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SPECIAL NATIONAL INTELLIGENCE ESTIMATE

Prospects for Further Proliferation of Nuclear Weapons

** ACCOUNTABLE DOCUMENT **
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PROSPECTS FOR FURTHER PROLIFERATION OF NUCLEAR WEAPONS

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THIS ESTIMATE IS ISSUED BY THE DIRECTOR OF CENTRAL INTELLIGENCE.

THE UNITED STATES INTELLIGENCE BOARD CONCURS, EXCEPT AS NOTED IN THE TEXT, AS FOLLOWS:

The following intelligence organizations participated in the preparation of the estimate:

The Central Intelligence Agency, the intelligence organizations of the Departments of State, Defense, the Atomic Energy Commission, and the National Security Agency.

Concurring:

The Deputy Director of Central Intelligence representing the Central Intelligence Agency

The Director of Intelligence and Research representing the Department of State

The Director, Defense Intelligence Agency

The Director, National Security Agency

The Assistant General Manager for National Security representing the Atomic Energy Commission

Abstaining:

The Special Assistant to the Secretary of the Treasury representing the Department of the Treasury

The Assistant Director, Federal Bureau of Investigation

ALSO PARTICIPATING:

The Assistant Chief of Staff for Intelligence, Department of the Army

The Director of Naval Intelligence, Department of the Navy

The Assistant Chief of Staff, Intelligence, Department of the Air Force

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PROSPECTS FOR FURTHER PROLIFERATION OF NUCLEAR WEAPONS

NOTE

This paper deals with a number of aspects of the potential spread of nuclear weapons outside the five major nuclear powers. It includes discussions of Indian nuclear intentions, the weapons development capabilities and policies of a number of other countries, and the potential for acquisition of nuclear weapons by non-governmental entities. Most specific judgments on capabilities and intentions are intended to cover the next five years or so, but longer term judgments also are included in some cases.

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SUMMARY AND CONCLUSIONS

A. **In the 1980s, the production of nuclear weapons will be within the technological and economic capabilities of many countries.** The once formidable barriers to development of nuclear weapons by nations of middling size and resources have steadily diminished over time. They will continue to shrink in the years ahead as plutonium, enriched uranium, and technology become more widely spread. Some countries will consider nuclear weapons largely in terms of military utility. **The principal determinant of the extent of nuclear weapons proliferation in coming years will, however, be political considerations—including the policies of the superpowers with regard to proliferation, the policies of suppliers of nuclear materials and technology, and regional ambitions and tensions.**

[redacted]

C. **We believe that Israel already has produced nuclear weapons.** Our judgment is based on Israeli acquisition of large quantities of uranium, partly by clandestine means; the ambiguous nature of Israeli efforts in the field of uranium enrichment; and Israel's large investment in a costly missile system designed to accommodate nuclear warheads. **We do not expect the Israelis to provide confirmation of widespread suspicions of their capability, either by nuclear testing or by threats of use, short of a grave threat to the nation's existence.** Future emphasis is likely to be on improving weapon designs, manufacturing missiles more capable in terms of distance and accuracy than the existing 260-mile Jericho, and acquiring or perfecting weapons for aircraft delivery.

D. Several other countries—including West Germany, Sweden, Canada and Italy—could have fabricated nuclear devices more easily, from a technological and financial point of view, than India and Israel.

They have refrained, and they are unlikely to be much influenced by weapons acquisition in countries like India. The inhibitions facing each of them are strong. In all, popular opinion is strongly opposed to the acquisition of nuclear weapons, both on emotional grounds and because such weapons would entail substantial risks—of provoking attack, of offending vital allies and of destroying existing mutual security arrangements. **It would require very fundamental changes, such as the breakup of major defense alliances accompanied by a substantial increase in strife and tension throughout the world, to induce countries like West Germany, Sweden, Canada and Italy to exercise their near-term capability.**

E. **The Director of Central Intelligence, the Deputy Director of Central Intelligence representing the Central Intelligence Agency, the Director of Intelligence and Research representing the Department of State, the Director, Defense Intelligence Agency, and the Assistant Chief of Staff for Intelligence, Department of the Army** believe that Japan's situation is very similar to that of the other advanced Western nations just mentioned. They **believe Japan would not embark on a program of nuclear weapons development in the absence of a major adverse shift in great power relationships which presented Japan with a clearcut threat to its security. The Assistant Chief of Staff, Intelligence, Department of the Air Force and the Director of Naval Intelligence, Department of the Navy, however, see a strong chance that Japan's leaders will conclude that they must have nuclear weapons if they are to achieve their national objectives in the developing Asian power balance. Such a decision could come in the early 1980s.** It would likely be made even sooner if there is any further proliferation of nuclear weapons, or global permissiveness regarding such activity. These developments would hasten erosion of traditional Japanese opposition to a nuclear weapons course and permit Tokyo to cross that threshold earlier in the interests of national security. Any concurrent deterioration of Japanese relations with the Communist powers or a further decline in the credibility of US defense guarantees would, in their view, further accelerate the pace of nuclear weapons development by Japan.

F. **Less sweeping changes could induce one or another of the less advanced nations to mount the sort of nuclear effort India and Israel have made.** Some states, such as the Republic of China, Argentina and South Africa, will be much influenced in their decisions not only by the general course of proliferation but by such factors as growing feelings of isolation and helplessness, perceptions of major military threat and desires for regional prestige. In each of these cases, any weapons capability probably would be small and delivery probably would depend on aircraft, though there is some possibility that one or another might be able to purchase a nuclear-capable missile system from a foreign supplier.

G. **Taipei conducts its small nuclear program with a weapon option clearly in mind, and it will be in a position to fabricate a nuclear device after five years or so.** Taipei's role in the world is changing radically, and concern over the possibility of complete isolation is mounting. Its decisions will be much influenced by US policies in two key areas—support for the island's security and attitudes about the possibility of a nuclear-armed Taiwan. **Taipei's present course probably is leading it toward development of nuclear weapons.**

H. **Argentina's small nuclear program is being pursued vigorously with an eye toward independence of foreign suppliers.** It probably will provide the basis for a nuclear weapons capability in the early 1980s. Argentina has no apparent military need for nuclear weapons, but there is strong desire for them in some quarters as a way to augment Argentina's power vis-a-vis Brazil. **Over time, in the absence of strong international pressures that stop nuclear weapons acquisition elsewhere, there is an even chance that Argentina will choose to join the nuclear club in a small way.**

I. In the short run, South Africa is of more concern in the proliferation context as a potential supplier of nuclear materials and technology than as a potential nuclear weapons power. It controls large uranium deposits, and it apparently has developed a technology for enriching uranium that could be used for producing weapons-grade material. **South Africa probably would go forward with a nuclear weapons program if it saw a serious threat from African neighbors beginning to emerge. So serious a threat is highly unlikely in the 1970s.**

J. **Other candidate countries—Spain, Iran, Egypt, Pakistan, Brazil and South Korea—would need at least a decade to carry out a nuclear weapons development program. One or another might detonate a demonstrative device earlier—perhaps considerably earlier by using purchased materials or by obtaining extensive foreign assistance.** Each of these countries is subject to a different set of motivations and pressures. Some have enemies already making efforts in the nuclear weapons field; all will be concerned with such efforts on the part of neighbors or potential antagonists. Some will be interested in nuclear weapons for their presumed prestige value. Unless countries opposed to proliferation—particularly the US and the USSR—find ways to stop the spread of nuclear weapons programs before these candidate countries are in a position to go forward, at least some of them will be motivated to join the nuclear race. The strongest impulses will probably be felt by Pakistan and Iran; Egypt and Brazil now appear to fall into a second category of likelihood.

K. France, India and Israel, while unlikely to foster proliferation as a matter of national policy, probably will prove susceptible to the lure of the economic and political advantages to be gained from exporting materials, technology and equipment relevant to nuclear weapons programs. And most potential proliferators are on good terms with one or all of them.

L. It is theoretically possible for a country capable of developing a nuclear weapon to do so covertly, up to the test of a first device. And a test is not absolutely necessary. In practice, indications of such a program are virtually certain to reach the outside world. But most countries will seek to maintain the tightest possible security with regard to any military nuclear activities, and information is likely to be intermittent and inconclusive. Indigenous ballistic missile delivery systems, on the other hand, would be readily identifiable early in the development cycle, and missile systems obtained abroad would not remain undetected for any significant period.

M. Governments backward in the nuclear field and anxious to acquire a token capability quickly are more likely to try to steal weapons than fissionable materials, despite the fact that the latter are less well protected. A country capable of developing and producing its own nuclear device is highly unlikely to try to steal weapons, but one might seek fissionable materials by theft or diversion. Competently done, diversion might go undetected.

N. Terrorists might attempt theft of either weapons or fissionable materials. They could see the latter as useful for terror or blackmail purposes even if they had no intention of going on to fabricate weapons.

