitler should have downed tools; having justified what they were doing as building a deterrent, it was now unambiguously the case that they were building a weapon of mass destruction. In fact, incredibly, only one did, and that was Rotblat. In the words of the American physicist and writer Freeman Dyson, “Only one man paused.” – and he didn’t just pause, he stopped for good. Subsequently, the Nobel Prize winning German physicist James Franck, who came to Los Alamos and in 1945 tried to persuade the American authorities not to drop the bombs on Japan, told Rotblat that he regretted not having joined him – which has the further virtue of telling us that Franck as well (and how many others?) knew that there was no German bomb project.

Years later, in 1985, Rotblat asked why others had not quit. From his conversations with scientists he found that the most common reason given was simply scientific curiosity, the pursuit of what J. Robert Oppenheimer called “the technically sweet”, the seduction of science, the pure momentum of the profession. Others felt that American lives would be saved if the bomb hastened the end of the war with Japan, but they had no competence on this matter and the notorious judgment of history is mostly not on their side; with peace they assumed the bomb could be sensibly dealt with, in retrospect a remarkably naïve notion. Some felt that their careers would be adversely affected if they quit. The prevailing sentiment among the scientists, according to Rotblat, was to let others, the political people, decide. Nuclear physicists had the extraordinary minds that mattered most in the mid-twentieth century – those assembled in the Manhattan Project were literally a crowd of geniuses – yet there is something terribly ordinary about how those minds operated outside of their narrow field. They were without conscience or, in the language of John Ralston Saul, “unconscious.”

Rotblat himself observed: “Our concepts of morality seem to get thrown overboard once military action starts.”

American security officials were deeply suspicious of what Rotblat was doing. They thought he was a Soviet spy and because he had a pilot’s license, they imagined he might defect to the USSR. His books and papers were seized by the F.B.I. He was obliged to commit himself to secrecy at threat of imprisonment, to not even telling his colleagues at Los Alamos why he was leaving, to having no further contact with them, to not speaking with the media, and he was barred entry to the U.S. till 1951. (At one point he tried to go to America to talk with Einstein about what should be done about the escalating arms race and was denied a visa because of his leaving Los Alamos.) A weapon that was supposedly being built to defend democracy had a striking capacity to constrain individual freedom. All the while, the physicist Klaus Fuchs laboured away at Los Alamos while spying for the Soviet Union; it was one of those colossal failures of intelligence that have now become routine.

The bomb likewise did wonders for the ambitions of an ascending power. Indeed, in March 1944, Rotblat was at a private dinner in Chadwick’s house in Los Alamos where General Leslie Groves, the head of the Manhattan Project, had stated that “You realize, of course, that the main purpose of this project is to subdue the Russians.” (Some versions of this story say “Russkies.”) Rotblat was shocked. He was no fan of the U.S.S.R. but he thought it no way to treat an ally that was paying heavily in blood. It re-ignited his doubts about what he was doing. He was right to be deeply concerned, for Groves, though lacking in subtlety, was no crazed General mouthing private fantasies. Tellingly, the purpose of the elaborate security that surrounded the Manhattan Project was to keep the Soviet Union, not Germany as one might imagine, in ignorance; that point was understood both in the White House and No.10 Downing Street. And we have long known that from the outset, there was concern at the highest political level about postwar planning assuming the bomb had been built, and that this was code for how the Soviet Union would be dealt with.

By others not stopping work, the bomb got built and having been built it came to be seen as sensible to use it, and thus the horrors of Hiroshima and Nagasaki. And, though Hitler is long dead, the bomb lives on with no present sign of going away; indeed, in the era of George W. Bush, it has taken on a new life that threatens to return us to the truly dangerous days of the first half of the Cold War.

Historians, if they even bother to take note of what Rotblat did, sometimes treat it as a mere gesture, but it is not Rotblat’s fault that others lacked his integrity. It was an extraordinary act that deserves never to be forgotten and forever to be celebrated. While a good deal of the literature on the bomb is organized around the choices made at critical moments, from the original British-American decision to build the bomb to the Cuban Missile Crisis to the recent American decision to reverse arms control, the decision to continue to build the bomb after it was clear that the Germans were not in the race is rarely included because the conven-
tional wisdom regards it as a no-brainer. It wasn’t. That this was never contemplated in Washington is consistent with the view that the prospect of the bomb was officially seen as too good to give up. Or, yet worse, that the bomb had already taken on a life of its own. It makes it all the more amazing that Rotblat realized that there was a decision to be made and that it was such a radical thing to do that it changed his life.

