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MEMORANDUM

RM-5313-ISA

MAY 1967

**THE INTERNAL DEBATE ON
THE INDIAN NUCLEAR WEAPONS PROGRAM:
SOME PRELIMINARY OBSERVATIONS**

George Rosen

PREPARED FOR:

THE OFFICE OF THE ASSISTANT SECRETARY
OF DEFENSE/INTERNATIONAL SECURITY AFFAIRS

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PREFACE

Since 1965, The RAND Corporation has been conducting a program of research on the problems of nuclear proliferation under the joint sponsorship of U.S. Air Force Project RAND and the Office of the Assistant Secretary of Defense, International Security Affairs (ISA). This Memorandum was written in response to a recent request from ISA for thoughts on the current debate within India over the development of nuclear weapons. The results must be regarded as preliminary and subject to the limitations of the sources: chiefly newspaper and public media. They are the personal observations of the author, who, though he draws on a long acquaintance with problems affecting the Indian economy, prepared this paper while working with secondary sources in the United States. Furthermore, the study was submitted during the course of the 1967 elections in India, and before a new Indian government had been chosen; the author could therefore only make a preliminary assessment of the election results.

Future research might include looking into the electoral fate of the members of the Lok Sabha who signed the 1964 petition in favor of an Indian nuclear weapons program, and to explore their backgrounds for common features. It would also be useful to look into the attitudes of new members of the Lok Sabha, especially those from the Jan Sangh Party. Within India effort should be made to discuss the nuclear weapons issue with appropriate officials, politicians, and private individuals.

This study has benefited greatly from the suggestions of RAND colleagues J. F. Digby, P. Hammond, J. R. Schlesinger, and F. Watts. The comments of Albert Wohlstetter of the University of Chicago, and the invaluable assistance of Leo Rose of the University of California, are gratefully acknowledged.

SUMMARY

This study begins by examining Indian arguments for and against India's initiating a nuclear weapons development program. It then discusses the attitudes of various groups -- political parties, scientists, economists, and others -- on this issue. Certain tentative hypotheses are here advanced as to the role of various political and bureaucratic elements within the government in making decisions on the matter. The final section discusses implications for U.S. policy.

Indian arguments in favor of developing nuclear weapons may be summarized as follows:

- o Nuclear weapons would serve as a deterrent to China.
- o A tactical nuclear capability would be needed, at least, to counter small-scale Chinese nuclear attacks. India would depend on the big Western powers to counter a major nuclear attack.
- o Without some kind of nuclear capability, India would lose a significant part of its independence in world affairs.
- o A nuclear capability would permit reductions in the size, and hence the cost, of conventional forces.
- o A nuclear weapons development program would have related technological and psychological benefits.

Arguments against nuclear weapons development run as follows:

- o The Chinese threat, though real enough, is not a nuclear one; it is one that nuclear weapons cannot meet and might, in fact, aggravate.
- o To make a nuclear capability credible, India would have to acquire longer-range aircraft or develop a missile delivery system.
- o An Indian nuclear capability would encourage the Chinese to take pre-emptive action.

- o It might, in addition, set off a crash Pakistani effort to develop its own bomb.
- o The rupee cost of developing a full nuclear capability would be very high. It might, furthermore, jeopardize future economic aid from the United States and the Soviet Union.
- o Nuclear weaponry is out of keeping with India's traditions and policies.

Surveying the foregoing arguments at a distance, one concludes that internal discussion of the Indian nuclear weapons program is confused and based on widely varying assumptions with respect to the costs and benefits of such weapons, the nature of the Chinese nuclear threat, and the potential U.S. response to the Chinese threat. This is an extremely sensitive issue and one that reaches important psychological roots in India. None of the national leaders of the Congress Party has so far come out in favor of an Indian nuclear capability. Several opposition parties, however, have taken positions approving nuclear weapons, and there seems to be a similar tendency among groups from the north, and those representative of the younger generation. The question is evidently not an issue in the current elections. Among scientists, economists, and other intellectuals, the opinions appear to be scattered.

In the light of these arguments, the final section of the study points out how the attitude of the United States can affect the debate in general, cites specific methods by which the United States can assist India to reach a more informed and rational decision on the issue, and suggests areas for future research. Two key factors must be kept in mind. First, the picture that Indians have of how the United States views the American role in Asia may be a decisive factor in the rational argument; and, second, in view of the great Indian sensitivity on this issue, any exercise of American influence, including the supply of information, must be handled with great delicacy. It must be emphasized, in providing any information, that it is intended to assist India to make its own decision on the issue. If the American role should become a political issue, it could easily prove harmful.

NOTE ON CLASSIFICATION

Although the sources for this Memorandum are all unclassified, the author's suggestions for U.S. policy and statements on Indian military attitudes have been given the classification CONFIDENTIAL. Pages where these subjects are discussed are so marked.

This note on classification is included in compliance with provisions of the Industrial Security Manual for Safeguarding Classified Information (DoD 5220.22-M), Section II, Paragraph 11.

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I. INTRODUCTION

This study first sets forth the argument now going on in India for and against India's "going nuclear." Next it identifies the political parties and interest groups favoring various positions. These two sections focus only on Indian arguments -- without analyzing them either on the basis of information available outside India, or from the point of view of United States policy. The final section discusses some ways by which the United States might influence this debate, and some of the problems of exercising influence. The conclusions from the earlier sections are applied to U.S. policy, but simply by taking the present policy against nuclear proliferation for granted, rather than by examining it in detail or in a critical fashion. The final section also suggests possible future areas of research.

This Memorandum is specifically not a study of the role and attitudes of Indian bureaucracy on this issue. I know nothing of these attitudes; to learn them would require lengthy research in India. In the discussion of attitudes of Indian interest groups, something is said about what I think the role of the bureaucracy will be in the decisionmaking process on nuclear weapons. However, these opinions are in the nature of deductions from past experience rather than findings of an examination of this specific problem, which can be done only in India.

The sources for this study are largely public -- articles in Indian newspapers and magazines that have appeared since the first Chinese nuclear explosion in October 1964. The coverage has obviously been selective, limited both in terms of available sources in the English language in California, and by the time at my disposal. Nevertheless, the sources present a wide range of views and arguments, and it is doubtful that this range could be widened significantly by more time spent in examining literature in the United States.

II. INDIAN ARGUMENTS FOR AND AGAINST INDIAN NUCLEAR WEAPONS

THE ARGUMENTS FOR INDIAN NUCLEAR WEAPONS

The main argument in favor of India's deciding to go nuclear is that this would serve as a deterrent to China. In effect, this argument proceeds as follows: (1) China is the enemy of India; (2) A major purpose of China's developing a nuclear capability is to exert pressures on India; (3) China would be willing to use the bomb both to blackmail India, and, if need be, as a weapon; (4) India cannot depend on other countries to protect it from such Chinese blackmail or attack; (5) Therefore, India must have its own nuclear weapons that it can use on China, if need be, to deter China.

One version of this argument sees China mounting, or threatening to mount, a major attack upon India's great northern cities, either itself using conventional aircraft or at some later date missiles, or through a willing Pakistan. By the time any foreign countries could decide to come to India's aid the threatened cities would be destroyed, and the aid would be valueless; or as China perfected its own long-range missile delivery system western countries would be unwilling to risk their safety to protect India.* To meet this threat, it is felt to be logical that India build up a strategic nuclear weapon stockpile and a delivery system. An important assumption, stated or unstated, underlying much of the rational analysis for an Indian nuclear capability, is that no one of the nuclear powers can be depended upon to remain sufficiently interested either in Asia as a whole, or in maintaining an independent India, to be willing to risk the threat of a nuclear attack on itself from China to deter China from an attack on India. It is, therefore, necessary for India to build up its own nuclear capability.

* For this argument in its strongest forms, see Opinion, Vol. VII, No. 3 (May 24, 1966), pp. 1-5; Vol. VII, No. 36 (January 10, 1967), pp. 1-3. Opinion is edited by A. D. Gorwala, formerly in India's Civil Service, and now a strongly independent journalist.

A second argument, unlike the first one, essentially states that India can depend upon the major western powers in the event of a major nuclear attack but requires its own nuclear capability to meet smaller scale Chinese attacks. This argument denies that China is likely to use atomic weapons in a major attack upon India because that would result in one or more of the big powers -- essentially the United States and the Soviet Union -- coming to India's defense. China is willing to carry out border subversion, guerrilla warfare, and infantry attacks, for which tactical nuclear weapons would be useful, and it would be prepared to use its nuclear power as a blackmail device. These latter threats would be unlikely to call forth a big-power response. Therefore, India must build up its own tactical nuclear weapons capability including an aircraft delivery system capable of matching China's equivalent tactical nuclear capability. There is no need for India to create a strategic nuclear capability, including "a stockpile, long-range supersonic bombers, missiles, interceptor and second strike capacity, naval power, and so forth," since the big powers would supply this type of defense.* This tactical nuclear capability, which is never defined very explicitly in terms of requirements or function, would permit India to play a balancing role vis-à-vis China in Asia without undue dependence upon the major western powers.

