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STOPPING THE PROLIFERATION OF NUCLEAR WEAPONS

by David Albright and Tom Zamora

"Nuclear weapons are the international currency of power," says a leading Indian national security expert. This perception remains, despite the momentous changes in Europe and the greatly reduced tensions between the United States and the Soviet Union. The political utility attributed to these weapons of mass destruction is well appreciated by many countries, particularly those in South Asia and the Middle East, two regions now on the brink of their own nuclear arms races.

Just as the Non-Proliferation Treaty (NPT) pioneered an international norm against the spread of nuclear weapons to additional countries, the international community needs once again to counter the growing threat of nuclear arsenals in the developing world by creating new norms against the development, testing, and production of nuclear weapons. Unlike the NPT, which allows the unbridled production of nuclear weapons in the five acknowledged nuclear weapon states, these new norms must apply equally to all countries.

Deligitimizing Nuclear Weapons

In general, unless the nuclear powers begin to delegitimize nuclear weapons and take steps to constrain their own nuclear weapons production activities, it will be impossible to stop the spread or deployment of nuclear weapons in developing nations. Although the number of countries with nuclear weapons is considerably smaller than once projected in the 1960s, when the international community felt compelled to conclude the Non-Proliferation Treaty, the fundamental problem remains. According to the joint United States-Soviet Statement on Non-Proliferation issued immediately following the June Summit in Washington DC: "The more nations that possess [nuclear and chemical] weapons, the more difficult it will be to realize the desire of people everywhere to achieve effective arms control and disarmament measures and to reduce the threat of war. Weapons proliferation can provoke or intensify insecurity and hostility among nations, and threatens mankind with warfare of unprecedented destructiveness."

In the wake of easing cold war tensions, the United States and the Soviet Union now have an historic opportunity to cooperate more closely in curbing the emergence of new nuclear arms races. According to the same Joint Statement on Non-Proliferation: "The historic steps we have taken to improve US-Soviet relations and to cooperate in the interests of international stability create the possibility of even closer and more concrete cooperation in the areas of nuclear, chemical, and missile non-proliferation."

With rapid progress being made in negotiating arms reduc-

tion treaties, such as the START treaty, the United States and the Soviet Union could greatly delegitimize nuclear weapons by constraining their own nuclear weapons production activities and formalizing these constraints through verifiable agreements open to all nations. Thus, by pledging to constrain their own programs, the United States and Soviet Union would gain important political leverage over unsafe-guarded plutonium and highly enriched uranium production and nuclear weapons development and testing activities in other countries, the very activities that are the target of most non-proliferation efforts.

Superpowers Have Little to Lose

The United States and the Soviet Union have little to lose by initiating these agreements, since they have already acted unilaterally to impose some of these constraints on their own programs. The Soviet Union announced in March 1990 that nuclear weapons testing at Semipalatinsk would be stopped due to environmental concerns about underground testing, and in 1989 President Gorbachev announced that his country would end highly enriched uranium production for weapons and shut down two plutonium production reactors. In the United States, plutonium production has ground to a halt for safety reasons and lack of need; new weapons production has been severely constrained by growing safety and environmental concerns about the Rocky Flats Plant in Colorado that makes plutonium components for nuclear weapons.

Global efforts to ban all nuclear weapons production activities are crucial now, since most recent attempts to stop the



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spread of nuclear weapons and associated delivery systems have failed. A major reason for their failure is that the countries of proliferation concern see little benefit in adhering to discriminatory constraints on their own activities.

Discriminatory Proliferation Policies have Failed

Although the issue of discrimination is often used as an excuse for continued weapons development, the fact remains that few of the key "threshold" countries are expected to sign the NPT because of its discriminatory nature. The treaty legitimizes the nuclear arsenals of the five acknowledged nuclear weapons states, while asking other countries to forswear such weapons. Although Article VI requires the 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," the weapons states have been unwilling to do so to date. Moreover, some signatory nations, such as Iraq and North Korea, are suspected of being "false adherents" to the treaty, with ambitions to acquire nuclear weapons.

The only "hold-out" country that might sign the NPT is South Africa, which is widely suspected of having nuclear weapons. President Frederik de Klerk apparently supports signing the treaty, but doing so is difficult because the treaty itself has little political support within his country.