In that ancient adage, at the time Rotblat had “insight into much and power over nothing.” He was alone in his insight. He bore witness at the first opportunity. He spent his life pleading with scientists to do what they could, individually and collectively, to constrain power. He did what he could and what he should.

Rotblat returned to Britain. With Poland under Soviet occupation, he now took out British citizenship. He decided to abandon physics and study medicine but he was persuaded by medical practitioners that it was such a radical thing to do and it changed his life. He bore witness at the first opportunity. He spent his life pleading with scientists to do what they could, individually and collectively, to constrain power. He did what he could and what he should.

Rotblat was also a founding member of the Campaign for Nuclear Disarmament (CND) in 1958; briefly on its executive committee, he dropped off to devote more time to his first love, which was Pugwash.

It is generally agreed that Pugwash, in which Rotblat was “the most important figure,” played a role, arguably a significant one, in the thawing of the Cold War. The Pugwash model, with its annual worldwide gathering, backed by its chapters in many countries, was intended to bring together influential scientists from around the world, and particularly from the U.S. and the U.S.S.R., an event that in itself demonstrated that dialogue was possible over the chasm of the Cold War. To encourage a free exchange of ideas, all meetings were private. These scholars, chosen to be Pugwash members, had access to their respective governments and would work to improve the climate for nuclear disarmament. They had the technical knowledge essential to the details of arms control agreements. After the Cuban Missile Crisis, which Rotblat called “the most terrifying moment in my life,” there was indeed a proliferation of arms control agreements for which Pugwash, by being in place, can properly claim some credit; as their web-site modestly puts it, for having “played useful background roles in helping lay the groundwork.”

As governments built up their own technical expertise on arms control, Pugwash moved to broaden those it invited to be members, adding social scientists, particularly political scientists and experts in international relations, who could be helpful in talking with governments, and broaden its concerns to include biological and chemical weapons, the environmental crisis, and the growing gulf between the North and the South. While doing educational work through its publications – Rotblat himself authored, co-authored, edited, co-edited, twenty-four books, the last one in 2003 – Pugwash continued mostly to operate privately and to give a low priority to working through the media or collaborating with other peace groups.

The model worked and got its just reward: in 1995, Rotblat personally and the Pugwash Conference were jointly awarded the Nobel Peace Prize. In his acceptance speech Rotblat confessed that when he started as
a scientist “I did not imagine that the second half of my life would be spent on efforts to avert a mortal danger to humanity created by science.” Rotblat wryly added: “We have been trying for forty years to save the world, sometimes against the world’s wishes.” He concluded with an appeal to scientists and everyone else that echoed the plea of the Russell-Einstein Manifesto: “Above all, remember your humanity.” 24 In an interview with the Guardian in 2005, he said: “When I received the Nobel peace prize, the Committee said our efforts had contributed to preventing a nuclear war.” High praise indeed, but Rotblat modestly added, “Maybe to a tiny extent, we did.” 25

In the same year, the Australian government created the Canberra Commission of eminent persons, including Rotblat, to advise on nuclear weapons policy; its report in 1996 called for the abolition of nuclear weapons. In 1992, Rotblat – jointly with the physicist Hans Bethe, an advocate of arms control whom Rotblat respected – was awarded the Einstein peace prize.

While the British government was initially suspicious of Pugwash and Rotblat, they came to value their contribution to arms control. In the aftermath of the Partial Test Ban Treaty of 1963, Rotblat was honoured with a CBE (Commander of the British Empire) in 1964. 26 In 1998, Rotblat was knighted, fittingly “for services to international understanding.” 27

Still, as early as the 1970’s, the very distinguished Swedish disarmament advocate and practitioner Alva Myrdal, while lauding Pugwash’s bringing together of scientists from the two blocs as a “very worthwhile seminal activity,” thought the model, in order to have access to power, risked a deferential attitude toward governments and that, by neglecting the media, scientists “largely lost influence they might gain in pressuring for a change in policies.” 28 In the late 1980s, Andrei Sakharov, having been liberated by Mikhail Gorbachev, attended his first Pugwash Conference; he thought it all talk and decided “Let Pugwash do its work. But without me!” 29