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Nuclear Activities of Selected Countries

	Raw Materials: Uranium Ore Deposits	Raw Materials: Mining and Milling	Raw Materials: Exportation	Uranium Enrichment Facilities: Gaseous Diffusion	Uranium Enrichment Facilities: Gas Centrifuge	Uranium Enrichment Facilities: Laser	Uranium Enrichment Facilities: Other	Number of Plutonium Producing Reactors*: Natural Uranium Fueled (in operation)	Natural Uranium Fueled (under construction/planned)	Enriched Uranium Fueled (in operation)	Enriched Uranium Fueled (under construction/planned)	Fast Breeder (in operation)	Fast Breeder (under construction/planned)	Significant Reactor-Associated Facilities: Chemical Separation Plant	Significant Reactor-Associated Facilities: Heavy Water Production**	Treaty Commitments: Nonproliferation	Treaty Commitments: Limited Test Ban
ARGENTINA	●	•	•					1	1					△	□		S
AUSTRALIA	⬤				□											R	R
AUSTRIA											1					R	R
BELGIUM										2	3					S	R
BRAZIL	•	•			□						2						S
BULGARIA	●	●	●								4					R	R
CANADA	⬤	⬤	⬤					8	9						○	R	R
CHINA, REP of						□		1			4			□		R	R
CZECHOSLOVAKIA	⬤	⬤	⬤					1			4					R	R
DENMARK	•															R	R
EGYPT	•															S	R
FINLAND											3					R	R
FRANCE	⬤	⬤	•	○	□	□		8			20	2	2	○	○		
GERMANY, EAST	⬤	⬤	⬤		□					1	3					R	R
GERMANY, WEST	•	•			△	□	□	2		8	12	1	2	△	△	S	R
GREECE	•															R	R
HUNGARY	●	•	•								2					R	R
INDIA	•	•						2	3	2				△	○		R
ISRAEL	•	•			□	□		1						□			R
ITALY	•			□	□			1		2	3		1	△		S	R
JAPAN	•	•		□	□		□	1	1	7	21		1	△		S	R
MEXICO	•										1					R	R
NETHERLANDS					△		□			2						S	R
PAKISTAN	•							1									S
PORTUGAL	•	•	•														S
ROMANIA	•	•														R	R
SOUTH AFRICA	⬤	⬤	●				△										
SOUTH KOREA											2					S	R
SPAIN	●	•	•					1		2	8			△			R
SWEDEN	●	•		□			□	1		2	9					R	R
SWITZERLAND										3	3					S	R
YUGOSLAVIA	•	•									1			△		R	R

* Small research reactors and others that produce insignificant amounts of plutonium are excluded
** Significant in association with natural uranium fueled reactors

⬤ Major
● Significant
• Minor

○ Production
△ Pilot plant
□ Research

6 (unshaded box) In operation as of 15 Aug. 74
6 (shaded box) Under construction and/or planned for operation by 1980

R Ratified
S Signed but not ratified

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DISCUSSION

1. Five nations—the US, the USSR, the UK, France and China—have overt, substantial nuclear weapons programs. India exploded a device, labeling the event a "peaceful nuclear explosion," in May 1974 [redacted] We believe Israel already has nuclear weapons, though the Israelis have been quite successful in concealing their program and denying outsiders absolute proof of their weapons capability. A number of other countries are technologically capable of producing a weapon in the foreseeable future, although none now appears committed to such a course. They range from countries like Canada, West Germany and Sweden—with near-term capabilities but minimal incentives—to those like South Africa and Taiwan—where the nuclear weapons option is more distant in time but potentially more attractive from the politico-military viewpoint.

2. The once formidable technological and economic barriers to development of nuclear weapons capabilities by nations of middling size and resources have steadily diminished over time; they will continue to shrink in the years ahead. Fissionable material—the first essential of a nuclear weapon—is becoming more readily available throughout the world. The knowledge necessary for making a weapon is spreading. Many of the facilities for processing nuclear materials are becoming commonplace, leading—among other things—to a decrease in the incremental costs of a weapons program. More and more countries are entering into or expanding domestic programs in fields such as metallurgy and conventional weapons that provide a basis for nuclear weapons fabrication capabilities.

3. Thus, military utility and political consequences as perceived by national leaders will increasingly dominate the future nuclear weapons decisions of those states now having little or no nuclear weapons capability. Military utility will probably be the overriding consideration in any case where a nation perceives an urgent military requirement; in most instances, however, domestic and international political considerations are likely to be the key determinants.

I. THE BARRIERS TO PROLIFERATION

A. Technological Requirements

4. Natural uranium, the source material for the two most commonly used fissionable materials—Uranium-235 (U-235) and Plutonium-239 (Pu-239)[redacted] is abundant enough so that many nations have domestic reserves that are exploitable at present market prices. (See Table.) Others (e.g., India and Israel) are exploiting domestic uranium that is not economic in world market terms.

5. Of the two primary weapons materials, plutonium is the one that most aspirants to nuclear weapons could obtain most readily. It is produced by bombarding U-238 with neutrons in nuclear reactors (the irradiation process). The uranium that serves as fuel for the reactor contains both U-238 and U-235. After the fuel has been irradiated, it contains a mixture of uranium, plutonium and many fission products. Plutonium can be separated from the irradiated fuel by a chemical process in a chemical separation plant. As of mid-1974, there are 16 countries aside from the five nuclear powers with a total of 53 operational electric power or research reactors capable of producing up to a total of some 9 metric tons per year (mt/y) of plutonium. By 1980, we anticipate that 24 such countries will have about 157 such reactors capable of producing up to 50 mt/y. Maximizing the Pu-239 content for weapons use involves frequent fuel reloadings, requiring significantly larger uranium supplies than normal operation and greatly increasing the cost of the electric power produced. This can most readily be done in a natural uranium reactor designed to permit fuel rod replacement without interrupting power-generating operations.

[redacted]

6. Alternatively, a state seeking a nuclear capability could opt for a weapon based on U-235, rather than plutonium. Natural uranium contains only some 0.71 percent of U-235, the isotope essential for nuclear weapons utilizing uranium as the source of an explosive chain reaction. It must be highly enriched for weapons use; enrichment to over 90 percent offers the best combination of explosive potential and weapon size. The method of enrichment commonly used to date is gaseous diffusion.[2] This method has not been practical on a small scale and facilities have been built only by the five nuclear powers, although a French-led consortium (Eurodif) including financial participation by Italy, Belgium and Spain—and possibly Libya—will soon begin construction of a $2 billion plant in southern France that is due for operation in 1980 or shortly thereafter and intended to provide enriched uranium for reactor fuel.[3]

7. The first enrichment method suitable for small-scale operation to be proved feasible for

[2] In this process, natural uranium in the form of gaseous uranium hexafluoride is pumped or diffused through a barrier containing a very large number of pores of very small diameter. Because U-235 is lighter and therefore diffuses more rapidly than U-238, a larger fraction of the original amount of U-235 succeeds in doing so. Through many repetitions, the gas is enriched in U-235, until the desired enrichment is achieved. Since the gas must be pumped by a compressor run by an electric motor at each stage, an enormous amount of electric power is consumed.

[3] The subject of worldwide commercial demand for enriched uranium for peaceful purposes will be treated in a forthcoming NIAM, *The Nuclear Fuel Market Through 1990*, scheduled for publication in October 1974.

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ESTIMATES OF WORLD URANIUM RESOURCES AND PRODUCTION
(Thousand short tons of U_3O_8)

	RESERVES				PRODUCTION	
	Recoverable below $10/lb.**		Additional Recoverable at $10–$15/lb.**			
	Known	Known & Probable	Known	Known & Probable	1972 Actual	1980 Attainable
Argentina	12	30	10	40	*	1
Australia	207	255	38	76	0	8
Bulgaria	12	12	na	na	*	*
Canada	241	488	158	442	5	14
Central African Republic	10	21	na	na	0	0
China, People's Republic	100	100	na	na	2	3
Czechoslovakia	150	570	na	na	3 [1]	3
Denmark	7	20	na	na	0	0
France	48	79	13	39	2	3
Gabon	26	32	na	7	1	2
Germany, East	50	100	na	na	7 [1]	6
Hungary	12	12	na	na	1 [1]	1
India	0	0	3 [2]	4	*	*
Italy	12	12	na	na	0	*
Japan	4	8	5	na	*	*
Mexico	1	1	1	na	0	*
Niger	52	78	13	26	1	2
Portugal	9	17	na	30	*	*
Romania	10	20	na	na	*	*
South Africa	163	173	81	115	4	6
South-West Africa (Namibia)	100	100	na	na	0	5
Spain	11	11	10	na	*	*
Sweden	0	0	350	402	*	*
USA	340	1,040	183	483	13	34
USSR	95	155	na	na	7	7
Yugoslavia	8	21	na	na	0	*
Other	5	7	4	4	*	*
Totals [3]	1,685	3,360	870	1,665	45	95

*Less than 500 tons.

**These are measures of ore quality commonly used as benchmarks. Actual prices in international contracts concluded in the several years prior to 1974 tended to be in the $8–12/pound range. Thus, fairly intensive work has been done on locating and delineating deposits recoverable at $10/pound or less. Prices in contracts recently concluded for future delivery are substantially higher, but the price rise has not yet inspired much new information on the availability of lower-grade or less accessible ore.

na Data not available.

[1] Processing into metal done in USSR.

[2] India currently is exploiting these reserves.

[3] Totals may not add, due to rounding.