Likewise, attempts to convince threshold countries to accept international safeguards at their most sensitive facilities, such as plutonium reprocessing and uranium enrichment plants, have little prospect of succeeding. The United States has been unsuccessful in obtaining the support of the other major nuclear suppliers in Europe and Japan to require safeguards on all nuclear facilities in a country as a condition of exporting any major nuclear items to that country. And without the support of these other suppliers, the United States is no longer in a position to exact non-proliferation concessions from most threshold nations by threatening to cut off nuclear supplies.

Export controls in general have been ineffective in stopping a tenacious "gray" or "black" market in nuclear equipment and other items useful to a nuclear weapons program. Moreover, the recent decision by the Coordinating Committee for Multilateral Export Controls (Cocom) to relax Western controls on technology exports to the Soviet Union and Eastern Europe may have inadvertently created a loophole that would enable a threshold country to obtain "dual-use" items through these countries. Reestablishing a discriminatory export regime aimed at developing nations could be difficult to achieve, and would only reinforce the developing world's existing perceptions of trade discrimination. This in turn would make it harder for export controls to work effectively in the future.

Creating New Norms

Non-proliferation policy is now at a crossroads. The United States and the other weapons states can either concentrate on creating additional discriminatory export controls and hope that threshold countries will eventually adopt regional constraints on their own nuclear weapons production, or they can launch an effort to achieve global norms against

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nuclear weapons production activities. Although efforts to achieve global norms should not be seen as replacing attempts to bolster the existing non-proliferation regime, universal efforts are more likely to attract broader political support among the unacknowledged nuclear weapon states.

The public in many threshold countries may also find global constraints more compelling, and thus may be more likely to support such initiatives. In this way the public could become an important force for change in the threshold states.

The most important universal constraints are global prohibitions on nuclear explosive testing, a halt to the production of separated plutonium and highly enriched uranium, the reduction of unsafeguarded stockpiles of separated plutonium and highly enriched uranium, and bans on new nuclear weapons production.

Ban Nuclear Explosive Testing — The purpose of a Comprehensive Test Ban Treaty (CTBT) is to inhibit the research and development of nuclear weapons. Although crude nuclear explosives can be built without conducting a nuclear test, without testing most countries would be seriously constrained from indigenously developing sophisticated nuclear weapons, such as thermonuclear weapons ("H-bombs"), tritium boosted weapons, or warheads capable of fitting on ballistic missiles.

In addition, a CTBT would prevent a country from detonating a nuclear explosive as a political tool to establish parity with or superiority over another country. Unlike 1974, when India tested a "peaceful" nuclear device and Pakistan had no nuclear capability of its own, if either India or Pakistan tested a nuclear device today the other can be expected to follow. For example, a successful test of a Pakistani nuclear fission device could lead to an Indian thermonuclear test, clearly establishing India's nuclear superiority over Pakistan. In response, however, Pakistan might feel pressure to develop and test its own H-bomb. Such an exchange of testing could lead both countries to enter into a nuclear arms race for arsenals of ever more sophisticated nuclear weapons.

Although regional test bans could accomplish these same goals, few of the key developing countries would agree to yet another discriminatory treaty allowing those outside the region to test, even if it were in the interests of the region to do so. Therefore, for a norm against testing to be established, a test ban agreement would have to be signed by the United States and the Soviet Union, and perhaps the other nuclear weapon states as well.

Conversely, the successful negotiation of a CTBT between the superpowers would put significant political pressure on the threshold countries to renounce nuclear testing, particularly since many of them have expressed strong public support for such a treaty. For example, India and Pakistan have both endorsed a CTBT and would be placed under intense pressure to sign an international test ban agreement.

Argentina and Brazil, two other strong supporters of a CTBT, would also be under pressure to sign such an agreement. At present, both countries maintain the right to detonate "peaceful" nuclear explosives, and within a few years they will each have the capability to produce nuclear devices. A CTBT that is truly comprehensive would ban all nuclear detonations, civilian or military, and would thus prohibit

The Non-Proliferation Treaty Review Conference

This August, the signatories to the Non-Proliferation Treaty will gather for the fourth time in Geneva to review the status of the treaty. This review conference will be the last one before the signatories gather in 1995 to decide for how long to extend the treaty.

Despite its highly discriminatory nature, the treaty, which has 140 signatories, has created a powerful norm against the spread of nuclear weapons to other countries. The NPT has helped to stabilize the situation in Europe and Japan by providing assurances that these countries, which are fully capable of rapidly producing nuclear weapons, will refrain from doing so. The treaty is also the basis for an elaborate set of national, bilateral, and international agreements that control the export of nuclear equipment and technology.