Both of these contradictory arguments unite, however, in building up to the argument that without some nuclear capability -- either of the strategic or tactical type, depending on the arguer -- India would lose a significant part of its independence in world affairs. India's continuing reliance on external support would greatly reduce its ability to remain unaligned in international affairs, and provide leadership for the Asian-African bloc of countries; it would also give the major nuclear powers a leverage that they might use to intervene in India's domestic policies. Thus, the call for nuclear weapons is closely

*This argument is presented by Raj Krishna, "India and the Bomb," in the India Quarterly, May 1965, pp. 119-137. Raj Krishna is one of India's leading agricultural economists and has spent much time in the United States.

allied to the broader demand that India should be as nearly self-sufficient as possible in military equipment and supplies, including nuclear weapons.* This argument is also obviously related to the claim that if India is to compete with China as a leader of the Asian-African countries, it must be able to resist Chinese pressure and show that it is capable of as high technical and military advances as China.** And in turn, the fear of a loss of independence rests upon the implicit assumption that India will have to pay a price for U.S. support in the future, in the form of the loss of independence in certain areas of national policy vital to its view of itself as a leading independent Asian power. This loss of independence would be intolerable for a recently independent India.

The independence argument is related to the "trigger" argument. This argument in effect states that if India has nuclear weapons it will be able to initiate when it will be involved in a nuclear war and will not be entirely at the mercy of other countries' initiatives. Furthermore, by making this choice, it will be able to bring in the United States or the Soviet Union since it would thereby be widening the war from a local one to a more general one. This, of course, assumes that the United States will be more willing to come to India's defense after India takes the initiative in starting a nuclear war, than it was before. The reason for this is unclear, to say the least.***

Another series of arguments revolves around the relative costs of nuclear weapons compared with conventional forces. One article points out that India has been building up its army. This article does not openly state that nuclear weapons would be a substitute for a large,

* This has been stressed by the leaders of the Praja Socialist Party and the Jan Sangh. See "National Herald" of Lucknow, May 28, 1966, and "The Organizer," May 15, 1966.

** Overseas Hindustan Times, January 6, 1966, p. 11, quoting R. Zakaria, a member of the state government of Maharashtra and an Indian delegate to the United Nations.

*** For this, see S. Gupta, "The Indian Dilemma," in A. Buchan (ed.), A World of Nuclear Powers?, Prentice-Hall, 1966, pp. 61-62. S. Gupta is one of India's leading foreign affairs and defense intellectuals, now with the Indian World Affairs Council.

costly army, but it implies that an Indian deterrent to China would not require a large nuclear capability or one equal to that of China, and that therefore a nuclear capability might make possible reduced conventional forces and their expense.* This is supported by some of the cost estimates of nuclear weapons that have been publicized, most notably by the late head of the Indian Atomic Energy Establishment, Homi Bhabha, in a speech on October 24, 1964. The Overseas Hindustan Times reports this speech as follows:

.... [A] 10 kiloton explosion, equivalent to 10,000 tons of TNT (about the size of the Hiroshima bomb) would cost about Rs. 1.8 million, while a 2-megaton explosion, equivalent to 2 million tons of TNT would cost about Rs. 3.0 million. This, he said, was cheaper than the price of 2 million tons of TNT which was about Rs. 1,500 million.

About the delivery system, Dr. Bhabha said that it was not difficult to deliver atomic weapons against a country not possessing a modern air force and ground-to-air missiles. Even against a country having such modern defenses, if it were near, a considerable part of the attack would go through and, with nuclear weapons the devastation would be terrible. Capability of nuclear retaliation, he said, was the most powerful deterrent.**

Although Bhabha did not go on from this to favor an Indian nuclear weapon capability, his cost figures have been used by proponents of an Indian bomb. Opinion magazine argues,

Dr. Bhabha estimates the expenditure on one bomb to be Rs. 1,800,000.... The total for a hundred bombs would have been Rs. 180 million. Assume an element of error ... make the total Rs. 250 or 300 million, was that a figure to make you blanch, when your Defense budget alone is Rs. 8 billion?***

* See S. Gupta, "India's Defense Pattern: The Problem," Seminar, No. 83, July 1966, pp. 11-14.

** The Overseas Hindustan Times, October 29, 1964. I have converted the figures in the original article from Indian units of lakhs and crores to millions and billions. (The figures given above -- and all subsequent ones -- are expressed in Rs. at the former exchange rate of Rs. 4.7 = \$1.00.)

*** Opinion, January 10, 1967, p. 3.

However, Opinion, in an earlier issue, cited the estimate of several foreign specialists that the cost of "hydrogen bomb, delivery systems, everything," is on the order of Rs. 24-30 billion, over a period of 5-6 years. This is the equivalent of about Rs. 5 billion per year; the author claims that approximately half of this can be raised by squeezing fat out of current state and central government expenditures. He asks in conclusion, "Is that too high a price for freedom and national independence?"* This conclusion has been presented as well by others, in such expressions as whether India can afford to defend its freedom without nuclear weapons. It could be significant, however, that the cost estimates given in Opinion have gone down between May 1966 and January 1967, since it may indicate that the cost argument is, in fact, a high hurdle for the nuclear weapon advocates.

Raj Krishna estimates that for the tactical weapons program he advocates, "an additional allocation of Rs. 2.0 billion a year would be necessary in the next few years." He feels that this could easily be diverted from, or added on to, the proposed expenditure of Rs. 32 billion per year for economic development in an early projection of the Fourth Five Year Plan.**

A final argument for military nuclear weaponry is in terms of the external technical benefits from military research into both missile materials and delivery systems. The reactors that create enriched uranium also produce power; "the aviation rocketry, radar and electronic technologies, and industry cannot only help to strengthen our armed forces but also to create economic strength."*** It is significant that this argument appears in a journal representing the scientific community, and it probably reflects an opinion that Indian technological development and leadership among the Asian countries is helped by a nuclear weapons program.

* Opinion, May 24, 1966, p. 3.

** R. Krishna, "India and the Bomb."

*** "China Joins Atomic Club -- What Should India Do?," Science and Culture, October 1964, Vol. 30, No. 10, pp. 467-468, 507-508.

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Apart from this technological benefit, the psychological benefits of nuclear weaponry are strongly argued. Tangible evidence of nuclear capability, whether by a weapons explosion or a peaceful explosion, will either give the Indian people in general a high degree of self-confidence or will give specific groups such as the army or the scientists confidence that they are getting the best weapons or carrying on the highest level research. Thus, serious crises of an economic or political nature that undermine Indian self-confidence, such as the Chinese victory in 1962 or the recurring communal crises, can strengthen the demand for the bomb as an instrument of national identity;* success in meeting such crises, such as the successful meeting of the Pakistani attacks and Chinese threats in 1965, by reinforcing Indian confidence, reduces the demand for the bomb. The current unrest in China might also contribute to such confidence.**

Since the arguments in favor of India's going nuclear are based on such a wide variety of assumptions, and such a range of facts, there is an equally wide range of policy conclusions, with respect to the type of nuclear development India should adopt. The following alternatives have been urged either singly or consecutively: a peaceful explosion for development purposes, either underground or above ground; the explosion of one or two bombs; the development of a tactical nuclear weapon stockpile and delivery system; and finally the development of a strategic nuclear weapon stockpile and delivery system.

THE ARGUMENTS AGAINST INDIAN NUCLEAR WEAPONS***

The key Indian argument against an Indian bomb is that it is unnecessary to meet the Chinese threat, as well as having other

* L. Hazard, "Strong Medicine for India," *Atlantic*, Vol. 216, No. 6, December 1965, pp. 43-48, has also presented the psychological argument for a peaceful use of nuclear energy for India.

** It could also contribute to Indian fears of a more irresponsible China, or one prepared to use warfare out of frustration or to unify the country.

*** The arguments presented below are found in the following articles, among others: Major General D. Som Dutt, "India and the

disadvantages. There is agreement in general among those opposing Indian nuclear weaponry that China, allied or unallied with Pakistan, is a threat to India. But they argue that the threat is not a nuclear one, and it is one that nuclear weapons cannot meet, but might, in fact, aggravate. To the bomb opponents China's aims are to undermine and either take over or dominate the governments in the Himalayan border states, which would then enable China to dominate India; China's intentions with respect to India are to create dissension and unrest within India so as to undermine any Indian aspirations or claims to either leadership of the Asian-African countries, or as an example of successful political and economic achievement by a non-Communist country. Nuclear weapons are unnecessary to meet the Chinese military threat -- conventional forces are the useful ones. If India decides to invest in strategic nuclear forces and build a bomb, the resulting diversion of resources from economic growth would contribute directly to the economic and political collapse in South Asia for which the Chinese are striving. This fundamental argument that India's ability to resist the Chinese threat without its own nuclear weapons rests upon an implicit belief that India can depend upon the United States; both for economic development and in the event of fighting with China. This belief is supported by past U.S. policies. These U.S. policies have in turn been supported in the United States, not by reasons of charity that can be turned on and off, but by reasons of self-interest that are more long standing, and on which India has, in the past, been convinced it can depend.