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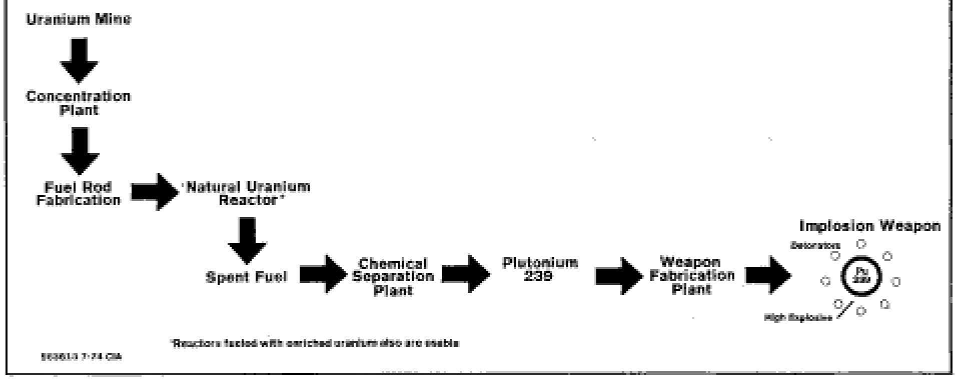
Plutonium Weapon Production Cycle



commercial use for reactor fuel was the gas centrifuge.[4] The UK, West Germany and the Netherlands, in a consortium called Urenco, are pioneering the commercial use of gas centrifuges to enrich uranium for power reactor fuel. Urenco has begun construction of two plants scheduled to be operational in 1976 that will be large enough, in combination, to provide about enough fuel for one large reactor. It is negotiating ten-year contracts for enrichment services, and it plans to have enough capacity to satisfy the fuel needs of 25 major reactors by 1985. Intensive research on gas centrifuge enrichment is also going forward in Japan, which plans a pilot plant by 1980 and a production facility by 1985, and considerable effort is being devoted to the process by a number of other countries.

8. Several other enrichment methods are under development—notably the Becker jet nozzle technique, laser isotope separation and an unknown South African process.[5] Most of the work on the Becker process has been done in West Germany, supported both by the government and by a private firm. The several possible laser techniques and processes are in their infancy—they are being pursued principally in the US, the USSR, Europe and Israel.

9. South Africa is building a pilot enrichment plant that probably involves an aerodynamic process—perhaps similar to the Becker

[4] The centrifuge process involves high speed spinning of uranium in gaseous form in cylindrical containers through many iterations, with the lighter isotope (U-235) gathering towards the center of the tube.

[5] One of several aerodynamic methods, the Becker technique involves forcing a jet stream of a gaseous uranium mixture along a curved wall, with the heavier isotope remaining close to the wall, the lighter one collecting away from it, and the fractions being separated by a knife edge. Laser techniques are based on the use of laser beams to ionize or otherwise isolate a selected isotope—whether of uranium, sulphur or some other element—which can then be removed by electrical or magnetic attraction or by changes in chemical activity.

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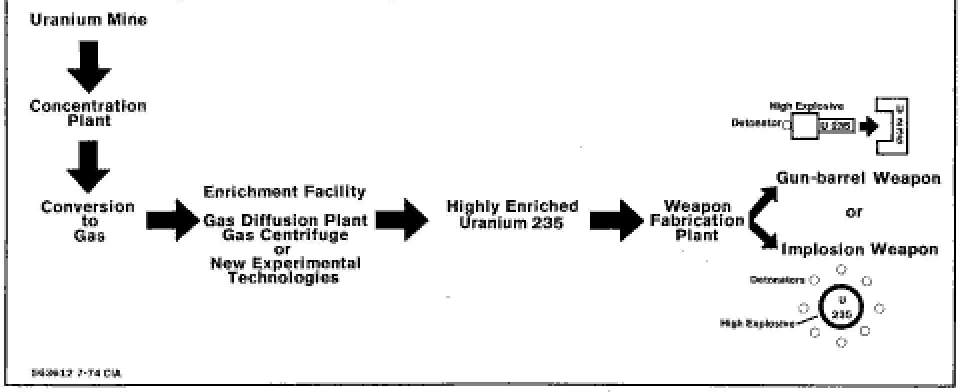
Uranium Weapon Production Cycle



jet nozzle. Construction began on this plant in early 1971, following the Prime Minister's July 1970 announcement of the development of a new technology for enrichment that would be economically competitive with other established methods. It has been announced that the pilot plant is to begin partial operation in 1974. After feasibility studies, a full-scale production facility is anticipated, which is to be financed partly by foreign sources and will involve some sharing of technology. The one known possible future partner is the German firm that has been backing development of the Becker jet nozzle and is participating in the South African feasibility studies; Japanese participation at the study stage also is rumored.

10. Interest in enriched uranium does not necessarily indicate a desire for weapons. Most power reactors utilize slightly enriched uranium as fuel, and dependence on the US—which until recently was the only commercial source of enriched uranium—or on the other major powers as suppliers of a commodity vital to national energy output strikes many users as undesirable on both economic and political grounds. The intensive work being done in many places on enrichment technology leads us to believe that technical knowledge necessary to produce weapons-grade uranium is likely to become increasingly available. As new reactors using enriched uranium are built throughout the world, supplies of low enrichment uranium will become common. Enrichment plants to serve the reactors will become more widely spread. Low enrichment material can be upgraded rapidly by relatively small enrichment plants. Conversion of a gaseous diffusion or Becker nozzle facility from a low enrichment end product to a high enrichment one requires extensive modification. But a gas centrifuge plant which can produce slightly enriched uranium can be used to produce weapons-grade material without substantial modification.

11. A country seeking a demonstrative nuclear explosive device or a weapons capability can choose to develop a simple gun-assembled device employing U-235 or a more complex

spherical implosion device employing either U-235 or Pu-239. A gun-assembled device, in which two subcritical masses of uranium are rapidly brought together in a gun barrel type arrangement, has the advantages of being simple in concept, inherently rugged and easy to design. [redacted] able or [redacted]

Implosion devices, in which spheres and/or shells of uranium or plutonium are rapidly compressed by detonation of the high explosive charge surrounding them, are more complex, require considerably more developmental research and a more sophisticated technological base for their manufacture. [redacted]

12. If access to kilogram quantities of fissionable material is available, the technological resources required for the development and testing of a simple nuclear explosive device are not very great. Much information on the functioning of a simple gun or implosion assembly with a fission yield in the nominal range has been published in open literature. It is generally known that plutonium is unsuitable for use in gun-assembled devices. Critical masses have been published for spheres of plutonium and enriched uranium of various isotopic contents and with different configurations of neutron reflectors. With these basic data, a combination can be selected that will be appropriately subcritical until the high explosive is detonated. [redacted]

[redacted] Moreover, experimental techniques for studying high speed detonations and hydrodynamic material behavior that are needed for the more sophisticated designs are widely used in the field of conventional ordnance. Once a country had detonated a first device, it could move on to reduce size and weight and to increase the efficiency of use of fissionable material.

13. The cost of a program for producing a few low-yield fission weapons per year is not prohibitive for any country with a modest industrial and technological base. Beginning from scratch, a program to produce one or two weapons per year probably would cost at least $200 million before testing an initial device would be possible. This figure would include capital investment on the order of $50 million for necessary facilities for research, production and testing, and some $150 million to cover operating expenses for research facilities for at least five years and production facilities for two years. For a program to produce 15-30 fission weapons per year, the costs prior to a first test or device probably would be $500 million to $600 million, of which at least half would be capital investment in facilities.

14. No potential producer of weapons is today in quite the state of innocence assumed by the foregoing cost estimates. As a result of widespread publication in the nuclear field, competent personnel could reduce the time and expense required for research and devel-

opment. All facilities essential to weapons production except a weapons fabrication plant can be justified as necessary for a power program. Many nations already have all or most of the requisite facilities. By deferring a decision to manufacture weapons until completion of all facilities required for production of fissionable materials, the cost of weapons production can be limited to the additional expense incurred for research, development, fabrication and testing of actual weapons. A fabricating facility need cost no more than a few million dollars. If it is assumed that all other necessary facilities are developed within the framework of a peaceful uses program, a country today probably could operate a program for production of one or two weapons per year, plus on-going research and limited testing to improve the weapon design, for about $10-15 million per year. A larger program to produce 15-30 weapons per year, including ongoing research and testing, might cost some $20-30 million per year.

15. A number of countries have already spent considerably more on their nuclear programs than the amount estimated as the minimum necessary to acquire a capability for weapons production, without actually acquiring such a capability. Funds have been spent for research and facilities not directly related to capability for weapons production. The additional amount that each would have to spend if it wished to produce weapons depends on the nature and status of its present program, and of course on the size of the weapons program desired.

B. International Restrictions

16. In an effort to prevent or limit the spread of nuclear weapons, much of the international community has joined to construct barriers to further proliferation. These include the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), test-ban treaties, and international inspection agreements. Elaborate controls on the use of nuclear materials, called safeguards, have been devised.

Safeguards

17. Under the provisions of the NPT, new safeguards arrangements under the auspices of the International Atomic Energy Association (IAEA) have replaced or will replace most bilateral and trilateral safeguards arrangements. The objectives of applying IAEA safeguards to nuclear materials are: (a) the timely detection of any diversion of significant quantities of material from peaceful nuclear activities, and (b) the deterrence of such diversion by the risk of early detection. To detect diversion, the IAEA must verify the quantities and location of safeguarded nuclear material. Application of uniform safeguards on a broad basis, covering entire national nuclear programs, probably will be more effective than the multiplicity of systems and methods that have been used to date. For those countries who have signed the NPT, the possibility of being detected in a violation will be a strong deterrent to diversion of safeguarded nuclear materials into weapons production.