There is a growing concern over how long the Non-Proliferation Treaty will be extended in 1995. A short extension, or the withdrawal of key countries from the treaty, could seriously undermine the existing non-proliferation regime. ■

tests conducted under the banner of "peaceful" use.

Even a US-Soviet agreement to limit the yield of nuclear tests to less than 1-kiloton would send a strong international signal against testing, and help legitimize a new norm against the testing of nuclear explosives for any reason.

The passage of a CTBT agreement would also go a long way in guaranteeing the extension of the Non-Proliferation Treaty in 1995, since more than any other arms control provision a CTBT is viewed by the non-weapon states as the minimum price the nuclear nations must pay to keep the NPT alive. The 100-nation Non-Aligned movement stated recently that a CTBT is "absolutely essential for the preservation of the non-proliferation regime embodied in the Non-Proliferation Treaty."

Halt the Production of Plutonium and Highly Enriched Uranium for Weapons

— Since all nuclear weapons require plutonium or highly enriched uranium ("fissile materials"), a halt to fissile material production for weapons would put an ultimate cap on the number of nuclear weapons that could be built. In addition, nations that either do not have fissile material stockpiles or cannot obtain them from foreign sources would be prevented from producing any nuclear weapons at all.

If the major nuclear weapon states agree to stop the production of plutonium and highly enriched uranium for weapons, they would strengthen the legitimacy of the non-proliferation regime and would significantly increase political pressure on the threshold states to place all their nuclear facilities under international or bilateral inspections. As in the case of the CTBT, many of the threshold states would find it politically difficult to oppose such a constraint on their own nuclear activities, if the United States and the Soviet Union subscribed to one.

Achieving a global halt to fissile material production for weapons would be an important and timely extension of the Non-Proliferation Treaty. A fundamental purpose of the NPT is to prohibit the non-weapon states from using their nuclear facilities to produce plutonium and highly enriched uranium for nuclear weapons and to verify that commitment through international inspection of all their nuclear facilities. Extending this commitment to all nations would remove one of the most discriminatory aspects of this treaty.

Halting the Production of New Nuclear Weapons —

The "de facto" nuclear weapons states India, Israel, Pakistan and South Africa are widely believed to be actively engaged in designing and constructing new nuclear weapons, even if in some cases they do not completely assemble them. A global ban on the production of new nuclear weapons would halt the construction and proliferation of more sophisticated weapons.

The current US and Soviet policy of pursuing arms control while at the same time continuing strategic modernization efforts is counterproductive. According to Secretary of State James Baker, "Without the START negotiations, the domestic consensus needed to support essential modernization programs—not only mobile ICBMs, but also the B-2, Trident, and SDI—would be difficult to sustain. Our force modernization and arms control efforts reinforce each other." Such statements lead to the view that US and Soviet arms reduction initiatives are pursued mainly to ensure continued weapons production, and therefore reduce the credibility of their efforts among the developing nations.

Over the next decade, the United States hopes to build thousands of new nuclear weapons, despite the recent international political changes. Undoubtedly, the Soviet Union has similar plans. Abandoning these plans would help to create a new political climate against nuclear weapons production by any nation.



Rep. Dante Fascell, Chairman of the House Foreign Affairs Committee, sponsored legislation last year calling for a halt to US and Soviet plutonium and highly enriched uranium production for weapons. This year, the House and Senate both passed legislation requiring the US to explore agreements on verifiable nuclear warhead dismantlement and on banning US and Soviet plutonium and highly enriched uranium production for weapons.

Controlling Stockpiles of Highly Enriched Uranium and Separated Plutonium — India, Pakistan, Israel and South Africa have already accumulated significant stockpiles of plutonium and highly enriched uranium that are free of any international constraints on their use. Since a cutoff in the production of fissile materials for weapons would not put any constraints on these stockpiles, it is necessary to develop controls over these stocks of fissile materials to prevent these countries from quickly building nuclear weapons.

This task would be easier if the United States and the Soviet Union agreed to dismantle at least some of their nuclear warheads and prohibit the recycling of the fissile material from them into new weapons. Such an action could give the nuclear weapon states better standing to convince other states to turn over stockpiles of fissile material available for weapons to civilian uses.