Gorbachev himself, however, lauded scientists, particularly Soviet and American, for being “the first” to speak out against the nuclear arms race, and told Rotblat that “the Pugwash movement had been especially important in this regard.” 30

By the end of his life, Rotblat himself was calling for change. At Pugwash’s annual conference in Halifax in 2003, he delivered a lucid one hour public lecture, warning on the worsening situation with respect to nuclear weapons and the urgent need for a campaign of public education and for Pugwash to reform itself. “Pugwash has often been accused – perhaps justifiably – of being an exclusive club. But even if our own mode of work has been justified in the past, I believe the time has come to open up.” 31 Though unable to travel to Hiroshima in 2005 for the 50th anniversary meeting – the only one of Pugwash’s annual global gatherings that he ever missed – he sent a message to be read that reiterated what he had said in Halifax. “I am coming to believe that the time has come for Pugwash, while not for a moment relinquishing its scientific integrity, to lay the facts before the public. The end of the Cold War has led to public complacency, but in fact the dangers of a nuclear conflict are about as high as they have ever been.

In the U.K., we have been running a campaign, in collaboration with other organizations, to make the public aware of the dangers. I hope that Pugwash Groups in other countries will follow and improve upon our example.” 32

It is evident that Sir Jo, as he was affectionately called, continued to play an active role in Pugwash until his death. Pugwash owes it to him to heed his advice. The times have indeed cast elitist models into the dustbin.

In his autobiography, Bertrand Russell wrote of Rotblat: “He can have few rivals in the courage and integrity and complete self-abnegation with which he has given up his own career (in which, however, he still remains eminent) to devote himself to combating the nuclear peril as well as other allied evils.” 33 “Rotblat stands out,” writes the historian and philosopher of science John Cornwell, “as an extraordinarily courageous and principled individual, prepared to resist the pressures of the prevailing tide of opinion.” 34 In 1996, he was prepared to use, and to risk, his now considerable reputation in appealing to Israel to show clemency for Mordechai Vanunu whose crime was to tell the world what it already knew, that Israel had nuclear weapons. When the day comes that the story of the abolition of nuclear weapons is written, it could best begin with the name of Joseph Rotblat.

1 See the excellent obituary, Guardian Weekly (September 9–15, 2005), p. 27.
5 Ibid., p. 68.
7 Interview, June 2003, Halifax/Pugwash.
9 Rotblat, op.cit., p. 17.
11 Rotblat, op.cit., p. 19.
12 Fred Jerome, The Einstein File: J. Edgar
To the Inheritors of the Manhattan Project

Professor Sir Joseph Rotblat

On 6 July 2005, the Atomic Mirror wrote a letter to Professor Joseph Rotblat, the only nuclear scientist to walk away from the Manhattan Project, asking if he would like to send a message back to Los Alamos for the 16 July, 2006, 60th anniversary of the Trinity atomic test in New Mexico in remembrance of the birth of the nuclear age. He responded with the following message.

In national research laboratories, such as Los Alamos or Livermore in the USA, Chelyabinsk or Arzamas in Russia, and Aldermaston in the UK, many thousands of scientists are employed doing pure and applied research for specific purposes, cloaked in secrecy, purposes that I see as the negation of scientific pursuit: the development of new, or the improvement of old weapons of mass destruction. Among these thousands there may be some scientists who are motivated by considerations of national security. The vast majority, however, have no such motivation; in the past they were lured into this work by the siren call of rapid advancement and unlimited opportunity. What is going on in these laboratories is not only a terrible waste of scientific endeavour but a perversion of the noble calling of science.

The Nobel Laureate Hans Bethe, who was a most distinguished physicist, and one-time leader of the Manhattan Project, said:

“Today we are rightly in an era of disarmament and dismantlement of nuclear weapons. But in some countries nuclear weapons development still continues. Whether and when the various Nations of the World can agree to stop this is uncertain. But individual scientists can still influence this process by withholding their skills.

Accordingly, I call on all scientists in all countries to cease and desist from work creating, developing, improving and manufacturing further nuclear weapons - and, for that matter, other weapons of potential mass destruction such as chemical and biological weapons.”

I would like to see an endorsement of this call by the scientific community. I will go further and suggest that the scientific community should demand the elimination of nuclear weapons and, in the first instance, request that the nuclear powers honour their obligations under the Non-Proliferation Treaty.