There are several related arguments in the group arising out of China's intentions. One is that the purpose of the Chinese bomb is

Bomb," Adelphi Papers, No. 30, November 1966. The Institute for Strategic Studies, London. General Som Dutt was head of the Indian Defense Services Staff College and will be Director of India's Institute for Defense Studies and Analysis. V. Dutt, "The Bomb and We," The Times of India, May 19, 1966, p. 8. Girilal Jain, "The Dilemma," Seminar, No. 83, July 1966, pp. 15-19. Jain is Assistant Editor of The Times of India, handling foreign affairs. M. R. Masani and R. K. Nehru, "The Challenge of the Chinese Bomb," two lectures delivered on December 8 and December 17, 1964, before the Indian Council of World Affairs. M. R. Masani is Secretary of the Swatantra Party. R. K. Nehru is one of India's leading Foreign Service Officers.

purely blackmail. China's use of nuclear weapons on India would inevitably bring the major nuclear powers into nuclear action against China, and the Chinese government is far too cautious to risk this; therefore, India does not require strategic nuclear weapons to resist the blackmail, and they would not be useful against the limited conventional threats that are more probable. (This negative argument, except for its conclusion, is similar to Raj Krishna's positive argument in favor of tactical nuclear weapons.) A second argument is that the purpose of the Chinese effort is not directed against India, but arises out of China's relations with the United States; and thus the Chinese bomb is not something that should stampede India into "going nuclear."

In discussing the size of the required Indian capability, it is claimed that the Indian nuclear deterrent would have to exceed that of China's capability, because the distances between Indian bases and Chinese cities are far greater than the reverse. The major Indian cities in the north are within relatively short range of existing Chinese bombers based in Tibet or Sinkiang, and within easy distance of Pakistani bombers from any direction; but the equivalent Chinese cities are the entire breadth of China removed from the nearest Indian bases, beyond the flight range of almost all present Indian aircraft. Thus, India would have to acquire longer range planes than it now has or develop a missile system.

The distance argument is important in light of another negative argument. This states that an Indian nuclear bomb, since it is so clearly directed against China, would encourage the Chinese to take preemptive action against India. It is argued that the Indian Government would be morally inhibited by its traditions against a "first strike" in a way that a Communist Chinese government would not be. Thus, even if India had a bomb, given the distances to be covered and without a missile system, India would still have little or no second strike capability -- and the Indian bomb would simply encourage the Chinese first strike action the Indian weapon was meant to deter.

Quite apart from the effect on China, the effect of an Indian bomb could easily set off a Pakistani effort to get its own bomb quickly. Although this would take Pakistan by itself a long time, the fact that China is the only likely source of such a quick capability would drive Pakistan and China even closer than at present. In such a situation both the dangers of nuclear war on the subcontinent, and the costs of protection against its possible effects upon India, would become much higher. In fact, it can be argued that it would be to China's interests to encourage India to acquire a small nuclear weapons capability, both for its effects on Pakistan and for its effects on India's relations with the United States and the Soviet Union.

Thus, for a wide variety of military reasons, it is argued that it is not in India's national interest to go nuclear at this time. Furthermore, if India goes nuclear it is useless for defense, and possibly even very harmful in its effects upon its neighbors simply to explode only one or two bombs. What would be required is a large arsenal of nuclear weapons and a system to insure both their delivery and safety. Without this, India would only be "creating a paper tiger."*

The opponents of the bomb say that although little is known of costs, a single bomb is more expensive than Bhabha estimated, and the cost of a full system is very high. General D. Som Dutt cites estimates that the annual cost would be on the order to Rs. 1-1.5 billion per year** for a nuclear or thermonuclear weapon and missile system -- and points out that such estimates are below Great Britain's annual costs. Opinion magazine has already been quoted at a Rs. 5-6 billion annual estimate; and Masani goes as high as Rs. 32 billion per year. Even the smallest of these figures are significant proportions of India's present defense budget; for example, General Dutt estimates that the cost figures he cites would require a 25 percent increase in

* Quoting V. Sarabhai, the new head of the Indian Atomic Energy Establishment, following Dr. Bhabha's death. (Times of India, June 2, 1966.)

** This converts a \$300 million estimate to rupees at the old exchange rate of 4.7/\$1.

current Indian annual defense expenditures. The estimated annual level of investment in Indian industry during the Third Five Year Plan was 5-6 billion* -- and General Dutt's relatively low nuclear estimates are clearly a substantial proportion of this figure. Thus, any meaningful Indian nuclear weapons program would be heavily competitive with India's two major efforts of economic development and the creation of an effective conventional military force.

Apart from this direct cost, the effect of an Indian decision to go nuclear would unquestionably raise serious doubts in both the United States and the Soviet Union of either the desirability of maintaining their present economic aid programs to India, or their willingness to come to India's aid in the event of military conflict with China, or their attitude in the event of Indo-Pakistani conflict. Since much of India's economic and military planning is based on receiving economic aid and military supplies from these two countries, any reduction of those external resources would increase the strain of a nuclear program on India's resources even more than the direct costs of the nuclear program indicate.

Such national interest arguments are also bolstered by a series of negative arguments based on India's past traditions and policies, embodied in the statements and policies of Mahatma Gandhi and the late Prime Minister Nehru. Today, however, those arguments seem to have more of an "atmospheric" value -- both the late Prime Minister Shastri and Mrs. Gandhi have stated that India's decisions on this issue will be based on its national interest, and are under constant review. However, any Indian above-ground explosion could be carried out only if India denounced the Nuclear Test Ban Treaty that it was the first country to sign. Any explosion would also appear to be inconsistent with the spirit of the Canadian-Indian Reactor Agreement, although it is believed by Indians that this agreement would not prevent a "plowshare explosion."

* See GOI, "Fourth Five Year Plan: A Draft Outline," p. 11.

What are the policy implications drawn by those opposing an Indian nuclear weapon? All of those against Indian weapon development at minimum favor continued research in fields of non-military nuclear theory and its application, and the use of the results of this nuclear research where possible (which may not be the same as where economic), but not in the form of explosion, whether "peaceful" or not. This would yield economic benefits and would insure that India would reap the external technological benefits of continued nuclear research and that it would retain its position of leadership among the developing countries in this area; it would hopefully insure that the present staff of 8,000, including 1,800 scientists and 5,000 technicians now employed by the Atomic Energy Establishment, would remain in India with their morale high; and finally, it would permit India to retain an option to proceed with nuclear weapons if the need eventually arises. The Indian government is giving extensive support to such efforts. From 1955-1964 approximately \$220 million had been expended on its nuclear energy program, and an additional \$235 million has been budgeted for the 1965-1967 period.

The government is also, at least in terms of the image presented to the Indian public, currently supporting the attempt to reach a treaty controlling the use, accumulation, and dispersal of nuclear weapons and their technology, and also hopes to achieve some nuclear disarmament. Such a treaty would hopefully put pressure upon China either to sign, or to limit its own nuclear weapons program. From the point of view of various American experts, it appears that the Indian government is putting such difficult requirements on a treaty it would accept that it is attempting to forestall a treaty at this time. To some extent, it would therefore appear that the Indian government is hedging between those elements opposing nuclear weapons and those favoring them, while trying to preserve its option to go

nuclear as long as possible. It may also be that the government is using its position as a "hard" bargaining tactic, either to get as broad a treaty as it can, or to get some implicit or explicit commitment from the United States and the Soviet Union vis-à-vis China in the event of a Chinese nuclear threat. Those favoring an Indian bomb now are not against such a treaty effort; they think it is not enough. Many of those opposed to an Indian bomb at this time argue that if an acceptable treaty is not signed after some unstated period and China continues its weapons program, then India should go ahead with its own program. It is also argued by some that if China does not sign such a treaty it would be of little value -- and these argue that India not sign it either* (some go further and advocate an Indian bomb in such an event).

Another group against an Indian bomb also agree that simply to depend on a new nuclear treaty is insufficient. General D. S. Dutt argues that India should take a more active role to build up some joint defense relationship with Japan and Australia, so that Chinese expansion on its borders can be resisted. Vishnu Dutt, although against a unilateral Indian nuclear weapons effort, advocates in a very general fashion a collective defense program, which might include a nuclear shield, "among such nations as Sweden, Switzerland, Australia, and Japan." Finally, M. R. Masani advocates that India should end its non-alignment policy and accept a unilateral nuclear umbrella from the United States; if need be India should be prepared to ally itself with the United States for such an arrangement.