In the longer term, stable, lasting reductions in the US and Soviet nuclear arsenals will require verifiable dismantlement of the nuclear weapons and disposal of the nuclear materials inside these weapons. At this time, other countries with nuclear weapons, whether acknowledged or not, should be pressed to dismantle their own weapons and restrict the contained plutonium and highly enriched uranium to non-weapons purposes.

Phase out Civilian Use of Plutonium and Highly Enriched Uranium —

Supplementing a universal halt to the production of fissile materials for weapons with an international deferral of commercial plutonium reprocessing and recycling and civilian highly enriched uranium production would create a powerful norm against the establishment of nuclear weapons capabilities. Civilian plutonium can be used to make nuclear explosives, and the spread of plutonium technologies gives a country the means to quickly make a nuclear weapon. It is therefore important to stop the separation of civilian plutonium and its use as fuel for nuclear reactors.

During the next decade, the commercial plutonium market in Europe and Japan will grow dramatically, vastly increasing the amount of plutonium in international commerce and the chances of theft or diversion. If current plans go forward, by the end of the century about 20,000 kilograms of plutonium will be separated each year in these countries. This represents about one-fifth of the total amount of plutonium in the US nuclear arsenal.

Currently, plutonium reprocessing is both unnecessary and uneconomical. Plans to proceed with reprocessing in Europe and Japan seem to be driven mostly by inertia and the desire of some foreign governments and their electric utilities to postpone decisions on radioactive waste disposal. These countries, however, are starting to follow the lead of the United States, where concern about the development of a "plutonium economy" in the 1970s led to the rejection of reprocessing and plutonium fuels. This decision has not been seriously questioned since then, because reprocessing remains uneconomical. The Soviet Union likewise has backed away from its commitment to use plutonium fuels in its power reactors, although it continues to operate a civilian reprocessing plant at Kyshtym.

Highly enriched uranium continues to be used to fuel civilian research reactors. Its use in these reactors, however, can be avoided through the development of new low enriched uranium fuels, which cannot be used for nuclear explosives. The Reduced Enrichment for Research and Test Reactors (RERTR) program was initiated by the United States in 1978 to develop just such fuels. Despite significant cuts during the last several years, the RERTR program has been able to develop and test new low enriched fuels that have enabled most of the smaller research reactors in the world to convert, although it has not finished developing the fuels necessary to convert the largest research reactors. The program should be charged with developing new fuels for all civilian reactors that use highly enriched uranium.

Conclusion

Although the NPT has been successful at limiting the spread of nuclear weapons in the industrialized world, it has been unable to stop the proliferation of nuclear weapons capabilities to the developing world. As a result, we are now confronted with the possibility that nuclear arms races in the developing world could actually lead to regional nuclear wars. The international community must therefore create new barriers to the spread of nuclear weapons and, unlike those erected in the past, these barriers must be global and non-discriminatory if they are to appeal to the very states from whom we seek restraint. □

NUCLEAR WEAPONS CAPABILITY AMONG THE THRESHOLD STATES

Since 1964, there have been five acknowledged nuclear weapons states: Britain, France, People's Republic of China, the Soviet Union, and the United States. However, the total number of nations possessing nuclear weapons or able to assemble them quickly is now at nine. The four additional countries—India, Israel, Pakistan, and South Africa—actively deny that they have nuclear weapons, although a wide variety of intelligence and scientific sources reveals that these countries either have fully assembled, deliverable nuclear weapons or could assemble them within a short period of time. In addition, several other countries, such as Argentina, Brazil, Iraq, and North Korea, could become capable of building nuclear explosives during the next decade.

Even though there is little question that India, Pakistan, Israel, and South Africa have nuclear weapons programs, there is no publicly available evidence to suggest that these countries have conducted full-scale nuclear tests other than an Indian test in 1974, and a mysterious flash off the coast of South Africa in 1979 that has been interpreted by many as a nuclear test by South Africa, possibly in conjunction with Israel.

But full-scale nuclear tests are not necessary to develop a reliable nuclear arsenal. With component testing and computer simulation, any of these countries could have developed deliverable fission bombs. Without full-scale testing, however, they are unlikely to have developed sophisticated nuclear weapons, although India and Israel appear to have conducted research and development work on thermonucle-

Limited Test Ban Treaty Amendment Conference

In response to the Bush Administration's opposition to further limits on nuclear explosive testing, forty-one of the 118 signatories of the 1963 Limited Test Ban Treaty (LTBT), including India and Pakistan, have called for a conference to amend the treaty to become a comprehensive ban on all nuclear tests. Despite strong US opposition to the amendment conference, a preparatory meeting has already taken place and the conference itself will begin in January, 1991 at the United Nations in New York.