Let me, in conclusion, remind you that the basic human value is life itself; the most important of human rights is the right to live. It is the duty of scientists to see to it that, through their work, life will not be put into peril, but will be made safe and its quality enhanced.

Joseph Rotblat; 12 July 2005
Joseph Rotblat: A Man of Peace

David Krieger

Joseph Rotblat lived a long life – a life dedicated to peace and the abolition of nuclear weapons. He was a quiet, unassuming man, a scientist who became a leader in the global effort to abolish nuclear weapons. Joseph Rotblat’s life was shaped by the horrors of World War II and his participation in the British and American projects to create an atomic weapon. He believed that the only justification for creating such a weapon was to deter the Germans in the event they succeeded in also doing so. When Rotblat realized in late 1944 that the Germans would not succeed in this attempt, he left the US atomic bomb project at Los Alamos, New Mexico, and returned to London. He was the only Manhattan Project scientist to leave the project on principle, and he would spend the rest of his life working to eliminate nuclear weapons and war. He would never again work on creating a weapon, and spent the remainder of his career working as a physicist at St. Bartholomew’s Hospital in London.

Joseph Rotblat was born in Warsaw, Poland, in 1908. At the age of 30, he accepted a fellowship and went to London to work with physicist and Nobel Laureate James Chadwick, the scientist who had proved the existence of neutrons. Rotblat left Warsaw just days ahead of the Nazi invasion of Poland. His work with Chadwick led to his involvement first with the British atomic bomb project and then with the American Manhattan Project at Los Alamos. He left the Manhattan Project about seven months before the first nuclear weapon was tested in the New Mexico dessert. He learned of the bomb’s successful creation only when he heard of its use at Hiroshima and Nagasaki. Stunned by the decision to use the bomb against civilian populations and its further potential to destroy civilization, he committed himself to working for the total elimination of these weapons and the elimination of war.

Rotblat helped Bertrand Russell in drafting one of the seminal documents of the 20th Century, the Russell-Einstein Manifesto, which was released on July 9, 1955, nearly ten years after the destruction of Hiroshima and Nagasaki and only a few years after the first tests of the far more powerful hydrogen bombs. The Manifesto, signed by Einstein just days before his death, begins, “In the tragic situation which confronts humanity, we feel that scientists should assemble in conference to appraise the perils that have arisen as a result of the development of weapons of mass destruction, and to discuss a resolution in the spirit of the appended draft.”

The resolution to which the document referred was directed to the scientists of the world and to the general public. It stated: “In view of the fact that in any future war nuclear weapons will certainly be employed, and that such weapons threaten the continued existence of mankind, we urge the governments of the world to realize, and to acknowledge publicly, that their purpose cannot be furthered by a world war, and we urge them, consequently, to find peaceful means for the settlement of all matters of dispute between them.”

Joseph Rotblat was one of only nine high-level scientists to join Russell and Einstein as the initial signatories of this Appeal. He would devote the rest of his life to realizing the aims of the Appeal.

The issuing of the Russell-Einstein Manifesto led to a groundbreaking meeting of scientists from East and West in 1957 to address the dangers of nuclear weapons. The scientists gathered in the small fishing village of Pugwash, Nova Scotia, under the sponsorship of Canadian-American industrialist Cyrus Eaton. This, in turn, led to the creation of the Pugwash Conferences on Science and World Affairs, an organization that became influential in achieving dialogue between scientists from both sides of the Iron Curtain. Rotblat served as the Secretary-General of Pugwash from 1957 to 1973, and later as president of the organization from 1988 to 1997.

During his long life, Rotblat was a tireless crusader for the elimination of nuclear weapons, but along with the other signers of the Russell-Einstein Manifesto, believed that this was not enough and that it was also necessary to abolish war. The Manifesto put the matter directly: “Here, then, is the problem which we present to you, stark and dreadful and inescapable: Shall we put an end to the human race; or shall mankind renounce war? People will not face this alternative because it is so difficult to abolish war.”

In 1995, fifty years after the first use of atomic weapons at Hiroshima and Nagasaki, Joseph Rotblat and the Pugwash Conferences were jointly awarded the Nobel Peace Prize. In his Nobel Lecture, Rotblat made three appeals. He appealed first to the nuclear weapon states “to abandon their out-of-date thinking of the Cold War period and take a fresh look.” He continued: “Above all, I appeal to
them to bear in mind the long-term threat that nuclear weapons pose to humankind and to begin action towards their elimination. Remember your duty to humanity."