The government's attitude toward a nuclear umbrella has varied. At present, it appears that even if the attitude were positive, India would not be willing to accept such an umbrella by a formal guarantee unless both the United States and the Soviet Union were associated with it in some fashion, possibly through the United Nations. What India's attitude would be toward an informal, implied umbrella from

*"Non-Proliferation Without China," Economic and Political Weekly, Vol. I, No. 15, pp. 608-609.

the United States alone is not clear, but it might be more positive than for a formal one-sided guarantee. Raj Krishna, who favors an Indian capability, in a recent article argued that "a joint Russo-American guarantee would be the best, ... a single Russian, American or French guarantee would be second-best; and a multilateral guarantee ... would be the worst. The first would be consistent with our tradition of non-alignment, and have the maximum deterrent effect. The last would be the least credible, for it would be nearly impossible for a number of nations ... to respond to a future contingency affecting India, harmoniously, quickly and effectively." He argues, however, that it would be very difficult either to get an acceptable guarantee of an agreed upon boundary or for India to depend upon the guarantors.*

GENERAL CONCLUSIONS FROM THE CURRENT DISCUSSIONS

First, the discussion of the whole issue has shifted from moral or historical grounds to an attempt to judge what would be most desirable in terms of India's national interests. However, this discussion is very confused. There seems to be no agreement, or in fact, very much knowledge, with respect to such key issues as the nature of the Chinese threat to India, the capabilities of various alternative systems of nuclear weapons in meeting that threat compared with systems of conventional weapons, the costs of various nuclear alternatives, or the economic and political consequences of the nuclear alternatives. The rational argument is also crucially influenced by the differing opinions of the arguers concerning the intentions and presumed policies of the United States in Asia, and in the event of a Chinese nuclear threat upon India.

Second, in my opinion, the issues involved are not simply those that are openly discussed. Underlying the rational arguments and analyses of costs and benefits are deeper psychological feelings of self-confidence, nationhood, and independence of the Indians, both in

* Raj Krishna, "Proliferation," Indian Quarterly, Vol. 22, No. 3 (July-September, 1966), pp. 287-288.

terms of their picture of themselves and their view of China and of the "white" developed countries. These psychological issues come out into the open in Raj Krishna's second article. He stresses that

... the United States, the Soviet Union, France or China did not consult any other country when they decided to make their bombs.... [They] did not allow foreign opinion to influence their decisions.... Western politicians and intellectuals cannot ask for or sit in judgment on the reasons why India may or may not decide to make the bomb now or in the future. The reasons are being debated in India.... Foreign friends of India can discuss them -- as a matter of right, of course -- provided that they are willing to place themselves in the shoes of Indian policy-makers.

Further, he argues,

The West has set up the possession of material and military power as the most important attribute of national greatness. For nearly four centuries, the great civilizations of the East have been raided, humiliated, ruled and exploited by a West driven and intoxicated by its material and military power.... Now that the East ... seeks greatness, it must develop the Western attributes of greatness as well as its own. The West cannot now change the definition of greatness so that its own supremacy in material and military power may still remain unchallenged.... [We] cannot glorify any more the virtue of powerlessness. The West cannot ridicule our passion for the critical minimum of military power.

If India has to make her own nuclear weapons, one of its purposes will be simply to convey a cool but complete message to the psyches of all duopolists and oligopolists among world powers that she would not be threatened, dominated or taken for granted by anyone.... The communication of an anti-hegemonistic message to the world is necessary to ensure our own people that no matter what happens, India shall not be run by others ever again. Only Indians understand this need.*

It is not surprising the Raj Krishna in his earlier articles, favors a nuclear capability for India, based on "cool, objective, rational" arguments; and similar feelings support many of the pro-bomb discussions. Many of the arguments in favor of the bomb in India

* Ibid., pp. 287-292.

are similar to those used in France -- and because of their nationalist basis, they will be difficult to influence.

On the other side, a fear of the role of the military in India underlies some of the arguments against the nuclear alternative. To the extent that India is successful in meeting its challenge of national integration, of its relations with Pakistan, and of economic development, the psychological biases in dealing with nuclear weapons problems will be less important in relation to a rational analysis of the question. It is precisely because the nuclear question reaches such psychological roots that it is such a profoundly political issue and not just a technical issue to be handled bureaucratically. This, in turn, raises obvious problems with respect to the effects and methods of either advice or exertion of influence by foreigners on the issue. At the same time, the character of the discussion in India makes it clear that objective information and knowledge from trusted and objective foreign sources could greatly assist the Indian government in approaching the question rationally, and in providing reasonably accurate data to make a "correct decision" within a rational framework of analysis of India's self-interest.

III. GROUP POSITIONS ON THE NUCLEAR WEAPONS

PROBABLE DECISIONMAKING PROCESS

The decision as to whether India should proceed publicly with a nuclear weapons capability program, whether directly or indirectly through a "plowshare" explosion, will be made by the country's political leaders, both in the government and in the Congress Party. The members of the bureaucracy and the government offices that they head may push for such a decision, or may create the conditions that would make possible a public declaration or demonstration of capability, but the demonstration or declaration cannot, and will not, be made by them: the decision will be made by a small group, unquestionably including the Prime Minister, leaders of the Congress Party, and the key political ministers, possibly including the Defense Minister. (When Krishna Menon or Y. B. Chavan were Defense Ministers, they would certainly have been included; it is doubtful that Swaran Singh, or someone of his caliber, would, in fact, be a decisionmaker on this issue.) Given the changing character of the government-party relationship and the center-state relationship, it is also very probable that certain of the key regional and state leaders, whether as center or state ministers, or as state party leaders, would be brought into the decisionmaking process, and would look at this question in terms of its effects upon the Congress Party in their areas. Finally, it would not be surprising if on such an issue, on which an attempt would be made to get cross-party support, certain opposition leaders were informed and possibly heard prior to the decision.* This might be even more so after the recent elections, in which the opposition parties gained significantly.

The role of bureaucracy will not be decisive, as its role in devaluation was not. But some elements of the bureaucracy will play

* This might be compared with the decisionmaking in the case of the 1966 devaluation. This was made by a very small group within the Cabinet -- The Prime Minister and the key economics ministers, who have only weak independent political strength, and with some technical

an important role in shaping the question as it comes to the political leaders and providing these leaders with the facts on which they can make the decision. The key elements within the bureaucracy in influencing the decision will be the senior military officers, the senior scientists of India's atomic program, and senior foreign service officers, with the economic officers playing a secondary role.

I know almost nothing of the attitudes of these bureaucratic elements, as will be clearer subsequently. It is possible to make some general remarks, however, on their influence and how it would be exercised. The armed forces will play an extremely important role from the demand side. The fact that the chiefs of the armed forces today do not favor an Indian nuclear capability has greatly strengthened the government's reluctance to push for this. However, if there were strong disagreement among the leaders of the armed forces on this question, it would, in my opinion, be difficult to prevent it from becoming a political issue.

The role of the chiefs of India's Atomic Energy Establishment could also be significant. It has recently been reported by Sir John Cockroft that Homi Bhabha privately favored "making bombs for a plow-share program," and that "after the Chinese nuclear bomb tests he certainly wished to put India into the position of being able to make plutonium bombs, if the Government so desired." This opinion of Cockroft has been denied by M. G. K. Menon.* This purported attitude of Bhabha, combined with his close relationship to Prime Minister Nehru, may have contributed to his policy of accelerating India's nuclear program to the point where India would be in a position to opt

support from the bureaucracy. The top political leaders were apparently informed at a point where they could do very little about the decision. The effect of this, which may have been necessary for reasons of secrecy, was to lead to criticism from party leaders, and to weaken the position of the ministers making the decision. It seems very likely that any subsequent decision of such magnitude will be made by a broader group.

* See "Atom Bomb: Bhabha's Reported Hint," Hindu Weekly Review, January 30, 1967, p. 4.

for an explosion within a certain period of time. It may also have contributed to his already cited speech of October 1964, with the extremely low cost estimates for an Indian explosion, which have been used by the supporters of an Indian nuclear weapons capability. Bhabha's successor, Vikram Sarabhai, by his "paper tiger" statement already quoted, and his statement of the high costs of a nuclear weapons system for India, has strongly supported the Prime Minister in her opposition to a nuclear weapons capability at this time. These are evidences of the role of only the leaders of the Indian nuclear establishment. In my opinion, it would not be consistent with the Indian style of behavior to come out into the open. The form the disagreement would take would most likely be limited to resignation of key scientists of the Atomic Energy Establishment, and probably their departure to other countries -- since they would have little change of alternative employment within India. An important problem for both the Indian government and the chiefs of the scientific establishment is to keep these scientists professionally satisfied and willing to work at their best within India, without the nuclear weapons capability. The death of Homi Bhabha may have weakened the position of the nuclear scientists relative to other groups. This may reduce the pressures they can exert within the government, their claims for priority in funding, and their ability to attract top personnel by salaries and equipment.