If the LTBT is amended into a comprehensive test ban treaty (CTBT) at the January meeting, all signers would be bound by the new limitations, including the nuclear weapons states and the nations which pose the greatest proliferation risk such as India, Pakistan, Israel, and South Africa—none of which have signed the NPT. However, as depository governments of the LTBT, the US, UK, and USSR all have final veto power over any amendments to the treaty, and the Bush Administration has made clear its intention to veto such an amendment. Since the amendment conference will most likely vote to accept the CTBT amendment, the United States runs the risk of further political isolation if the veto threat is carried out. ■

ar devices.

In addition, there is evidence that Israel and Pakistan have obtained weapons design information from other countries. Pakistan is reported to have received a weapons design from China in the early 1980s, and Israel evidently received help from France in the late 1950s. Any of these threshold countries might also have illicitly obtained design information from the weapons program of a nuclear weapon state or through the unofficial cooperation of foreign weapons designers.

South Asia

In South Asia, the current tensions between India and Pakistan could lead to a regional war between these two rivals. This situation confronts the world with an historical first: the possibility that a conventional war between two nations with an undeclared nuclear weapons capability could escalate to the point where both nations might deploy their nuclear weapons, or actually use them in a nuclear exchange.

The deployment of nuclear weapons by India and Pakistan would confirm to the world that weapons exist in these countries. Such an overt display would legitimize the development of nuclear weapons and increase the pressure on other states to develop their own weapons programs, thereby raising the chances of other regional nuclear conflicts.

India — For the last several years, India has been stockpiling separated plutonium unrestricted to peaceful uses. The recent tensions with Pakistan have undoubtedly led India to



President Saddam Hussein of Iraq: "We do not have nuclear weapons, but we would see no problem in a Western nation helping us to develop nuclear arms to help compensate for those owned by Israel."

accelerate its nuclear weapons program. According to intelligence sources, India also has a research and development program in thermonuclear weapons, although the status of this program is not publicly known.

India possesses several attack aircraft capable of delivering its nuclear warheads against Pakistan or China. Its most sophisticated aircraft is the British-supplied Jaguar. In addition, it has several other nuclear-capable attack aircraft that it has received from the Soviet Union and France.

In February 1988, India announced the successful test of its first dedicated military ballistic missile, the short-range Prithvi missile. India successfully launched a medium-range ballistic missile, the Agni, in 1989. It is not publicly known whether India can build a nuclear warhead for its missiles.

Pakistan — Pakistan operates its uranium enrichment program with the goal of obtaining highly enriched uranium for nuclear weapons. During the last few years it has been able to accumulate enough highly enriched uranium for at least several nuclear weapons.

Pakistan has sophisticated aircraft capable of delivering its nuclear weapons. Its US-supplied F-16 aircraft and French and Chinese supplied attack aircraft are capable of delivering its nuclear weapons against many Indian cities and military targets.

Pakistan is also developing ballistic missiles. Its program, however, is evidently far behind India's program.

The Middle East

In the Middle East, the undeclared and sophisticated nuclear arsenal in Israel continues to provoke Arab countries to develop their own weapons of mass destruction, including nuclear weapons. Iraq, despite having signed the NPT, is widely suspected of trying to develop a nuclear capability. During the spring, it was caught trying to import krytrons—which can be used to detonate a nuclear explosion—from the United States. Recently, the United States denied Iraq an export permit for three advanced industrial furnaces be-

cause the designated user, the Iraqi Ministry of Industry and Military Industrialization, was engaged in "nuclear activities." In July, President Saddam Hussein of Iraq said on French television: "We do not have nuclear weapons, but we would see no problem in a Western nation helping us to develop nuclear arms to help compensate for those owned by Israel."

If and when the Arab nations succeed in getting the bomb, the security situation in the Middle East will change dramatically, with important ramifications for Israeli and US security. Meanwhile, chemical weapon stockpiles in the region have already been developed as an interim response to Israel's nuclear capability. According to President Hussein, "Whoever threatens us with the atomic bomb, we will annihilate him with the dual chemical."