18. The IAEA's safeguards under NPT agreements are applied to processed uranium in all peaceful nuclear activities carried on by all parties to the Treaty other than the nuclear-armed signatories—the US, the USSR and the UK—with a view to preventing diversion of nuclear material from peaceful uses to nuclear weapons or other nuclear explosive devices. Thirty-three countries were covered by such agreements at the end of July 1974, although only 19 of the countries had nuclear

NUCLEAR SAFEGUARDS

INITIATION

- Imposed by NPT or by suppliers of nuclear materials and/or equipment or assumed unilaterally by recipients

PURPOSES

- Detect diversion of materials to unauthorized uses
- Deter such diversion by providing high likelihood of detection and of adverse political and economic consequences

SCOPE

- Recordkeeping and record audit—to maintain fullest possible accountability
- Influence over facilities design—to facilitate accurate checking
- Equipment such as tamper-indicating seals and surveillance devices
- Inspection for independent verification

CONTROLLING AUTHORITIES

- IAEA (International Atomic Energy Agency)
  - — in connection with all transfers of relevant materials and equipment from any party to the NPT to any other country
  - — on most arrangements predating the NPT and involving a party to it
  - — on some arrangements entered into by non-parties who have nevertheless given jurisdiction to the IAEA
- EURATOM (same membership as European Economic Community)
  - — administers own independent safeguards in all member countries
  - — under agreement recently negotiated and approved by IAEA Board of Governors but not yet ratified by member countries, will fulfill IAEA's safeguarding functions in Germany, Italy, Benelux countries, Denmark and Ireland
- Supplier Governments
  - — sometimes impose conditions that supplement or substitute for safeguards of multinational bodies

RELIABILITY

- IAEA system cannot provide absolute assurances that nuclear material has not been diverted
- Supplier governments impose conditions that range from extremely strict to extremely lax

LIMITATIONS

- Major power signatories of NPT—no means for assuring compliance
- Other signatories of NPT—only declared facilities are covered; areas subject to inspection are narrowly defined; surprise inspections are not practiced; materials used for non-explosive military purposes are exempt
- Important non-signatories of NPT (France, China, Israel, India, Spain, South Africa, Argentina, Brazil)—safeguards voluntary or non-existent
- IAEA safeguards under non-NPT agreements are interpreted by some countries as permitting peaceful nuclear explosives

programs significant enough to be safeguarded. IAEA safeguards also are applied to selected nuclear activities in non-NPT parties with a view toward ensuring that the special fissionable or other materials, services, equipment, facilities, and information under Agency controls are not used in such a way as to further any military purpose. Forty-one such agreements are in force dealing with specific facilities in 23 non-NPT countries, plus the US and the UK. Examples are the two US-supplied power reactors at Tarapur, India; the two Canadian-supplied power reactors in Rajasthan, India; the research reactor at Nahal Soreq, Israel; the major fraction of the Japanese and Swiss nuclear power programs; and research reactors in Argentina, South Africa and Brazil.

19. However, no safeguard system can provide absolute assurance that no fissionable material is diverted to weapons uses. Small undetected diversions are possible even with thorough inspection. Nuclear processing involves lost material in amounts that cannot be so precisely accounted for as to make diversion impossible. In practice, accountability is even less precise than it technically could be—because the IAEA lacks funds to buy the best possible equipment and because the most effective inspection methods would interfere with economically optimal operating methods. Moreover, some authorities (e.g., France) set relatively lax standards in their bilateral agreements. Inspectors do not have free run of nuclear facilities; because of deep concern in some countries about the possibility of industrial espionage, areas subject to inspection are narrowly defined. More importantly, safeguards detect diversion only after it has occurred; a country with a large stockpile of fissionable material can violate the treaty and face the consequences—at a minimum, the suspension of nuclear cooperation and supply by most other signatories—afterward.

20. The largest shortcoming, of course, is the number of countries where materials are not subject to inspection under the NPT. Mainland China, France, India, Israel, Brazil, Argentina, South Africa and Spain have not signed; most are unlikely to do so. Each is important as a potential source of technology or nuclear materials. Moreover, the major power signatories—the US, the UK and the USSR—are on their honor to refrain from providing assistance in nuclear weapons development to non-nuclear states, but no means exist for assuring compliance. While each appears sincerely opposed to proliferation, none can guarantee that all their citizens and government officials will abide by the treaty. Competition among the major nations supplying nuclear materials and equipment is likely to erode the effectiveness of safeguards in the future. Continuing growth of nuclear power programs, with increasing numbers of facilities to be controlled and ever growing amounts of fissionable materials moving in world markets, will add to the problem.

Protection of Existing Weapons

21. Numerical abundance and geographical dispersion also magnify long-standing problems in assuring the security of existing nuclear weapons from theft. As of mid-1974, there are well over 50,000 nuclear weapons in existence, scattered at many hundreds of locations around the world. The US has elaborate programs, involving physical security measures for stored weapons, procedures designed to minimize risks inherent in shipment, and selectivity applied to personnel given access to weapons. As a further barrier to detonation by an unauthorized party, some US nuclear weapons are fitted with devices requiring spe-

cial coded instruction prior to activation. The UK and France use similar approaches to the security of their weapons. It is reasonable to believe that the USSR and China are also very careful, and the vulnerability of weapons within their borders probably is reduced by the restrictions on personal freedom and travel characteristic of Communist societies. There is no reason to believe that any nuclear weapon has been misappropriated anywhere in the world. As with safeguards on materials, however, absolute assurance about future security is impossible. And prudence would require any observer to credit the thieves of a weapon with the potential capability to detonate it or release its toxic material content.

II. CANDIDATES FOR THE DEVELOPMENT OF NUCLEAR WEAPONS

22. For those countries technically capable of producing weapons, the governing factors in their decisions up to this point have been political and military—safeguards and international pressures have retarded the pace of proliferation but not prevented it. The US and the USSR have devoted very substantial attention and resources to discouraging their separate sets of allies and friends from developing independent capabilities, but France and mainland China have proceeded to acquire significant inventories of weapons. India has detonated a device; we believe Israel has weapons in being. Other countries which could more easily have produced a weapon from a technological point of view—e.g., West Germany, Japan, Canada and Sweden—have refrained. In the following section, therefore, we discuss the future of nuclear weapons programs in a number of countries in terms of the political and military parameters that will influence governmental decisions as well as in terms of technological capabilities.

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[redacted]

B. Israel

37. We believe that Israel already has produced and stockpiled a small number of fission weapons. [redacted] it cannot be proven beyond a shadow of a doubt. But several bodies of information point strongly in the direction of a program stretching back over a number of years:

(a) Israel has gone to great effort to obtain uranium concentrate. It has sought this material clandestinely, [redacted]

(d) Israel has invested heavily in a costly missile system that is ineffective for precision delivery of conventional weapons. [redacted]

Facilities and Programs

38. [redacted]

[redacted]

TOP SECRET

TOP SECRET

43. The fact that Israel has made such a large investment in the Jericho missile system—which is only marginally useful if armed with high explosive warheads—is compelling substantiation for the judgment that Israel has nuclear weapons. Development began in France in 1963, was transferred to Israel in 1968, and was probably completed about 1970. The missile itself is essentially unchanged from the original French design. However, the Israelis replaced the original inertial guidance system developed by the French with one of their own design which is based on components produced in Israel under licenses from US companies.

44. The Jericho is a mobile, two-stage, solid-propellant, short-range ballistic missile system with both tactical and strategic importance in the Middle East context. (See graphic.) It is about 43 feet long, weighs almost 15,000 pounds and has a reentry vehicle that probably weighs about 2,200 pounds. Its maximum range is about 260 nm and the circular error probable (CEP) at that distance is estimated to be about 0.5 nm.

45. Development of the missile is the responsibility of Israeli Aircraft Industries (IAI), which has constructed a number of facilities for both production and testing. These include solid-propellant production facilities north of Tel Aviv, motor research and development facilities near Haifa, motor production and test facilities at Ramla (about ten miles southeast of Tel Aviv), and a missile assembly and checkout plant at nearby Hoter. A test range is in the Yavne sands—an area on the coast south of Tel Aviv.

47. The Jericho missile was designed by the French to carry nuclear as well as conventional warheads.

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C. Republic of China (Taiwan)

Capabilities

55. In connection with an ambitious program for procurement and operation of nuclear power facilities on Taiwan, the Republic of China (ROC) is gradually developing a potential for the production of nuclear weapons. There is strong military association with nuclear programs on the island, and we believe facilities are being developed with conscious intent to keep a nuclear weapon option open. But it will be at least five years or so before the ROC is in a position to fabricate a nuclear device.

56. Most military-related nuclear programs are centered at Lungtan. Prior to 1973, the military-controlled portion of the nuclear program was conducted at the Chung Shan Science Institute, established after Peking's first nuclear test under orders to provide a nuclear weapons research facility. It conducts nuclear research, missile development and related electronics research. A 1973 spin-off, named the Institute of Nuclear Energy Research (INER) remains collocated; it was publicly placed under the civilian Atomic Energy Council but we believe it is still subject to strong military influence and is conducting military-related research. The physical security of the Lungtan facilities is excellent, and our information on activities there is far from complete, but known projects are applicable to weapons development.

57. The centerpiece of the Lungtan facilities is the Taiwan Research Reactor, a 40 MWt heavy-water reactor built by Canada which has been in operation since mid-1973. This reactor, similar to the CIRUS reactor in India which produced the nuclear materials used in the Indian test, is capable of producing enough plutonium for one or two weapons annually. Other facilities include an almost completed pilot laboratory for reprocessing fuel plates from small testing and teaching reactors, a fuel fabrication plant with a capacity of 25 tons of fuel per year, a hot laboratory for handling spent fuel and various other laboratories. Scientists at INER are designing a unique sort of 135 MW natural uranium-fueled power reactor for domestic production. This reactor would be suitable for plutonium production, but actual construction of such a facility would be a long and difficult endeavor and may not be achievable.