His second appeal was to his fellow scientists. He called upon them to follow the call of senior Manhattan Project scientist Hans Bethe to give up all work on all weapons of mass destruction. "If all scientists heeded this call," Rotblat said, "there would be no more new nuclear warheads; no French scientists at Mururoa; no new chemical and biological poisons. The arms race would be truly over.

His third appeal was to "fellow citizens of all countries." He called upon them to prevail upon their governments to give up nuclear weapons and also war. "A nuclear-weapon-free world would be safer than the present one. But the danger of the ultimate catastrophe would still be there. The only way to prevent it is to abolish war altogether. War must cease to be an admissible social institution. We must learn to resolve our disputes by means other than military confrontation."

In the final words of his Nobel Lecture, he spoke as an elder statesman of humanity, sharing his abundant wisdom: "The quest for a war-free world has a basic purpose: survival. But if in the process we learn how to achieve it by love rather than fear, by kindness rather than by compulsion; if in the process we learn to combine the essential with the enjoyable, the expedient with the benevolent, the practical with the beautiful, this will be an extra incentive to embark on this great task. Above all, remember your humanity."

I first met Joseph Rotblat in Berlin in 1991 at the founding meeting of the International Network of Engineers and Scientists for Global Responsibility. I was impressed by his directness, honesty, wisdom and gentleness. In the years to follow, I would see Joseph at many other international meetings and my respect for him only deepened.

In 1997, Rotblat came to Santa Barbara to receive a Lifetime Achievement Award from the Nuclear Age Peace Foundation. During that period, we had many in-depth discussions and I conducted an interview with him on the issue of eliminating nuclear weapons. Since nearly all of what he said then remains valid and progress toward achieving a nuclear weapons-free world has been painfully slow, I would like to share that interview below.

Joseph Rotblat celebrated his 90th birthday in 1998 at the State of the World Forum in San Francisco. His remarks on that occasion reflected his enduring optimism. He said that his short-term goal was to eliminate nuclear weapons, and his long-term goal was to eliminate war. Even in his later years, he never lost his conviction that the impossible dream was achievable; it was just a matter of effort and time. His commitment to peace and a world free of nuclear weapons inspired people through his writing, traveling, speaking, and encouraging others throughout the world, an impassioned crusade for peace in which he continued until his final years.

Bertrand Russell said of Joseph Rotblat in his autobiography, "He can have few rivals in courage and integrity and complete self-abnegation with which he has given up his own career (in which, however, he still remains eminent) to devote himself to combating the nuclear peril as well as other allied evils." Joseph Rotblat loved science, but he loved humanity even more.

I saw Joseph for the last time in July 2005, when I stopped in London to visit him at his home. He was still recovering from a stroke, but he was alert and eager to get back to his work. We had a good talk and I was inspired by his indomitable spirit. Until his final days he was a warrior for peace, committed with all his being to the twin goals of abolishing nuclear weapons and abolishing war. Now it is up to us, to carry forward his legacy of peace.

When Joseph Rotblat received the Lifetime Achievement Award of the Nuclear Age Peace Foundation, he began his speech by describing his orientation toward peace: "I am a man of peace. I am a pacifist. I abhor war. I dislike any type of fighting, but I'm not an absolute pacifist. I would describe myself as a realistic pacifist although I know this sounds like an oxymoron. I'm not an absolute pacifist because I do not believe in absolutes. Nature is so immensely rich in its infinite varieties that nothing can be excluded. By the same token, anything could happen. Even events that seem out of this world can be realized if we put enough effort and faith into them. One such event is a world without war."

Joseph Rotblat believed in peace and human decency. He believed in possibilities that exceeded expectations. He believed in humanity, and he believed that the humanity within each of us could inspire and motivate us to contribute more to our common future. In his brilliant speeches and down-to-earth engagement with his friends and those he met throughout the world, he conveyed a consistent message. It is the message with which he ended his Nobel Lecture, and with which he lived his life: "Above all, remember your humanity."
We Owe an Allegiance to Humanity

An Interview with Joseph Rotblat
October 29, 1997

Krieger: Having worked for more than 50 years for the elimination of nuclear weapons, how would you assess the progress that’s been made toward achieving a nuclear weapons free world?