Israel — Israel has a large plutonium production capability at the Dimona facility near Beersheva and is widely believed to have had nuclear weapons for about two decades.

Israel might be conducting research and development into very sophisticated nuclear weapons designs, including thermonuclear weapons. The Dimona facility is reported to be producing materials, such as tritium and deuterium, which are useful in thermonuclear or boosted fission nuclear weapons.

Israel has aircraft and missiles capable of delivering nuclear weapons to its major Arab foes, and even to the borders of the Soviet Union. Its US-supplied F-15s can reach the Soviet Union and distant Arab capitals with nuclear bombs. Although its F-16 attack aircraft have a slightly shorter range than its F-15s, Israel has an aerial refueling capability which would enable these planes to reach many of the same targets.

Israel is also well along in development of the intermediate-range Jericho II missile. This missile is highly accurate and capable of carrying nuclear warheads. Once operational, this missile could reach the southern border of the Soviet Union.

Iraq — Little is known about Iraq's nuclear weapons program, although it does not have an unsafeguarded indigenous source of either highly enriched uranium or separated plutonium. Thus Iraq is probably years away from possessing nuclear weapons.

Iraq has sophisticated aircraft capable of delivering nuclear weapons, as well as an aggressive ballistic missile program. If and when Iraq develops nuclear weapons, it will already have the means to deliver them.

Libya — Libya has often been linked to efforts to clandestinely obtain nuclear weapons or the capability to make them, but so far it has been unsuccessful.

South Africa

For many years, South Africa has been capable of producing highly enriched uranium, although little is publicly known about the amount they have produced.

Recently, South Africa has been debating signing the NPT. With the reduced tensions in Southern Africa and rapid progress being made in abolishing apartheid, the present South African government is less resistant to signing the treaty. When South Africa will sign the NPT remains un-

clear, although continued delay could risk its expulsion from the International Atomic Energy Agency.

South Africa has several aircraft capable of delivering nuclear weapons. It has French-supplied Mirage F-1C aircraft and a small number of Buccaneer aircraft. South Africa does not have any ballistic missiles, although there have been reports that it is developing a long-range missile, perhaps with Israel.

Argentina and Brazil

Although they have not acquired nuclear explosives, Argentina and Brazil are developing the capability to build them, and have refused to sign the Non-Proliferation Treaty or accept international or bilateral inspections of their nuclear facilities. Current Argentine and Brazilian governments have no apparent intentions to build nuclear weapons, but both governments maintain the right to produce "peaceful" nuclear explosives.

Neither country has significant amounts of unsafeguarded plutonium or highly enriched uranium, but this situation could change during the next several years. Within a few years, both countries could produce a stockpile of highly

enriched uranium. Both countries have aircraft capable of delivering nuclear weapons.

Other Potential Proliferators

North Korea operates a small plutonium-production reactor that can produce enough plutonium for one nuclear weapon a year. It is also suspected of building a small plutonium separation plant near the reactor. Even though it signed the NPT in 1985, it still has not concluded a safeguards agreement as required by the treaty. If North Korea does not conclude an agreement soon, it will be the first country to ever be in violation of the NPT.

Despite having signed the NPT, South Korea and Taiwan continue to provoke suspicions about their long-term ambitions in this area. Both countries took steps in the 1970s to obtain nuclear weapons capabilities, and Taiwan tried again in the mid-1980s to obtain a secret plutonium separation capability. In addition, both Taiwan and South Korea maintain large nuclear power programs and can be expected to persist in their attempts to obtain commercial plutonium reprocessing capabilities in the future.

—David Albright and Tom Zamora □

Nuclear Weapons Capabilities of the Threshold States

Country	NPT Signatory	Materials for Nuclear Weapons		Nuclear Weapons Production		Delivery Systems	
		Reprocessing Facility	Enrichment Facility	Weapons Design Program	Nuclear Test	Aircraft	Missiles
Argentina	no	under construction	yes	no	no	yes	research
Brazil	no	no	yes	no	no	yes	research
India	no	yes	no	yes, fission and fusion	yes	yes	developing
Iran	yes	no	no	possibly	no	yes	deployed
Iraq	yes	no	no	probably	no	yes	deployed
Israel	no	yes	?	yes, fission and fusion	?	yes	deployed
North Korea	yes	may be under const.	no	unknown	no	yes	deployed
Pakistan	no	under construction	yes	yes, fission	no	yes	developing
South Africa	no	no	yes	probably, fission	?	yes	developing
South Korea	yes	no	no	no	no	yes	research
Taiwan	yes	no	no	no	no	yes	research