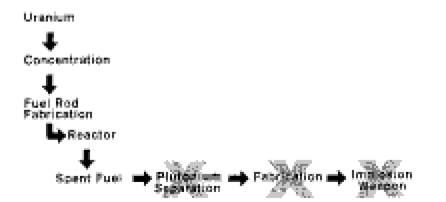
58. At present, the nuclear plans of the Taiwan Power Company (Taipower) are based entirely on imported reactors. Two 636

MW plants are under construction and due to come on line in 1975 and 1976. Contracts have been let on two 985 MW plants; bids are currently under review for two more of similar size. Future plans call for two more, of 1,300 MW each. Taipower once considered purchasing Canadian natural uranium reactors, but all contracts signed to date have been with the US for reactors requiring enriched uranium fuel.

59. Taiwan has no chemical separation plant; it has been seeking one for several years. After an unsuccessful attempt in 1972 to buy one in West Germany, it turned to the US. A strongly negative US response led to Taiwanese assurances that attempts to obtain a reprocessing capability would be dropped. Subsequently, however, reports were received of continuing attempts to obtain a separation plant from France. With separation technology widely available and a number of manufacturers selling the equipment, the Taiwanese should encounter no great difficulty in obtaining a production-size plant if they are determined to have one.

60. Taiwan is dependent on foreign sources both for uranium and for the heavy water moderator required by the CIRUS-type reactor. Canada has provided enough fuel, under safeguards, to operate the reactor for research purposes for about four years. And the ROC has bought some 112 tons of safeguarded uranium from South Africa via the UK—enough fuel for another 14 years. If the reactor were operated for the production of weapons-grade plutonium, fuel presently available would last for about five or six years and produce enough material for about ten weapons. Dependence on imports could not be eliminated in the foreseeable future, however, as Taiwan has no known uranium deposits. But construction of a domestic plant for processing uranium concentrates into metal and a domestic heavy water facility are possible. These would leave Taiwan dependent on outsiders only for uranium concentrates, which are much more readily available on the world market.

Taiwan: Facilities Suitable for a Plutonium Weapon



61. At this stage, there is no evidence of ROC progress toward development of a nuclear delivery system which would pose a credible threat to Mainland China targets.

[redacted]

62. Taipei was an original signatory of the NPT and moved rapidly to ratify it; all known nuclear facilities on the island use safeguarded materials. However, it was expelled from the IAEA in December 1971, in response to Peking's demands. IAEA has continued to make inspections on Taiwan, but the ROC could refuse it access at any time. Under these circumstances, the CIRUS-type reactor would be free of safeguards. US-supplied reactors are less vulnerable, in practical terms, to such action; they are subject to bilateral US safeguards and require slightly enriched uranium which Taipei must import.

63. Even assuming that ROC authorities were willing to abrogate safeguards and to invest heavily in nuclear processing facilities they now lack, they would be some years from attainment of a weapons capability. A chemical separation plant would take several years to build. Testing and weaponization would require two or three years, once weapons-grade plutonium was available. All things considered, we think it would take a decision in the immediate future and considerable foreign assistance from sources such as Israel or France for the ROC to be able to construct a device by 1980.

Intentions

64. We have no reliable information on just what has inspired the ROC to continue its nuclear weapons efforts. Most likely, the initial stimulus of Peking's nuclear program was reinforced by concern for the durability of all-out US support, the program gathered momentum as the military-scientific bureaucracy expanded to staff the effort, and feasibility became an independent justification of sorts. Taipei's growing sense of isolation is adding impetus to its drive for military self-sufficiency. And the recent Indian test no doubt has buttressed the case for those on Taiwan who favor developing a nuclear weapons capability.

65. But the Taipei leadership must also be aware of the many risks that abrogation of safeguards and actual fabrication of weapons would entail. Taipei clearly cannot hope to compete with Peking in the area of nuclear weapons. Existence of a small number of nuclear weapons on Taiwan might serve to provoke Peking, rather than deter it. Disclosure of a nuclear weapons capability on Taiwan would lead to world-wide pressure to cut off nuclear fuel supplies and technical support for nuclear power programs. And exercise of a nuclear weapons option would endanger further support from the US. Taiwan's security is so heavily dependent on continued adherence of the US to the Mutual Defense Treaty that any move on Taipei's part which might imperil that relationship would not be taken without agonizing study.

66. All things considered, Taipei probably sees a capability to design and produce a nuclear weapon as a potentially useful hedge against the unknown exigencies of the future, when it may be alone and facing great risks. We think that an early ROC decision to proceed with testing or with the fabrication and stockpiling of untested devices is unlikely, so long as the US remains committed

enough to the ROC to give it some sense of security. But in the longer run Taipei is one place where US policies toward nuclear proliferation would have a major impact. If there are to be several more nuclear weapons states by the mid-1980s, the ROC will want to be among them, and its present course probably is leading it that way.

D. Japan

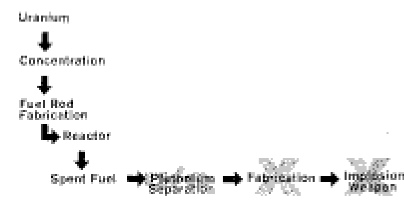
Capabilities

67. Japan has an extensive and technologically advanced nuclear energy program; within the next few years it will have the second largest nuclear power generating capacity in the world. Technologically speaking, it is in a position to produce and test a nuclear device within two or three years by violating safeguards and before 1980 with full adherence to safeguards, but it could not develop a credible independent deterrent force for a decade or more.

68. Japan has seven nuclear power reactors now in operation and another three scheduled for operation later in 1974. These 10 represent power generating capacity of 5,200 MW; the planned goal is 70,000 MW by 1985. The first operational reactor was built by the UK and the next six by the US; all are under IAEA safeguards. The Japanese are now building an advanced thermal reactor at Tsuruga, which will be operational in 1976. If fueled with indigenous uranium the Tsuruga reactor would not be under safeguards and thus would represent a significant potential source of unsafeguarded plutonium—some 50 kg annually in normal operation.

69. The Japanese plan to recover the plutonium produced in these reactors in their own 210 mt/y fuel reprocessing plant, which

Japan: Facilities Suitable for a Plutonium Weapon



is scheduled for operation in 1975. More capacity will be needed by 1978, and plans are currently being studied for a second plant of about 1,500 mt/y. The plutonium recovered will be under safeguards and is to be used in an experimental fast breeder reactor and the advanced thermal reactor. Later it will be used in Japan's fast breeder program.

70. Japan will be dependent upon imported, safeguarded enriched uranium fuel for its nuclear power plants, at least through 1985. To meet the enriched fuel needs of its power reactors later on, Japan is conducting active research on both gas centrifuge enrichment and gaseous diffusion. In 1972 a decision was made to construct a pilot centrifuge plant which, if successful, would be followed by a full size plant, tentatively slated for operation by 1985. Studies are being conducted into possible joint ventures with other countries in enrichment projects.

71. Although Japan has carried out extensive exploration for uranium, it has not located any substantial deposits. It does have limited reserves amounting to about 8,500 tons of U_3O_8 in widely scattered deposits impractical to exploit at present for use in the large power program. However, these reserves would provide a source of unsafeguarded material for

a weapons program. The Japanese are operating an experimental uranium processing facility with a production capacity of about 30 tons per year. Japan has made uranium purchasing agreements with the US, Canada and France and is participating in uranium exploration in Niger, Gabon, Canada and Indonesia.

72. If Japan decided to develop a nuclear weapon as rapidly as possible, in violation of safeguards, it probably could have an initial device within two or three years, and a weapon some time later. It now has on hand—from fuel reprocessed abroad and returned—separated plutonium sufficient for several tens of weapons. Costs would be minute in Japanese terms. And Japan has suitable weapons fabricating facilities and the technical knowledge necessary to proceed at any time. A Japanese weapon developed without abrogating safeguards would take somewhat longer, principally because implementation of such a decision would have to await significant production of plutonium from the Tsuruga reactor.

73. Japan already has a significant aircraft delivery capability. It began manufacturing F-4E Phantoms under license in 1972 and plans to have about 100 by the end of 1977 and 125-150 by 1980. The 500-600 nm combat radius of the Phantom is enough to put some Chinese coastal targets, Eastern Manchuria and the Soviet Maritime Province within striking range.

74. Japan has no strategic ballistic missile program, but it probably could develop and deploy a missile within three to five years of initiation of a serious effort. The Japanese could present a reasonably credible threat to the Soviet Far East and most areas of strategic value in China with a force of about 50 to 75 intermediate-range (1,500 nm) missiles. Experience gained during the past decade in development, testing and production of satellite vehicles and hardware for the Japanese space effort would be directly applicable. Using the largest satellite launch vehicle developed to date, the solid-propellant Mu-3C, as the basis for a design, it could develop a missile capable of delivering a 2,500-pound payload to a range of 1,375 nm. The principal problems in conversion would be development of guidance and control systems—a matter of a year or two before testing could begin. Improved and more powerful versions of the satellite vehicle, the Mu-4SH and the Mu-4SS, are scheduled for testing in the next few years; they would provide a basis for increasing payload and/or range capability of any military version. The Japanese probably could convert any of these vehicles into ballistic missiles without a major input of foreign technology.

75. Japan already has the basic test facilities required for missile development, and these are scheduled to be upgraded. The Kagoshima Space Center on the southern tip of Kyushu is a relatively modern facility well suited, with appropriate modifications, for missile development. A larger satellite launch complex is under construction 50 nm south, on the island of Tanegashima. Either site would provide adequate firing ranges to the east or southeast. The cost of developing and deploying a military missile would be little burden for Japan.