Rotblat: I believe that we have made significant progress. Perhaps hopes were a bit too optimistic that, with the end of the Cold War, very quickly we could get rid of all nuclear weapons because their purpose, if there was any purpose, certainly ceased to exist. We hoped that particularly the United States would then take drastic steps to get rid of the weapons. Steps have been taken, a certain amount of the dismantlement of weapons has taken place with a number of treaties, stopping testing, etc. But I am disappointed that the progress is not greater, particularly that the nuclear powers still stick to the same way of thinking as they did during the Cold War – that nuclear weapons are needed for security. As long as this thinking exists, there is not much hope that there will be an agreement by the nuclear powers to get rid of the weapons. I believe, however, that we’re gradually winning the logical argument against the retention of nuclear weapons. What is needed at the present is a push from the mass media and from mass movements to support the suggestions made in a number of recent studies. I believe that if this is done and specific ideas put forward which could easily be implemented, it will start the process of elimination of nuclear weapons which could be achieved in about two decades.

Krieger: What do you think is needed to achieve the sort of mass movement for abolition that you are calling for?

Rotblat: I think two things – a positive and a negative. The negative one is to point out that the problem with nuclear weapons has not been solved – that the progress which started the world toward disarmament has come to a halt. There is now a real danger that the nuclear arms race will start again and more nations will acquire nuclear weapons. People must realize that the nuclear issue should be put on the agenda because of the real threat that we will go back to the dangers that existed before the Cold War. People should be aware there is a danger.

And then, following out of this, we must put forth specific proposals which will start the whole disarmament process over again. In my opinion, among several proposals like dealing with nuclear weapons, separating warheads from missiles, all of which will make the world safer, we also need something which will enable us to go ahead to the actual elimination of nuclear weapons. One such step is a No First Use Treaty, providing that the nuclear weapons states will agree among themselves that the only purpose of nuclear weapons is to deter a nuclear attack and nothing else. Once they’ve agreed to this, if they agree to such a treaty, then I see the way directly open to the final step to the elimination of nuclear weapons.

Krieger: What will have to happen for the nuclear weapons states to take such a significant step?

Rotblat: They will have to be pushed towards it. And I said there are two things. One is to present the logical argument which is really unassailable. There’s no need for nuclear weapons today. It’s been shown that the world can live in better safety without nuclear weapons than with nuclear weapons. So the first thing is to convince the nuclear weapons states from the professional’s point of view, and then they’ll have to feel pressure from the people because, after all, they are subject to election. They can’t ignore the voice of the people. If we can build up a real mass movement – people demonstrating, writing petitions, writing to members of Parliament, etc. – if we can just build up to a real crescendo, than I think nuclear weapons states will just have to accept it.

Krieger: What you are calling for is a campaign to educate the people on the one hand and to educate the leaders on the other hand. Is that correct?

Rotblat: You cannot start a mass movement without telling people what they are trying to achieve. Therefore, when I speak about starting a mass movement, of course, it has to start by educating the people. Give them the facts. They should not just believe they are living in a world where nuclear weapons don’t matter. The truth now is that many people think that the danger is over completely, and this is the reason why the nuclear issue is no longer on the agenda. The first thing is to inform the people that the process is not complete, and in fact it may reverse. Give them the facts. Groups like yours, the Nuclear Age Peace Foundation, have a big task in this mass movement campaign for the abolition of nuclear weapons, part of the Abolition 2000 program.

Krieger: Do you believe that we will achieve a nuclear weapons free world in a reasonable period of time?

Rotblat: I don’t know what is reasonable. I would like to see it in my lifetime, at least the beginning. What is important is for the nuclear weapons states to get away from the mode of thinking that nuclear weapons are needed for security. This I believe could be achieved very quickly. It could be done next year. I believe that if this were achieved, if leaders really accepted a No First Use Treaty, which would mean a breakthrough in their thinking, from then on it would be largely a technical matter how to ensure that a convention banning nuclear weapons will not be violated. I believe this can be done. The main thing is to start the process. If the process is started, which I hope will happen soon, then it would take another two decades until a nuclear weapons free world is achieved.

Krieger: This way of thinking that you’re talking about, do you believe...
this is what Einstein meant when he made his famous statement that the splitting of the atom “has changed everything save our modes of thinking”?

Rotblat: What he meant was a new way to approach the problem of security – away from national security to global security. This is a new way of thinking. Many people have adopted it, but not yet the decision-makers. We still need a new way of thinking. It is still the most important issue at the present time.