PERSONNEL NEWS & NOTES

Gordon Burck, Staff Associate of the Biological & Chemical Warfare Project, is leaving FAS for EAI Corp. having completed with **Ambassador Charles Floweree**, the draft of a book on Chemical and Biological Warfare, to be published shortly—*International Handbook on the Global Chemical Weapons Threat*. Work on this subject will be continued by **Lora Lumpe** under the direction of Project Director **Matthew S. Meselson** of Harvard University.

Thomas Longstreth is leaving FAS on September 1 after three years as Associate Director for Strategic Weapons Policy to become an International Affairs Fellow of the Council on Foreign Relations; he will serve at the Pentagon on the Policy and Strategy Directorate (J-5) of the Office of the Joint Chiefs of Staff.

Dr. David Wright, a physicist working at the Center for Science and International Affairs at the Harvard Kennedy School of Government, will join FAS on September 10 to work on arms control, particularly constraints on modernization of strategic weapons.

Peter Tyler, Research Analyst, joined FAS in January to work on the Space Policy Project.

Nguyen Huynh Mai left FAS to return to Vietnam in August after a year studying the structure of American science and the possibilities of scientific exchange with Vietnam.

Dorothy Preslar, Special Assistant to the President, has been with FAS since December. She works in development and projects coordination. □

SCIENTISTS' HEARINGS PLANNED

With the enthusiastic approval of the FAS Executive Committee, and its Council, FAS is moving forward on a plan to carry out "Scientists' Hearings" as a staple part of its on-going activities.

These hearings on science and society issues of the day will feature scientists on the dias, as well as on the panels, so that the resultant transcripts will be, it is hoped, a useful complement to the hearings which congressmen are in a position to conduct.

Two such hearings are scheduled for September 6. One will focus on the relative advantages of usings humans or, alternatively, robots and unmanned vehicles in space activities. A second, in the afternoon, will discuss "Mission to Planet Earth" and will discuss the relative utility of funding large satellites to develop information on global warming versus other uses of the same monies. Distinguished representatives of both sides of the debates will be heard.

If FAS can secure the necessary funding, we plan to conduct such hearings, initially, on about a monthly schedule, inviting press coverage and publishing the transcripts. In particular, we will provide our members with condensed versions of the material in future newsletters.

We believe such hearings provide a flexible and penetrating method of examining choices in the use of scarce public resources. And we are convinced, from long experience, that they can be planned in a way that makes them more useful than most of the assorted panels, debates and conferences which are so common and normally have so little or transitory an impact.

Meanwhile, to conserve on staff time, we plan to publish larger but slightly less frequent newsletters—six a year rather than ten. This will provide certain economies of scale for all concerned. And it will give more room for the edited transcripts mentioned above. But all newsletters will provide the readers with full information on what we are doing.

A somewhat different format will be provided, accordingly, for the newsletter following this one.

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FAS Council Elections

The 1990 election saw *Denis Hayes*, Adjunct Professor of Engineering at Stanford University *Martin Sherwin*, Professor of History and Director of Nuclear Age History and Humanities at Tufts University, and *Valerie Thomas*, Research Associate, Center for Energy and Environmental Studies at Princeton University, elected to the Council. The full list of 15 Council members can be found on page 2. ■

EIGHT PROJECTS FORMALIZED

In April, FAS organized its current activities around eight projects and designated eight persons as directors of them.

Listed roughly in order of the expenditures currently involved in the projects, they are:

- US-Soviet Disarmament, directed by FAS Fund Chairman **Frank von Hippel** of Princeton University;
- Fissionable Material and Non-Proliferation, directed by staffer **David Albright**;
- Space Policy Project, directed by staffer **John Pike**;
- Peace and Scientific Exchange for Indochina, directed by FAS President **Jeremy J. Stone**;
- Protecting the Space Environment directed by staffer **Steven Aftergood**;
- Energy, directed by former Chairman **John Holdren** of UC Berkeley;
- Military Arms Sales, directed by **Michael Klare**, director of the Five Colleges Program on Peace and World Security Studies at Hampshire College;
- Chemical and Biological Warfare, directed by former Chairman **Matthew S. Meselson** of Harvard University.

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