The Foreign Service Office and the economists will be once removed from justifying the use of nuclear weapons or making it possible technically for India to manufacture them -- but they will be important for examining the effects of such a step. The Foreign Service officers must inform the government and political leaders of the attitudes of other countries toward an Indian capability and must negotiate the terms with other countries within which the government makes its decision on this issue.

Finally, it will be the economists who must answer the question of the economic implications of the decision to go nuclear. First, they have the task of trying to insure that the various alternatives

of this decision are, in fact, costed properly and, hopefully, that their benefits are also examined. Second, with India's limited resources, they must indicate what the effect of a nuclear weapon program of a given size will have upon other programs -- such as economic development and India's conventional military strength -- and at least make the government aware of these consequences. The key economic agency is the Ministry of Finance, which prepares the budget and must approve all foreign exchange allocations. With respect to military expenditures, however, it does not enter into analysis of the military budget, and largely accepts the estimates given to it. It may succeed in imposing a budgetary limit on expenditures, whether of local currency or foreign exchange, but within that limit the Defense Ministry is largely determining.* Since 1962 the prior constraints on military spending were in large part removed, and the determining element has been the Defense Ministry's Five Year Plan. Under Prime Minister Nehru and Krishna Menon, the Prime Minister was, in fact, the key control over military spending; since Nehru's death, the Defense Ministry has probably had greater independence. The Planning Commission potentially has a role to play in defense spending, essentially to relate such spending to development planning. In fact, in the past, it has accepted military expenditures as a given datum around which a development plan is constructed -- very little effort has been made to relate the two. However, members of the staff of the Planning Commission may play a personal role in influencing military budgeting by their role as advisors to the Prime Minister. In the past, this role has been small on this issue, and the Defense Ministry has provided the Planning Commission with little information on which to make judgments.

A bureaucratic group that may play an important role in the decision is the Prime Minister's Secretariat, which has increased in

*The resistance from the Finance Ministry might be undermined by initial low cost estimates of a nuclear weapons program, which, once started, would continue to demand ever-increasing financial support. This would be an example of the classic bureaucratic "foot in the door" technique.

stature and influence since the death of Nehru. The Secretariat's head has been L. K. Jha, one of India's foremost civil servants, who moved from a key position in the Finance Ministry to this new post. His responsibility has included an overview of the Indian nuclear program, and he would probably be the focal point for bringing to bear the economic cost elements upon this decision, assuming his position remains the same and his influence remains great after the election and ministerial changes.

Admitting these bureaucratic influences, it should again be emphasized that the role of these groups will be primarily technical. A nuclear weapons capability cannot be "sneaked" through the bureaucracy; it must be made public. And this public decision via tests or an explosion of one kind or another will be made by India's political leaders, expressing either their own beliefs or what they believe their political parties, or some wider Indian public, desire.

The following section will examine the party attitudes. It is not possible to know the viewpoint of various bureaucratic elements. They make few public statements that represent their own opinions; and unlike in the United States, it is not possible to relate their opinions to various newspaper columnists or reports. Similarly, it is difficult to identify points of view of private interest groups on this issue, if there are any -- in fact, there may not be any, but without interviews in India it is not possible to tell.

POLITICAL PARTIES

The arguments on the bomb straddle and cut across traditional political party lines within India.

The political parties that have most strongly favored India's going nuclear are the Jan Sangh, which is the Hindu communal party, the Samyutka Socialist Party (the SSP), and the Praja Socialist Party (the PSP), the two outright Socialist parties.* The significant element

*The information on the results of the 1962 elections for these Parties is from "A Post Election," The Eastern Economist, Vol. 38, No. 13 (March 30, 1962), pp. 807-809.

that these three parties appear to have in common is that most of their strength is in the Hindi-speaking north. In the 1962 state elections, all the Jan Sangh members in state legislatures won in the northern states of Uttar Pradesh, Madhya Pradesh, Rajasthan, the Punjab, and Bihar. The Jan Sangh is essentially a northern party. The PSP, many of whose members left it to join the Congress Party or the SSP in 1963-64, had most of its state legislator members in Uttar Pradesh, Madhya Pradesh and Bihar (although it also had a strong Mysore membership). It is significant that the SSP, like the Jan Sangh, has taken a strong position in favor of the use of Hindi; and the reasons for the agreement between the SSP and the Jan Sangh may be political competition in the north. The northern states feel the threat of Pakistan and of China most -- and this would tend to contribute to the demands in these northern opposition parties for Indian nuclear strength. The five northern states mentioned above had approximately 45 percent of the total electorate in 1962, and in the fierce competition for votes in those states both among parties, and between factions within parties, the demand for nuclear weapons may become a strong political issue in the future. It is of some significance that the most important Congress Party leaders that favor an Indian bomb also are from the north where they face strong competition from the pro-bomb parties. Since the Congress Party lost heavily from 1957 to 1962 in Uttar Pradesh, Rajasthan, Madhya Pradesh and the Punjab -- in all of which the Jan Sangh is a major competitor -- continued losses by the Congress in those states or Congress efforts to steal an issue from its opponents could lead to demands within the Congress for an Indian nuclear capability.

The other political parties in opposition to the Congress are against India's going nuclear, at least for the present. In the Swatantra party, both C. R. Rajagopalachari, one of India's most respected elder statesmen, now very old, and M. R. Masani, have come out against an Indian bomb, and in favor of a nuclear guarantee from the United States alone. Both Rajagopalachari and Masani are from non-Hindi, relatively southern areas. The Swatantra Party, however, is becoming stronger in

the north than in the south, and in the process factions favoring an Indian bomb may become stronger. In the event of Rajagopalachari's death, this strength in the north could result in a change in the party's public position to one that favors an Indian capability.

The Communist parties are against the bomb with varying degrees of strength. The pro-Russian party, like the Soviet Union itself, is against India's building the bomb, and it is also against India's acceptance of a nuclear guarantee from the United States alone. The pro-China party has obviously been embarrassed by the entire issue, which its newspaper has preferred to ignore. However, one of the leaders of the party, E. M. S. Namboodripad, the former Communist Chief Minister of Kerala and one of India's most astute politicians, stated in May 1966 that he would not object to India's manufacturing the bomb without foreign assistance if it were required, but that he would oppose any bomb made with U.S. help. The left Communists, in fact, probably oppose an Indian bomb, since it is obviously in the face of a Chinese threat, but it is difficult politically for them to say that India should not have the right to do what China did, if it is felt to be necessary for defense.

Within the Congress Party, easily the largest and most national party in India, there have been strong arguments on the nuclear issue. Until now, none of the national leaders, whether of so-called "left" or "right" wings, whether in favor of, or opposed to, the present leadership, have favored an Indian nuclear weapon. It can be argued that one would expect the national leadership to be united on foreign affairs at least; and that if the government changed its position, the national leaders would do the same. However, it is significant that leaders of the two extremes, Morarji Desai, now the Deputy Prime Minister and Finance Minister, who opposed Mrs. Gandhi for the succession to Shastri and is considered both conservative and a Hindu nationalist, and Krishna Menon who, before he left the Congress, was very critical of Mrs. Gandhi's government on the ground that it had moved away from socialism, have taken strong positions against an Indian bomb in large part on moral grounds. Reversal of their strong positions would prove

embarrassing for them. Other national leaders, such as Chavan, the Home Minister, have taken positions against it on national interest grounds; and many of the top party and state leaders have supported the government without taking a strong public stand.

Among the rank and file local leaders, there has been far more support for an Indian bomb. Both in the 1962 Lok Sabha and in Congress Party meetings, individual Congress Party members covering a supposedly wide spectrum of political opinion have criticized the government's present policy. Several ministers of second rank in the Central Cabinet before 1967, including the Minister of Housing, M. C. Khanna, and the leading north Indian Harijan minister, Jagjivan Ram, have at one time or another publicly favored an Indian bomb. In fact, it has been suggested that their statements may have been trial balloons by the government. Ninety-six Congress members of the 1962 Lok Sabha signed a petition urging the government to accelerate the Indian program to develop a nuclear weapons capability. One of the leaders of this group is K. C. Pant, a prominent leader in the Uttar Pradesh and son of the late B. Pant, one of the foremost leaders of the Congress Party in his lifetime. Of the state leaders, the most important favoring an Indian bomb has been the Chief Minister of Madhya Pradesh, D. P. Mishra. As pointed out, the support of the bomb by these northern leaders may be related to the pressure from the Jan Sangh, the PSP, and SSP. What is perhaps the most significant result of these debates and discussion is that the government has discarded any absolute or permanent ban on making the bomb, as well as the "moral" argument against it; the decision on the bomb is now being justified in public at least, in terms of national interest, and as such is subject to review. Unquestionably, this shift had to occur; "morals" or "absolutes" are an insecure basis for foreign policy, and it is doubtful how such absolutes did, in fact, govern India's decision. Putting the issue openly on grounds of national self-interest makes it open for rational analysis and criticism, which may provide a stronger base for whatever eventual decision is reached. Stressing national self-interest, however, clearly has the risk of stirring an emotional national issue.