Intentions

76. At a minimum, Japan will keep open the possibility of developing nuclear weapons—whether or not it ratifies the NPT. It will continue to develop its plutonium pro-

duction capability. It will pursue its space program with an eye to enlarging its commercial position in the aerospace industry and to future military applications. It will keep a wary eye on China and the USSR, and study evidence of US intentions with regard to Japanese security. In short, in the course of its nuclear power program, Japan will probably reach a point in about two years at which (a) a decision to manufacture nuclear weapons could be followed by the production of a first weapon in a program within two years or so; and (b) an initial device could be detonated in a shorter period. Opinions within the intelligence community differ on the decision that the Japanese are likely to make.

The Position of the Director of Central Intelligence, the Deputy Director of Central Intelligence representing the Central Intelligence Agency, the Director of Intelligence and Research representing the Department of State, the Director, Defense Intelligence Agency, and the Assistant Chief of Staff for Intelligence, Department of the Army

77. We believe that the Japanese are unlikely to make a decision to produce nuclear weapons unless there is a major adverse shift in relationships among the major powers. We do not believe that Japan's leaders view nuclear weapons as a prerequisite to achievement of the nation's basic political and economic goals. We do not believe that events such as India's explosion of a nuclear device will have significant influence on Japan's course.

78. Official Japanese nuclear policy is set forth in the "three non-nuclear principles"—no possession, no manufacture, no introduction of nuclear weapons into Japan. Despite a Japanese government interpretation that the "peace constitution" does not preclude possession of defensive nuclear weapons, Japan is likely to continue to hold to these well-publicized principles. The Japanese position is a product of continuing strong domestic opposition to nuclear weapons and general awareness of the hostile reaction that a nuclearized Japan would engender among its East Asian neighbors. There is also the risk, virtually unacceptable until Japan achieves independent means of producing massive quantities of plutonium or enriched uranium, of being cut off from imported materials, equipment and technology for its ambitious nuclear power program.

79. From the Japanese point of view, there is the problem of scale. It is hard for Tokyo to see how development of a modest nuclear arms capability—much less the token of a nuclear explosion on the Indian pattern—could enhance the nation's security or improve its economic standing. Indeed it would almost certainly be viewed as counterproductive, arousing China and the USSR without intimidating them and leading almost inevitably—in light of Japan's strategic vulnerability—to a requirement for development of a credible deterrent force. The latter would entail massive reordering of national economic priorities.

80. It is fair to assume, nonetheless, that the Japanese leadership would give serious consideration to the development of nuclear weapons if they felt the country threatened. The actual decision would depend on the domestic political context, the state of relations with the US, particularly the credibility of its nuclear umbrella, and—most important—the dimension of the threat perceived from the USSR and/or China. For the next several

years, it is difficult to foresee circumstances developing which would cause the Japanese government to decide to go nuclear. And it is even more difficult to imagine the Japanese electorate overcoming the nuclear allergy sufficiently to support such a decision.

The Position of the Assistant Chief of Staff, Intelligence, Department of the Air Force and the Director of Naval Intelligence, Department of the Navy

81. We believe the nuclear question poses a difficult choice for Japan between the uncertainties of continued and obvious reliance on the United States and the economic and probable political costs of an independent nuclear force. Acquiring nuclear weapons would subject the Japanese Government to political criticism, domestically and from abroad. It would also risk an embargo on foreign supplies of uranium, which are vital to the nuclear power program in which Japan has invested some $5 billion. Japan's assessment of the policies of other nations will weigh heavily in the ultimate decision. Japan's security policies have been predicated on containment of nuclear proliferation and general movement toward disarmament, two premises which now appear threatened. The Japanese have been disturbed by the lack of a strong stand by the US and other Western powers against India's explosion of a nuclear device and by US offers of reactors and atomic fuel to Israel and Egypt. These events follow other developments of the past few years which have created a sense of insecurity among the Japanese: growing doubts about the reliability of the US nuclear umbrella in defense of Japan; economic vulnerability, painfully brought home by the Arab use of oil as a weapon in time of crisis; and the discovery that economic power alone offers insufficient leverage in international politics to a nation that aspires to great power status.

82. Some Japanese see a military nuclear capability as a natural component of Japan's big power status; a greater number still oppose the idea. Recent Japanese polls, however, have revealed a public trend toward wider acceptance of at least the possibility that Japan might eventually acquire nuclear weapons, an indication that a growing number of Japanese, while not approving a nuclear capability, are becoming passive in their opposition, in the belief that such a development is inevitable.

83. On balance, we believe there is a strong chance that Japan's leaders will conclude that they must have nuclear weapons if they are to achieve their national objectives in the developing Asian power balance. Such a decision could come in the early 1980s. It would likely be made even sooner if there is any further proliferation of nuclear weapons, or global permissiveness regarding such activity. These developments would hasten erosion of traditional Japanese opposition to a nuclear weapons course and permit Tokyo to cross that threshold earlier in the interests of national security.

84. Deterioration of Japanese relations with China or the Soviet Union, and the Japanese perception of a military threat from either power, would accelerate the pace of weapons development. So would a further decline in the credibility of US defense guarantees.

E. Argentina

Capabilities

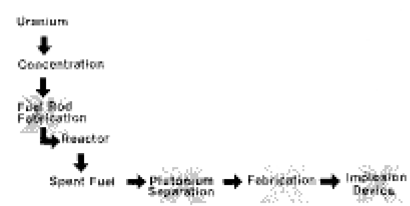
85. Argentina's nuclear program is fairly new, but it is being pursued vigorously with

an eye toward independence of foreign suppliers and controls. If Buenos Aires dedicated itself to the earliest possible achievement of a nuclear weapon and received continuing foreign assistance in building the necessary facilities, Argentina could have an initial device in the early 1980s.

86. Argentina's first nuclear power reactor, a 340 MW heavy water reactor at Atucha built by a German firm, is operational. Safeguard arrangements on it include a provision for renewal in October 1977; if the Argentines choose to refuse renewal and procure or produce unsafeguarded heavy water, they could have a reactor free of safeguards with an annual plutonium capability of about 150 kg in normal operation. Construction has begun on a Canadian-supplied and IAEA safeguarded natural uranium reactor, scheduled for operation in 1979. Work on a third power reactor of the same type supposedly will begin before the end of 1974 although the supplier is not yet certain. All three reactors are of a type easily adaptable to production of weapons-grade plutonium, and military pressures favoring them over reactors requiring enriched fuel played a significant part in the final decision.

87. The desirability of natural uranium fueled reactors also rests on the fact that Argentina has abundant supplies of natural uranium. Refining capacity is being expanded from 60 mt/y to about 400 mt/y of concentrate, based on anticipated daily processing of some 1,200 tons of ore. To date, fuel rod fabrication has been done abroad, but proposals are being solicited from Argentine firms for construction by late 1977 of a 300 mt/y fabrication facility. Other Argentine plans include a 400 mt/y heavy water plant to become operational in

Argentina: Facilities Suitable for a Plutonium Weapon



1979 and reactivation of a currently inactive British-built, pilot-scale chemical separation plant.

88. Although Argentina is highly industrialized by Latin American standards, attainment of a nuclear weapons capability in the near term would be severely hampered by technological shortcomings. A plant suitable for reprocessing reactor fuel in quantity would take several years to build and require a considerable advance in technology and skills. Thus the extent of foreign assistance available would be a key element in determining the time frame of Argentine progress. A five-year agreement with India, signed in mid-1974, might provide some help in this regard.

89. For the foreseeable future Argentina would probably have to rely on aircraft—notably the Mirage IIIs and Canberras now in inventory and anything more they might buy—as delivery vehicles. It has only a rudimentary aircraft industry and no capability to produce a ballistic missile. It might be able to purchase a short-range, nuclear-capable missile such as the French Pluton, but it probably would not have the skills to fit them with suitable warheads for years to come. And such missiles would be of doubtful utility in any event.

Intentions

90. Argentina has not signed the NPT; rather, it is an outspoken critic of the Treaty as a barrier to full development of peaceful uses by parties to it. It has signed but not ratified the Latin American Nuclear Free Zone Treaty. It would not appear to have any military need for nuclear weapons, but it has long been apprehensive and envious of Brazil, and this is being exacerbated by Brazil's noteworthy economic performance. An Argentine nuclear capability, perhaps described on the Indian model as possession of a "peaceful device," has considerable appeal in some quarters as a means of redressing the power balance. Argentine nationalism, pride and pretensions to a major role in Latin America and the world would be enhanced at least temporarily by possession of weapons or devices. But, Argentina must also consider the possibility that Brazil would follow suit and soon negate any advantage. Over time, and in the absence of strong international pressures that succeed in stopping weapons acquisition by other countries, there appears to be an even chance that Argentina will choose to join the nuclear club in a small way.

F. South Africa

Capabilities

91. In the short run, South Africa is of more concern in the proliferation context as a potential supplier of nuclear materials and technology than as a potential nuclear weapons power. It controls large uranium deposits, both in South Africa proper and in Namibia (South-West Africa). It apparently has developed a technology which will enable it to produce and market enriched uranium. If this technology proves successful, South Africa would be capable of producing a nuclear device within this decade if it chooses.