Krieger: You mentioned Abolition 2000 – the campaign for a Nuclear Weapons Convention. Can you share some of your thoughts on the Abolition 2000 campaign?

Rotblat: It is a much needed mass movement campaign. It will be, I believe, the deciding factor in whether the nuclear decision makers will accept abolition or not. But I feel that we need something more than has been done up to now. Additional aspects need to be added to the present movement, that is, to explain to people that they have to do something about the danger, and then point to a number of events and pull out specifically one event that we can get very quickly. In my opinion this would be a No First Use Treaty. I think that with this there is a good chance that we will be successful.

Krieger: You’re almost 89 years old and you’ve worked hard over the course of your life to eliminate nuclear weapons and to engender more responsibility by scientists as well as citizens in general. What gives you hope for the future?

Rotblat: My hope is based on logic. Namely, there is no alternative. If we don’t do this, then we are doomed. The whole existence of humankind is endangered. We are an endangered species now and we have to take steps to prevent the extinguishing of the human species. We owe an allegiance to humanity. Since there is no other way, then we must proceed in this way. Therefore, if we must do it, then there is hope that it will be done.

Krieger: I know that you have a great concern for young people and for life. If you could give one message to the young people of today, what would that be?

Rotblat: My message would be: “You have a duty. You enjoy many fine aspects of life, better perhaps than your parents had. We have bequeathed to you many of the things which we ourselves inherited and have tried to improve on, to ensure that you have a happy life. I think it is your duty to ensure that this goes on to your children and your grandchildren so that human life on this planet will continue to be enriched all the time.”

Sir Joseph Rotblat is dead. We lost a great man, friend, and inspiration. I heard Sir Joseph speak for the first time in April 1997, when he gave a lecture on the occasion of a visit to the Interdisciplinary Research Group Science, Technology and Security (IANUS) - the INESAP host group - at Darmstadt University of Technology. With his characteristic smile, quiet voice, and lovely English, at age 89, he answered to a question that, yes, he was confident to live long enough to see the world turn nuclear weapons free. Sadly, he lost his strength before that. But in the course of his life he made a deep impression on many people like me, to whom he conveyed the urgency of the nuclear weapons issue. We will not forget him, follow his call to remember our humanity, and continue Sir Joseph’s struggle to rid the world of nuclear weapons.

Regina Hagen
INESAP Coordinator
September 3, 2005
iGSE – a New INESAP Project

In March 2006, the International Network of Engineers and Scientists Against Proliferation (INESAP) launched a new project: the independent Group of Scientific Experts (iGSE), has been formed to develop and demonstrate technologies and procedures for remote environmental sampling for clandestine nuclear-weapons-usable materials production. A network of excellence, the independent Group of Scientific Experts (iGSE), has been formed to develop and demonstrate technologies and procedures for remote environmental sampling for clandestine nuclear-weapons-usable materials and other novel methodologies.

The unique features of this project are the combination of the required expertise; the independence of scientists from governmental, diplomatic, and organizational interests; real demonstrations in field tests; coordinated research efforts and common applications for funding; and public availability of the project results.

The goal of the iGSE is to facilitate progress in verification methodologies and new measurement technologies with respect to unreported production of plutonium and highly enriched uranium (HEU).

The iGSE will work with the International Atomic Energy Agency (IAEA), the European Safeguards Research and Development Association (ESARDA), and the International Panel on Fissile Materials (IPFM).

Project Launching Workshop in Vienna (May 2006)

The iGSE founding workshop took place in Vienna on May 10-13, 2006. It was hosted at the University of Natural Resources and Applied Life Science (BOKU). The workshop was attended by 24 participants from eight countries and two international organizations (CTBTO PrepCom and IAEA).

The meeting began with a tour through the IAEA Laboratory at Seibersdorf. This provided first hand information about the safeguards needs and the current capabilities for environmental sample analysis. After the excursion, the iGSE Advisory Board had its inaugural meeting.

On the next day, the workshop was opened by two keynote addresses, one given by Ola Dahlmann about the experiences of the Group of Scientific Experts (GSE) that worked for two decades since 1976 with a mandate by the Conference on Disarmament in Geneva to develop and demonstrate the global monitoring system for verifying the CTBT. The second keynote address was given by Julian Whichello on the Novel Technologies Program set up by the IAEA with the goal to solicit proposals for new measurement technologies that could be used to detect unreported nuclear weapons material activities. In the following three sessions related to sensors, meteorology, and other expertise, every participant explained his or her possible contributions to achieve the iGSE goals.