There may also be a generational difference among the political leaders in their attitude toward nuclear weapons policy that may operate in favor of the Indian nuclear capability in the future. Such leaders as President Radhakrishnan, C. R. Rajagopolachari, Krishna Menon, Morarji Desai, and in her own way on this particular issue as the inheritor of Nehru's policies, Indira Gandhi, represent the pre-independence Congress generation, strongly influenced by Gandhi's and Nehru's philosophies. The younger generation of leaders, Chavan, Sanjeeva Reddy, K. C. Pant, and many regional leaders, are far less influenced by such points of views and are much more likely to look at the question from the point of view of national interest and internal political pressures.

It is noticeable, too, that the issue of a nuclear capability is not an issue in the current elections. In part, this reflects the over-riding importance of local issues, and the impact of the economic problems of the past two years. But it may also indicate that important groups of the Indian people have seen that India can live with the Chinese bomb, and realize that it will not lead to disaster. The Indian success in the fighting with Pakistan in 1965, and India's ability to resist China's pressure on its frontiers during that fighting, both raised India's national and military confidence, and showed India that even though China possessed the bomb, its value was very limited on the border, and it could be resisted if used as a blackmail threat. Although I have seen nothing of the effects within India of the series of defeats that China has suffered in international relations since 1965, or of the internal difficulties that China is going through, it is possible that on balance they have contributed to a greater Indian self-confidence toward China. This would indicate that it is unlikely that the Indian government's policy will change in the reasonably near future providing the following elements influencing India's decision-making process remain roughly at the same level today:

- (1) The Chinese threat (a more rapid Chinese missile capability than expected would raise it; the present internal unrest may reduce it);

- (2) The attitudes of the United States and the Soviet Union toward India and an Indian bomb; (the worsening Sino-Soviet relations may both build up Indian confidence and lead to a greater willingness of the Soviet Union to offer India some type of protection against a Chinese attack);
- (3) The Congress Party's position, relative to its pro-bomb opponents, in both the Lok Sabha and the states, following the February 1967 elections.

With respect to the last condition, there has been a change already. The Congress Party, in the 1967 elections, lost majorities in the state legislatures of many of the northern states. The Jan Sangh was a major gainer. Although an Indian nuclear capability was not an issue in the election, the Congress may be under greater pressure from both the Jan Sangh and its own members in the north to opt for nuclear weapons, from the latter as a way of countering the Jan Sangh and creating an image of vigor and activity. The Congress will also be less amenable to foreign influence on this and other issues, since its position is weaker and its opponents are more likely to criticize actions that appear to be under foreign influence. For both of these reasons I feel the results of the 1967 elections make it more, rather than less, probable that India will move toward a nuclear weapons capability within the next few years.

NON-POLITICAL GROUPS

There appears to be public agreement among the present chiefs of staff against India's going nuclear at this time. The former Minister of Defense, Chavan, has publicly supported the government position, which he has probably had a good deal to do with making, in national interest terms, and by statements that the conventional threat from China is far more likely than the nuclear threat.* However, the

* See, for example, the Overseas Hindustan Times, October 29, 1967.

analysis behind this statement has apparently not been made public. It is possible that retired General Som Dutt's public study represents the point of view of other senior, and older, officers, but it is impossible to say to what extent there are disagreements among the senior officers, or between the senior officers and those of the rank of colonel and below.

Two straws in the wind may be of some significance. Apparently those younger officers who are students in the India War College have, in at least one of their problems, thought it desirable that India have a nuclear capability. This may indicate a generational difference on this issue that could become significant as the present generals retire. A second straw that may be even more important is the indication in one of India's newspapers that the Army Chief of Staff favors a missile capability for India.* The reason for this is not explained, but it is believed to reflect the Army Chief of Staff's prior experience as an artillery officer, with missiles in effect representing the next stage in artillery. It is unlikely that India's present military commanders, trained in conventional warfare, would be willing to jeopardize the development of conventional forces under the present Five-Year Defense Plan by advocating a nuclear capability. But once this Plan has been completed, it is certain that they will favor continued modernization of those forces -- and if that means missiles or nuclear warheads, they might well favor that step as one that simply carries conventional weapons one step further. I would think they would certainly oppose giving up the nuclear option, unless they were promised something valuable in exchange. There is also a small possibility that senior officers in either the navy or the air force, which receive much smaller proportions of the defense budget than the army and are bureaucratically weaker, might see some advantage in urging nuclear weapons that would build up their service at the expense of the army -- for example, by urging construction of nuclear submarines.

* See the Indian Express, November 2, 1966, editorial.

The attitude of the scientific community, especially the large number of nuclear scientists employed by the Atomic Energy Establishment, will be an important factor influencing both the position of the Director and the government. Although the position of India's atomic scientists on the issue is unknown, the position of Indian scientists in a more general sense seems to be favorable toward India's going ahead with a nuclear alternative. This may reflect a desire to show themselves as good as Chinese scientists; there would also be a wish to carry past nuclear work to completion. However, if conditions for research on peaceful applications of nuclear energy remain favorable, and there are genuine opportunities for such research and its application, it is likely that the desires of many scientists will be satisfied, especially if V. Sarabhai continues to oppose the bomb.

Among other intellectuals, the Chinese and Pakistan conflicts and the debate over the bomb have aroused a genuine interest in the systematic analysis of India's defense in relation to its national interest. The papers of Raj Krishna, Sisir Gupta, General D. S. Dutt, Girilal Jain and others are all framed in such terms. This tends to be a tough-minded discussion, with some bias in favor of a hard line. It is also clear that there is little agreement in the discussion on such basic issues as the nature of alternative threats, the costs of alternative defense postures, the role of alternative atomic systems in meeting various threats, or other key issues. The fact that the discussion is beginning to move in such areas is all to the good, since it implies that improved methods of analysis, greater knowledge and objective consideration of Chinese aims and methods and available instruments in the area, more accurate facts with respect to weapons and costs, could all contribute to informed conclusions.

It is difficult to say how India's economists within the government regard the question. Several of the academic economists, such as Raj Krishna, have taken the lead in formulating the discussion in terms of national interest. Obviously, the economists would be aware of the largely competitive relationship for very scarce resources between the nuclear arms program and the economic development program; but as

pointed out earlier, it is likely that they would be presented with a decision on the nuclear alternative, and then asked to find resources, or adjust resources, rather than participate in the decision with respect to nuclear weapons.

There certainly does not appear to be any "business" point of view on the issue, from what can be determined from the editorials of India's leading English-speaking newspapers controlled by large business groups. This is not an issue on which it would be expected that India's businessmen as a group would take a position. Nor is it likely that a negative stand on the bomb on their part would necessarily prove helpful in opposing an Indian bomb, since they are frequently criticized for being mainly interested in money. However, they are opposed to new taxes, and their opposition would sharply highlight the choice between the bomb and other uses of India's resources.

On this issue the Indian newspapers reflect the opinions of their political sponsors, when they are party papers; otherwise the opinions of the editors. Frank Moraes, India's most widely known editor, and the Indian Express, seem to be mildly in favor of an Indian bomb; The Times of India and the Hindustan Times seem to be opposed; Inder Malhotra, the influential columnist in the Statesman, favors an Indian weapons capability, and his paper appears to look favorably at a nuclear explosion for peaceful purposes; on the left wing of the spectrum, Blitz, the very popular Bombay weekly tabloid, and The Patriot, a New Delhi daily, both of which are strongly sympathetic to the views of Krishna Menon and also of the Soviet Union, are against India's going nuclear. However, both papers, somewhat surprisingly, have at various times pointed out the desirability of continuous review of the issue, and even that if the major nuclear powers do not achieve agreement on disarmament and nuclear control, India may have to opt for nuclear weapons. The fact that they have expressed this view is indicative of the popular appeal of a nuclear weapon. All papers agree on the desirability of continual nuclear research and maintenance on India's part of an ability to choose.

My impression is that there has not been any crystallization of Indian non-government informed opinion on the issue of a nuclear capability. There is still groping on this issue, and the debate has not become widespread enough either to arouse general feeling among the public, or to become a major political issue in the 1967 elections.

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IV. IMPLICATIONS FOR U.S. POLICY

In this final section I shall simply assume that U.S. policy is against further nuclear weapons proliferation on an international scale, and that it is therefore desirable that India retain its present policy of nuclear weapons. Based on this assumption, which will not be critically examined, this final section will indicate certain implications for U.S. policies that try to influence the broad Indian directions of nuclear weapons policy and suggest some avenues of future research.