92. South Africa has the world's third largest uranium reserves. It has been a major exporter, principally to the US and the UK, since 1950. Sales to those markets have dwindled, and exports to new customers such as Japan and Germany have not fully replaced them. Recent production of some 4,000 mt/y of uranium concentrates, principally as a byproduct of gold mining operations, has largely gone into stockpiling for future export and domestic needs. Some 20,000 tons of uranium concentrates now are on hand. Current plans are to bring the Namibian fields into operation at an output level of 3,000 tons by 1975 and increase their production to 10,000 tons by 1981.

93. Revived interest in uranium mining stems from increased world demand for uranium and apparent success in developing a method of enriching uranium into fuel suitable for the type of power reactors that will dominate world markets for nuclear generating plants in the decade ahead. As explained above (paragraph 9), the South Africans are building a facility—described as a pilot plant but substantial in size (see photo)—which will use some new and as yet undefined enrichment technology. The South Africans have announced that it will be operational before the end of 1974, but this date may slip somewhat. They intend to follow on with a commercial-scale enrichment facility but construction has not yet begun and operation probably will not occur in this decade.

94. Although the South Africans contend that their facilities will be used for production of slightly enriched uranium, all known enrichment processes are adaptable to produc-

tion of weapons grade U-235. The potential output of the pilot plant is unknown, but it certainly would be adequate to provide enough material for at least a few weapons annually. There is no reason to doubt that South Africa could acquire all the technology and fabrication facilities necessary for designing and producing such weapons within a few years. For delivery, South Africa would have to rely on aircraft. It has 38 Mirage IIIs in inventory. It also has a license to assemble the more advanced Mirage F-1 and will begin doing so in 1975, building up a planned inventory of about 50 by 1980. It does not currently have any capability to produce a ballistic missile.

South Africa: Facilities Suitable for a Uranium Weapon

Intentions

95. Although South Africa has not signed the NPT, it has required application of IAEA or other safeguards on most of the uranium it has sold over the years, and it has indicated that the output of the enrichment plant will be safeguarded. It is unlikely, however, that the South Africans would permit IAEA inspection of facilities on its territory. And they are unlikely to follow through on their hints of possible eventual NPT ratification. South Africa's political isolation is growing—slowly but inexorably—and its suspicion of the outside world is bound to increase over time. Such trends no doubt have been accelerated by recent events in Portugal, which raise the prospect of hostile states on South Africa's borders in the near future. There is no indication that South Africa currently is pursuing a nuclear weapons program, and it is unlikely to add to its troubles with the world community by initiating one solely for prestige reasons. But we believe the South Africans would go forward with a nuclear deterrent if they saw a serious military threat from their African neighbors beginning to emerge. This condition does not at present appear at all likely to be fulfilled within the next few years.

G. Other Countries

96. Several European countries and Canada have a near-term capability to produce nuclear weapons but little or no incentive to translate that capability into action. **Canada** has vast uranium resources and a nuclear program that is the country's largest scientific and technical undertaking. Its independently developed CANDU reactor system is a valuable export item, as well as a source of great national pride. With the exception of an operating chemical separation plant, all the necessary facilities for weapons construction exist or could be established in a short time. Power reactors now in operation could produce enough plutonium for a few hundred fission weapons per year. But the Canadians do not perceive a need for an indigenous nuclear force, since US forces provide them a high level of security. In short, Canada is the least likely of any near-nuclear country to seek its own weapons.

97. **West Germany** has a similar near-term capability that is, for various reasons, highly unlikely to be translated into an independent weapons program. Its extensive and well-developed nuclear program is firmly oriented toward peaceful applications, completely under safeguards and subjected to more than ordinary scrutiny by the rest of the world. Even a hint of a German nuclear weapons program, which would be a flagrant violation of the agreements under which Germany joined NATO, would have a major, divisive impact on the alliance, which is Bonn's most reliable source of security. Indeed, even the possibility of German participation in a multilateral European nuclear force is a subject of considerable concern in Western Europe. And the USSR would react very negatively to German acquisition of nuclear weapons. The Germans are well aware that any sort of nuclear exchange in Europe would be disastrous for them. In the absence of a total upheaval of relationships within the Western alliance, there is no reason for them even to contemplate nuclear weapons acquisition.

98. Other European countries are highly unlikely candidates. **Sweden** has an advanced nuclear research and power program and most of the facilities required for a weapons program. But it has ratified the NPT and closed down its only natural uranium reactor,

at Agesta, which was unsafeguarded. And it has abandoned plans for a chemical separation facility, choosing instead to use facilities elsewhere in Europe and in the US for fuel reprocessing. **Italy** has the technical capability to fabricate a weapon within three to five years. It has three nuclear power reactors in operation and most of the ancillary facilities that would be necessary for production of a plutonium device. But all its nuclear materials and facilities are safeguarded, and it has shown no serious interest in independent development of weapons. NATO participation and US nuclear defense arrangements satisfy its security interests and obviate any need by Italy for weapons of its own.

99. **Spain** is the one European country that is deserving of some attention as a possible proliferator in the years ahead. It has indigenous uranium reserves of moderate size, an extensive long-range nuclear power program (three reactors in operation, seven under construction and up to 17 more planned), and a pilot chemical separation plant. It has refused to sign the NPT, on grounds that pledges of protection for non-nuclear states are inadequate and requirements for inspection potentially harmful from the standpoint of commerical competition. However, Spain is linked to the US by a bilateral military agreement which Spanish leaders are likely to view as offering better security than any independent Spanish nuclear capability. Only an unlikely combination of circumstances, growing out of Spain's location with respect to Gibraltar, Portugal and North Africa—coupled with the loss of security ties to the US or NATO, and perhaps a post-Franco government unsure of itself—seems in any way plausible as a reason for Spain to develop a nuclear capability unless such weapons become commonplace.

100. **Australia** is another of the possible but implausible nuclear powers. It has huge uranium reserves, neglected until recently because it also has abundant cheap coal. Having maintained for some time that it would not again export uranium except in enriched form, it has recently announced its intention of establishing a substantial enrichment plant. It probably will seek foreign participation. Should it decide to pursue a weapons program, it presumably could obtain the necessary facilities.

101. Once opposed to the NPT on grounds of possible interference with peaceful nuclear programs, Australia signed in 1970 and participated in the negotiation of safeguards procedures. It also sought US assurances that the NPT would in no way alter the US commitment to Australia, embodied in the ANZUS pact, that the Australians see as the foundation stone of their security. Under the Labor government that has held office since 1972, Australia has shown decreasing inclination to participate in extra-Australian defensive arrangements and has reduced the size of its own military forces. No Australian government likely to hold power in the next few years would embark on an independent nuclear weapons program, although such a course is hypothetically possible.

102. There are several other countries which could feel strong urges to develop independent nuclear weapons but which have no capability in this decade. In the 1980s, the production of nuclear weapons will be within the technological and economic capabilities of many additional countries. Whether such countries do in fact become proliferators will depend largely on the degree of proliferation elsewhere in the interim, the reaction of the world at large to entry into the nuclear

weapons field of additional countries, and regional ambitions and tensions.

103. **Iran's** much publicized nuclear power intentions are entirely in the planning stage. A number of electric power reactors are scheduled and under negotiation, but the first will not become operational until 1979 or 1980. Iran now lacks all the non-reactor facilities necessary to weapon development and production. It is a party to the NPT and all its reactors and other facilities will be safeguarded. Although withdrawal from the NPT or abrogation of safeguards is possible, no Iranian leader is going to take that step while a nuclear energy program is in the middle of implementation. There is no doubt, however, of the Shah's ambition to make Iran a power to be reckoned with. If he is alive in the mid-1980s, if Iran has a full-fledged nuclear power industry and all the facilities necessary for nuclear weapons, and if other countries have proceeded with weapons development, we have no doubt that Iran will follow suit. Iran's course will be strongly influenced by Indian nuclear programs.

104. **Egypt, Pakistan, Brazil** and **South Korea** are also potential third-generation proliferators. None now has any of the facilities or skills necessary for fabricating nuclear weapons. A power reactor offered to **Egypt** by the US could not become operational before about 1981. It would be provided under a proposal calling for exceptionally stringent security and safeguard measures, including a US veto over all arrangements for physical security of facilities and fissionable materials and a provision whereby the US can demand return to its custody of all fissionable materials produced in the reactor, even if fuel of non-US origin is used. To date Egypt's modest nuclear program has been limited to basic research; any substantial expansion would require major foreign assistance.

105. **Pakistan** has one natural uranium fueled power reactor—supplied by Canada, dependent on the US for heavy water and subject to safeguards. It has no capability to produce heavy water, but it has facilities under construction for fuel fabrication and evidently is planning to construct a chemical separation plant. It is far inferior to its prime rival, India, in terms of nuclear technology and could not have a nuclear device by 1980 without extensive foreign assistance in constructing needed facilities. Nonetheless, Pakistan will certainly try to press ahead with nuclear weapons development as rapidly as its limited capabilities will permit. And in the interim it might attempt to obtain enough weapons grade material for a crude demonstration device from some foreign source.

106. **Brazil** has one reactor under construction and due for completion in 1977 and two others planned; all will be dependent on imported enriched fuel and subject to safeguards. It has begun seeking assistance from Japan, West Germany and France in building facilities such as fuel fabrication and chemical reprocessing plants, but plans are not yet firm. It trails well behind Argentina in terms of the time it would take to fabricate a first device; over the longer run, however, Brazil undoubtedly would be able to outdistance any Argentine nuclear weapons effort.