Based on these potentials, the workshop participants agreed on formalities, goals, and a working program for the iGSE. It was agreed to distinguish between iGSE members and observers. Accordingly, 16 workshop participants agreed to join the iGSE as members, four as observers. The remaining four participants had already agreed to serve as advisors. The participants discussed goals and scope of the iGSE, agreed on the individual contributions, and defined a work program both for the rest of this grant period as well as for the subsequent 3-years working phase. They also considered options for raising the separate funding that will have to be secured to conduct the 3-years program.

iGSE Work Program for 2006 and Beyond

In the initial project phase (2006), the project will define the agenda and prepare a proposal for a 3-year working phase of the iGSE; assure that research and development work on verification of non-production of nuclear-weapons-usable materials is optimized by coordinated efforts. The goals of the subsequent 3-year iGSE working phase will encompass the following:

- Summarize the state-of-the-art, identify open issues for further research, and initiate related projects.
- Develop practical procedures for air sampling during complementary access inspections to detect clandestine production of weapons-usable nuclear materials based on existing technology and published data.
- Apply atmospheric transport modeling and statistical data analysis to demonstrate the capabilities in locating a possible source based on reported data.
- Demonstrate the proposed verification procedures to detect known activities (e.g. krypton–85 as indicator for plutonium separation; UF₆ and its reaction products such as (HF)n and UF₂(OH)n as indicator for uranium enrichment) and report about the findings.
- Set up an interactive online archive for viewing and downloading observation data, a map showing the source location as determined by atmospheric transport modeling, plus supporting information and explanations.
- Raise public awareness of the existence of efficient verification means.
iGSE – a New INESAP Project

Ola Dahlmann

Petra Seibert

Heiner Daerr and Scott Kemp

iGSE – Vienna Workshop, May 10-13, 2006

Focus Point: Atmospheric Transport Modelling

- Impuls: Possible applications of ATM and statistical data analysis in the iGSE project (Gerhard Wotawa)
- Brief Input: My possible contributions to the iGSE project (Johann Feichter, Petra Seibert, Don Wuebbels)
- Discussion of inputs and of consequences for the iGSE project

Focus Point: Other Expertise with Relevance for the iGSE Project

- Brief Input: My possible contributions to the iGSE project (Ola Dahlmann, Wolfgang Liebert, Gotthard Stein, Julian Whichello)
- Discussion of inputs and of consequences for the iGSE project

Planning Ahead

- Conclusions for iGSE project, agreement of concrete contributions of workshop participants, and planning of joint 3-year work program for the iGSE
- Wrap-up of previous discussions and summary of agreements (Martin Kalinowski)

Getting Started

- Option for small group work to initiate joint project work; collecting ideas for funding and grant applications; etc.
INESAP is the International Network of Engineers and Scientists Against Proliferation and was founded in 1993. It is a non-profit, non-governmental network organization with participants from all over the world.

INESAP is part of the activities of the International Network of Engineers and Scientists for Global Responsibility (INES), which currently comprises more than 60 organizations from 25 countries. INES is a UN accredited NGO.

Although those active in the network can and do work independently from each other, the office plays an essential organizational role in most INESAP activities. It is hosted by the Interdisciplinary Research Group in Science Technology and Security (IANUS) at Darmstadt University of Technology. The INESAP Coordinator (Regina Hagen) cooperates closely with the international Coordinating Committee.

If you want to support the work of INESAP, you can send cash money or use our PayPal button (preferred to avoid high bank charges) or transfer money as follows:

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Participants of the iGSE founding workshop in Vienna, May 10-13, 2006 (see page 96 for details) from left to right:

First row: Jungmin Kang, Gerhard Wotawa, Gotthard Stein, Wolfgang Liebert, Martin Kalinowski; Second row: Petra Seibert, Johann Feichter, Peter Mueller, Roland Pertschert, Yuri Dubasov, George Healey, Regina Hagen; Third row: Heiner Daer, Scott Kemp, Ola Dahlmann, Donald Wuebbels, Mika Nikknen; Not shown: Andreas Becker, Valentin Borisevich, Lars-Erik De Geer, Martin Giersch, Alexander Nadezhinski, Martina Schwaiger, Steven Sholly, Julian Whichello

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