It is clear that a crucial issue in the debate within India is the difference over the credibility of a long-term American interest in, and commitment to, an independent India. On the U.S. side, this implies a willingness to come to India's defense in the event of a nuclear attack upon it by China, even if this would mean a threat of a Chinese nuclear attack upon the United States. Without this U.S. willingness, implicit or explicit, India would have little choice but to go nuclear. This also implies that the United States continue to show its interest in Asia and India by both its economic policies and its broader political policies in the region.

The nuclear issue is a very delicate one so far as India is concerned. Great care should be taken in either exerting or seeming to exert pressure, since it can easily backfire. Before any pressure is exerted, the United States should be reasonably clear in its own mind both of the desired ends and of alternative policies in the event the pressure backfired. Since it appears that both Russian and U.S. attitudes toward an Indian nuclear proliferation are similar, up to a point at least, there might be some possibility of implicitly or explicitly working together in the matter. This would reduce Indian sensitivity on the issue. This is especially important because at present some of the most vocal and influential political groups against an Indian bomb are on the extreme left, and it is desirable that on this issue the present coalition be maintained.

Little is known in the United States of attitudes toward nuclear weapons by very important groups in Indian society and the government. It would be desirable to make a greater effort than in the past to get some impressions of the points of view of members of such groups as scientists, soldiers, businessmen, and others. This is also extremely important as a precondition of trying to exert any influence within the Indian context. Following this exploration some effort might be made to have knowledgeable American or foreign counterparts discuss such issues as the costs of the bomb, difficulties of going nuclear, the role of the bomb in military forces and its implication for conventional forces, the value of the bomb in relation to China, and other issues with selected Indian scientists, soldiers, experts on international affairs, businessmen, newspapermen, economists, and politicians. But this should be handled in a low-key and quite informal manner, and should not be confined only to one element of these groups, or one political party. Unless such discussions transcend faction or party, they could easily backfire.

Indian discussion is currently bedeviled by lack of facts to evaluate nuclear weapon capabilities and costs; and by the failure to tie together the discussion by an analytic framework that looks at various threats, various alternatives to meet the threats, and the relationship of those costs to India's broader political and economic aims. Any assistance that the United States can supply in training and accustoming Indian officials and government leaders to think in such terms and in filling in the empty analytical boxes would be of greatest value. This would best be done outside government channels and through scientific and academic channels in whose impartiality Indian leaders have confidence. If there is a belief that the information is supplied to peddle or support the U.S. Government position, the effect could be useless or worse. To the degree that highly regarded foreign sources, such as the Institute of Strategic Studies in London, could supply correct information and training, they might be preferable to American sources. It would also be desirable that the Indians be made aware of the true costs and problems of nuclear weaponry in such other countries as the United Kingdom and France.

To keep India's scientists abreast of developments in nuclear research, and to maintain their present high morale, they should be kept in contact with peaceful nuclear research in the United States and other western countries that can provide a basis for India's own nuclear research and its application. To the extent possible, this research exchange should be disassociated from nuclear weaponry, and from side effects that would reduce the costs of nuclear weapons. It is important also that the United States think out and seriously pursue a policy of assisting countries such as India and Canada in peaceful nuclear research. This may require a U.S. economic aid program in this field for equipment, raw materials, and the like. Emphasis on peaceful nuclear research should harmonize the professional interests of the scientists and the U.S. goal of non-proliferation.

Indian knowledge of, and research into, Chinese aims, methods, and capabilities, seems to be small. Encouraging Indian research into this area, and making available relevant U.S. evaluations of Chinese intentions and capabilities to appropriate government officers, would better enable the Indian government and concerned public to make its own evaluation of the Chinese threat.

Efforts on the part of the United States to encourage thinking among government officials and the concerned public of Indian non-military alternatives to nuclear defenses against China may be useful. A closer Indian relationship, for purposes of security or development, with a wider group of Asian countries that includes Japan, Australia, and Indonesia, as suggested by General D. Som Dutt, would be desirable, not only from India's point of view, but from that of the United States.

Future research into the Indian nuclear weapons program should include an investigation of the electoral fate of the 96 members of the Congress Party in the Lok Sabha who signed the 1964 petition in favor of an Indian nuclear weapons program, and to explore their backgrounds for common features. It would also be useful to know the attitudes of new opposition members of the Lok Sabha, especially those from the Jan Sangh Party.

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There should be discussions of the nuclear weapons issue with appropriate Indian officials, politicians, and private individuals. These include members of the government on both the ministerial and bureaucratic levels; military officers; politicians of the various parties; scientists, economists, and intellectuals both in and out of the government; newspapermen; and businessmen.

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THE CLANDESTINE PRODUCTION OF NUCLEAR WEAPONS

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W. Z. Wade *

INTRODUCTION

This report discusses certain possible indicators of clandestine nuclear weapons production.

SECTION I: INDICATORS

GOVERNMENT FUNDING

The funding of a nuclear weapons development and production program should manifest itself in the operational effects on the governmental agency assigned the task. The sudden affluence of budgetary monies would be displayed in a burgeoning payroll, dramatically increased communication facilities, and on activity probably far out of proportion to the agency's purported function.

While funding would probably be unannounced, the flood of checks or government vouchers cycled into the nation's banking facilities by this agency for payroll and material purchases should be conspicuous. This would be true in spite of the fact that the bulk of the monies allotted for nuclear weapons is spent on the material sources and on the delivery systems.

*Editor's note: This material was prepared by W. Z. Wade in a more expanded form. It has been considerably reduced for publication here.

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As an example of cover operations for dispensing the large funds expended, consider large-scale reactor programs or military procurement programs. A vastly increased amount of monies spent upon purported military arms procurement without a corresponding increase in conventional armaments would tend to indicate a possible operation to cover funds controlled by the nuclear weapons administration agency.

Staffing

The sudden increase of staff of a governmental agency could be accompanied by the appointment of a high-ranking bureaucrat, military officer, or scientist as its leader. Such an appointment may not be announced, but then would be evidenced by only part-time appearance in his old function, or a leave of absence from that position. This behavior on the part of an influential personage would be suspect.

The large increase in staff would be accompanied by a corresponding increase in physical plant size necessary to house such an expanded or newly created administrative agency. This could manifest itself as an expansion of existing agency buildings, a move to larger quarters, or the dispersion of the staff to one or more unannounced annexes of this agency. The first two considerations of expansion would be self-evident. The latter possibility would only be evidenced by a profusion of couriers traveling between differently located annexes.

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In all cases, much mail, telephone, teletype, and travel to unknown or apparently innocuous destinations would become a prevalent feature of this agency staff.

Security

Within such an administrative agency would be large guarded areas which would require a certain type of identification card or badge. In separated sub-rosa annexes, this security guard would be complete. In all cases, windows and doors would be sealed with only a few selected points of exit and entry possible. Alarm systems, barred windows, closed circuit TV cameras, and excellent exterior lighting, may all be included as indicators of such an administrative agency. Secondary indicators are the mushrooming purchase of safe document repositories, air conditioning of the entire sealed agency staff area, and the movement of security conscious couriers. Every staff member would have been subjected to an intensive security check on his past life.

Administrative Expansion

Since the weapons administrative costs could be included in the budgetary analysis of any covering agency, an increased administrative expansion (civilian personnel) at any (possibly remote) government power complex, reactor, agricultural, or military research and development center would be suspect.

Site Expansion

Because of the program's national importance, it is probable that the high-level administration of the agency intrusted with this task would maintain its headquarters

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in the capital city (with indicators as outlined previously) in order to facilitate liaison with the country's ruling executive branch. However to avoid becoming too obvious in size, a large portion of the administrative personnel could be relegated to some covering site as outlined under Administrative Expansion. In this case, there would be the necessity of expanding that cover site to accommodate the influx of civilian and military staff personnel. Such an expansion of administrative staff without a corresponding increase in work output of that cover site would be suspect.

New and/or Remote Siting

It is improbable that the administrative agency would select any new or remote site. First, it loses all of the advantages of an existing cover and, second, it requires highly developed transportation and communication facilities to perform its function. However, if such a decision is made, then the providing of transportation, communication, and housing facilities at a new or remote site will be detectable and warrant further observation to determine if security measures are enforced when the site becomes occupied.

SOCIAL STRUCTURE

The institution of a nuclear weapons development and production program creates a pronounced effect upon certain small and specialized sectors of a nation's society. These areas of pertinent manpower include those people in the academic community, the technical work force, and in the personnel of applicable manufacturers within the nation's industrial complex.

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Academic Community

There should be a noticeable preoccupation on the part of the nation's scientists and engineers who possess competency in the areas necessary for research, development and production of nuclear weapons. These would include personnel such as mathematicians, nuclear physicists, solid state physicists, process chemists, high explosives chemists, metallurgists, reactor engineers, mechanical engineers, chemical engineers, electrical engineers, and ordnance experts.