107. **South Korea** [redacted] Seoul has embarked on a relatively ambitious nuclear program to meet urgent energy needs. It has two US-supplied research reactors, and a two-unit nuclear power station is under construc-

tion. Negotiations have begun for five more power reactors. Seoul is also seeking fuel reprocessing technology in Europe and Japan with an eye to constructing a plant in South Korea.

108. Each of these four countries has a real or potential antagonist which it sees as having actual or potential capabilities in the nuclear weapons field. If the worldwide non-proliferation effort is not reinvigorated, each is likely to feel increasingly strong desires to join the nuclear weapons race when possible. The strongest impulses will probably be felt by Pakistan; Egypt and Brazil currently appear to fall into a second category of likelihood. In this context, Arab countries in addition to Egypt must also be viewed as potential long-range candidates; several will have vast sums of money they might choose to spend on purchasing nuclear facilities and technical services abroad, when such are more readily available.

III. PROLIFERATION BY PROXY

109. Past proliferation of nuclear weapons and delivery systems has been facilitated by the present nuclear powers, deliberately or otherwise. The US, as the first and biggest of the nuclear powers, with an open society and many allies, has undoubtedly been the prime source of nuclear technology. It has provided many of the reactors currently in operation throughout the world. Through defense cooperation agreements—particularly with the NATO countries and Japan—it has spread knowledge of missile-related technology. It has sold nuclear-capable aircraft to a number of allies. Most notably, French development of nuclear weapons and delivery systems was expedited by knowledge gleaned from the US and by experience with US equipment supplied to NATO allies.

110. The French, in turn, have become a source of nuclear knowledge and equipment. French spokesmen have often said that the spread of nuclear weapons was inevitable, and one rationale for their own nuclear force has been that true independence requires such weapons. The French provided Israel with a reactor capable of producing fissionable material and a missile system designed to carry a nuclear warhead. Subsequently, French government policy turned against Israel, and deliveries of nuclear-capable aircraft were embargoed. [redacted] Although the French have refused to sign the NPT, they have declared their intention of abiding by its provisions. On the whole, now that they are a nuclear power, we doubt that they will foster proliferation as a matter of national policy, but they probably would not resist the temptation to sell technology and nuclear-capable delivery systems—and possibly even unsafeguarded uranium—if the price were right and the purchaser politically acceptable at the time of sale. They have been displaying the new nuclear-capable Pluton tactical missile at their export shows and advertising it in such publications as **Aviation Week.** And they have sold Mirage aircraft or licensed them for production in many countries. It is possible that French policy under Giscard will be somewhat more sensitive to the spirit of the NPT than it was under Pompidou, but this has yet to be demonstrated.

111. In the 1950s, the USSR provided China with substantial technical assistance and equipment related to nuclear weapons; since the Sino-Soviet split, however, Moscow has usually been a strong advocate of non-proliferation

France's Pluton Missile

Configuration	Single stage
Maximum range	65 nm
Minimum range	8 nm
Accuracy (CEP)	400 yd.
Guidance system	Inertial
Length	24.9 ft.
Lift-off weight	5,325 lbs
Warhead weight	730 lbs
Warhead yields	10 and 25 kts
Styx rocket motor	Dual concentrically-cast solid-propellant motor

Mounted on AMX-30 tank chasis

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in both word and deed. The Soviets have, of course, provided their allies with reactors and nuclear knowledge, as well as some delivery systems suitable for employment with nuclear weapons. But, they apparently have maintained rigid controls over fissionable materials and have allowed no warheads to leave the possession and control of Soviet forces. They initially pressed hard for worldwide adherence to the NPT, and signature by all of their East European allies means that nuclear facilities in the area are subject to IAEA safeguards, rather than the unilateral Soviet controls that governed them previously. We believe that the USSR will continue to export nuclear materials, but only under safeguards. We do not expect the Soviets to provide their allies with nuclear warheads—or permit them to develop independent weapons capabilities—in the foreseeable future. But the Soviets apparently are not willing to subject otherwise good relations with an important non-Communist country to severe strains in the interests of nonproliferation; they have taken no strong actions in the case of India.

112. Neither London nor Peking has contributed materially to weapons proliferation in recent years. The British have been in the forefront of countries urging controls on proliferation; in general, their sensitive technology in nuclear and missile fields has not been made available to outsiders. In many cases, it is based on technology received from the US and could not legitimately be passed on without US permission. So far as we know, Peking has provided no assistance to other countries in either the peaceful uses of atomic energy or in the nuclear weapons field. Both the UK and China like having an instrument of power that is available only to a select group, and neither has a close ally with a pressing need for nuclear weapons. We believe

both countries are likely to cling to their established policies in this field for the foreseeable future.

113. [redacted]

114. Sweden, West Germany and Japan are likely to be the source of considerable expertise in atomic energy and in fields related to delivery systems. We would not expect any of the three to knowingly assist another nation in developing nuclear weapons. They might, however, be willing to sell delivery systems—in whole or in part—to a country that had obtained a nuclear weapon without violating the NPT.

115. It is highly unlikely that any government now possessing nuclear weapons or capable of developing them over the next few years would wittingly make nuclear materials, weapons or technology available to a nongovernmental entity such as a terrorist group or a government-in-exile. International cooperative efforts to keep nuclear materials out of such hands probably will prove popular, so long as they do not appear to impinge on national sovereignties. But it is unlikely that any agreement requiring international inspections, audits or security checks additional to those of the IAEA would be widely acceptable.

IV. PROSPECTS FOR DETECTION OF A COVERT PROGRAM

116. It is technically possible for nations capable of developing nuclear weapons to keep a program completely secret, up to the test of a first device—and a country determined to develop a nuclear capability need not conduct a test. A country wanting uranium badly enough probably can obtain it. Most of the facilities needed to produce plutonium are also used in peaceful nuclear programs and can be so justified. New enrichment technologies just coming into use will make it feasible for countries to opt for U-235 weapons. Gas centrifuge facilities have no unique characteristics; those necessary to support a small nuclear weapons program could be concealed.

117. In practice, it is highly unlikely that any such program could be undertaken by a government in the non-Communist world without our getting some indications of it. A weapons program necessarily involves a number of people and facilities and extends over a period of time. To date, all countries with interest in weapons have relied fairly heavily on foreign technical assistance—official or otherwise. But the countries interested in weapons development, even as a very tentative option, clamp tight security on their programs. Infor-

mation is, therefore, likely to be intermittent and inconclusive. Although we could detect a weapons test under most circumstances, we cannot realistically expect to predict a test or to have details on weapons in being that are stockpiled without testing.

118. A country bent on keeping its intentions secret, however, would have to rely on aircraft delivery of nuclear devices, since aircraft are a normal component of national power and no indicator of nuclear intentions. We believe that no nation could long conceal a program for the production of nuclear-capable ballistic missiles. Most countries would have to signal their missile intentions early, through purchase of critical components and employment of foreign technicians. Highly developed nations such as West Germany and Japan might avoid that indicator, but they are relatively open to outside observation—particularly by Americans and others participating with them in research and development efforts. In any event, actual missile production requires testing on instrumented ranges that are readily identifiable, and deployment involves unique equipment such as transporters and launchers or silos. These latter factors mean that even the possession of a complete operational missile system obtained from a foreign country probably would not remain undetected for any significant period.

V. THEFT OF MATERIALS OR WEAPONS

119. A government or a terrorist group seeking a nuclear capability solely for its value in blackmail, terror and international attention-getting might consider acquiring that capability by stealing either fissionable materials or existing weapons. Generally speaking, a country with a relatively advanced nuclear program is unlikely to see any attraction in that route; indigenous development of a weapon would appear far more sure and less hazardous. A country with the personnel and facilities to assemble nuclear weapons might find itself without fissionable material and try to divert or steal some; it is much more likely, however, to have some weapons-grade material on hand as a result of its peaceful program.

120. A country with a very limited technological base or a terrorist group would be more likely to concentrate on weapons than on fissionable materials, particularly if its purpose would be served by knowledge of its action. (Theft of a weapon almost certainly would be detected, though it might not be publicized.) An actual weapon, no matter how well protected with failsafe devices, represents an immediate capability. No prudent observer could afford to proceed on the assumption that it could not be detonated or so damaged as to leak highly toxic material into its environs.

121. Theft of fissionable materials with the intent of assembling weapons would be only part of a much more complex operation. Stealing natural or low-enriched uranium is no use unless the fuel can be put through an enrichment process. Theft of irradiated reactor fuel after its removal from a reactor and before chemical separation would be extremely hazardous; it would also require a reprocessing capability. Thus, highly enriched uranium and separated Pu-239 are the only reasonable targets of such an operation. Separated plutonium is so highly toxic that it can in a sense be considered a weapon in and of itself, and it might attract the attention of terrorist groups on that basis. But a thief who wanted to go from U-235 or Pu-239 to an explosive device would have to arrange some sort of fabricating capability—in particular a few people with

the proper training and skills. Clearly, any country probably could make these arrangements. Terrorist groups would confront more difficulties than governments. But for all the practical arguments against it, diversion of fissionable materials from the world's ever-growing supplies is a possibility that will become more troublesome with the passage of time.

122. In sum, a country capable of producing nuclear weapons is highly unlikely to attempt to steal them; there is a chance that one might seek fissionable materials by theft or diversion. Competently done, diversion might go undetected. And even detected diversion might be concealed by the victim, who might be reluctant to face the political outcry that would result or the increased and expensive security measures that would be imposed. Weapon-seeking terrorists and governments backward in the nuclear field are more likely to go after weapons themselves than fissionable materials, despite the fact that the latter are less well protected.

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