The possible areas of expertise would encompass: reactivity codes for reactors, computer expertise, physical properties of fissile materials, nucleonics, shock hydrodynamics, detonation phenomena, separation and purification of fissile elements, organic and explosives chemistry, metallurgy of fissile materials, reactor design and operation, isotope separations, fuel fabrication, electronic neutron sources, and ordnance delivery systems.

The publications of a nation's scientists and engineers for a time prior to the "suspect" period may be evaluated to identify those who have competency in the areas previously delineated and, also, those who have a potential to develop such competency from their associated fields of specialization. The academic places in which these men acquired such competency should be identified, for they will continue to be a wellspring of personnel trained in such applicable specialty and will probably be a focal point of consultants and advisors in that specialty.

The literature produced by these identified men after the suspect period has begun should be correlated with earlier writings to see if an inexplicable deviation in direction has occurred. Such deviation could be characterized by

a complete cessation of publication, a sudden decrease in publication frequency, a radical shift in direction of effort, a more "emasculated" treatment of their specialty, or the advent of consistently co-authored articles of indifferent caliber.

The migration of these experts to a single geographic location, or their movements resulting in a juxtaposition of these various competencies into a single university, institute, or government laboratory would be suspect.

An adjunct of such identified centers would be computer availability, or at the very least, a computer time-sharing capability. A time inventory of the nation's computers should be revealing.

Technical Work Force

The techniques just described for identification of personnel and sites in the academic sector, may be applied in any analogous manner to technical personnel and their location. This would apply to the migration and requirements of computer operators, draftsmen, technicians, mechanical and chemical operators, nuclear reactor personnel, and technical librarians. As before, the places such individuals obtained their training should be identified as sources of new technical personnel as well as referral centers for past trainees.

Industrial Complex

The industrial complex of a nation would have to be the source of trained workers for such clandestine weapons production. Industries performing functions that are applicable to the production of nuclear weapons may be identified as sources of recruitment. Such recruitment would certainly take place from radioactive materials-handling concerns, inorganic chemical plants, machine shops,

electronics manufacturers, explosives industries, and all phases of the nation's nuclear reactor program.

The advent of applicable new technologies within the industrial complex should be followed with interest. The creation or expansion of industries such as inert gas suppliers, "biologically safe" working enclosure manufacturers, gas filter media producers, rubber gloves manufacturers, radiation monitoring device industries, explosive manufacturers, fluorine producers would be suspect areas of interest.

Imports of large earth moving equipment, calcium, magnesium, gallium, lithium metals, fluorine producing cells, alpha meters, glove-box components, induction furnace power units, etc. should be followed with interest.

Finally, the appearance of a serious civilian atomic defense program in all sectors of the society may well signal the anticipated emergence of a nation as a nuclear power.

MATERIALS

This section attempts to touch on all phases of the treatment of materials, but it should be kept in mind that some subsections may not be applicable. For instance, a few plane-loads of "yellow-cake" clandestinely acquired in the Congo or from a sympathetic nation would eliminate the necessity of mines, mills, etc; the "milking" of an experimental or power reactor, or the presence of a clandestine natural uranium production reactor would obviate the necessity of an isotope separation facility, etc.

Resources

A knowledge of the geological structure of a nation, particularly the location, quantity, and quality of its uranium and thorium deposits would pinpoint the areas to be observed for the tell-tale piles of gangue from tunnel mining, and/or the undisguisable scars created by strip mining.

From the standpoint of both economics and secrecy, the ore beneficiation mill would probably be located near the mining location. Otherwise, the mass transport of thousands of tons of ore over long distances from remote mining locations would be quite evident. In any event, the mill would be an easily recognized facility because of the huge mounds of tailings that would grow from the uranium or thorium concentration process. The plume of "yellow-cake" which leaves a yellow dusting on the ground hundreds of yards leeward of prevailing winds, is another identification of the typical uranium processing mill. For these operations some very important barometers exist. Since only a few of the highly developed nations manufacture huge earth-moving equipment, bulk transport equipment, and heavy milling equipment, the import of these large items into any nation would be suspect. Just as important is the repeated orders for spare repair parts that would be created by heavy-duty use of such items.

Once the "yellow-cake" or thoria concentrate has been obtained, concealed shipping to any other area may be effected. Once arrived at a purification and conversion facility, the material may be processed and fabricated into reactor fuel elements in a small inconspicuous plant. Another alternative would be to bleed it into the processing line of an existing conversion and fabrication plant that is an integral part of the nation's overt reactor program. In spite of IAEA inspections and international safeguard programs, it is possible (in this author's considered opinion) to increase production by a substantial fraction over the purported processing rate without even the

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chemical operators becoming aware of the extra clandestine processing load. Consequently, once this "extra" material becomes processed and fabricated, it becomes exceedingly difficult to detect its further destination or destiny.

Reactors

For the production of ^{239}Pu or ^{233}U fissile material, the weapons program has the choice of "milking" a known reactor or building a secret production reactor. In the first case, it is deemed possible, in a continuously or cyclically refueled reactor to insert clandestine fertile elements to breed these isotopes of Pu or U without the reactor operators handling such refueling being aware of the substitutions. A skilled reactor engineer in charge can change the reactivity of the pile to maintain power levels without the operators seeing any loss in neutron inventory. Only after the legitimate fuel is processed during recycle would there be evidences of a lower efficiency than had been designed for in the reactor so "milked." However, this is a fairly common situation arising in reactors that are not "milked," so such a lower efficiency is not an indicator in itself.

In the second case, the nation may erect a clandestine natural uranium production reactor for use in building inventories of ^{239}Pu or ^{233}U . The fabrication of fuel elements and the recycling of "bred" fuel may be completely disguised by the supporting plants used in an overt reactor program. In spite of so-called "safeguards" programs, it would be exceedingly difficult to detect such clandestine recycle processing of burned elements in the overt plants.

Only in the second case is there any indicator that would be apparent. That indicator is the large thermal pollution engendered by the secret production reactor.

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Isotope Separation

For the production of ^{235}U fissile material, it becomes necessary for the nation to construct an isotope separation plant. It is rather dubious that any nation would seriously consider this course of action in light of the ease in breeding and chemically separating ^{239}Pu and ^{233}U . The production of 90%, or better, ^{235}U creates the necessity of building an installation of large dimensions, consuming tremendous quantities of electrical energy, and probably costing more than their entire overt reactor program.

However, if such a course were decided upon, the construction of a gaseous diffusion plant would require huge quantities of materials such as sintered teflon, sintered nickel, or sintered alumina; thousands of double stage compressors of nickel of monel; etc.

An extraordinary amount of electrical power would be required, with the plant defined as the focus of huge transmission lines coming in from a number of power generating stations. If a gas centrifuge separation technique were utilized, much of the same power consumption criteria would apply (but on a smaller scale). In addition, factories would be built to construct the initial centrifuges and their later replacements in numbers ranging from 500,000 to 5,000,000 units, depending upon the separative capacity desired.

In summation, neither of these plants lends itself to the production of very small quantities of relatively pure ^{235}U . The nation that creates such a plant would have to carry out an all-out effort, in which case it should be very conspicuous. A final alternative is to build an open plant for the partial enrichment of reactor fuels. In this case, the centrifuge plant lends itself to "extra-hours" operation to achieve the greatly increased enrichment required for nuclear weapons.

Explosives

In any nation, with a respectable ordnance industry, this aspect of weapons production may be quite difficult to detect. The scientists, engineers, formulation laboratories, production facilities, and testing areas are already in existence and the exact nature of the explosives being worked on would be difficult to determine. If a nation had no such facilities, then the creation of each of the above requirements becomes a possible indicator.

Electronics

The situation here is analogous to the observations made in the

Explosives category.

Information

Suspicious should be aroused when a nation's information gathering agencies (possibly operating under cover of a university or laboratory technical information agency) show an increased interest in obtaining copies of articles dealing with condensed explosives, shock hydrodynamics and associated complex instrumentation, etc.

Literature appearing within such a nation which skirts the edges of such subject coverage would be worthy of interest. Attendance at pertinent international meetings or the tours of pertinent foreign installations should be evaluated.

Security

The best possible security indicator for the mines and mills engaged in clandestine production of uranium and thorium concentrates would be the remote location of such activities. To shield such a large area and such prominent works from sight would be virtually impossible with fencing. The best that could

be done would be jeep patrols and low-flying aircraft patrols to warn off trespassers.

The purification and fuel fabrication plants (if an open facility is not being used secretly) can be located in an inorganic chemical complex, such as a phosphate or potash fertilizer installation. Detection would be difficult, since the same reagents, equipment, etc., would be utilized to a great degree. Security could be effected by using translucent windows, keeping controlled entry points to a minimum in the physical plant, and using a dummy sign or designation to identify it with the complex within which it resides. Guarded fencing could be used, but would appear quite obvious and thus ruin the excellent cover of the existing chemical plant.

"Milked" reactors need no physical security measures, only the conspiracy of several key engineering, inventory, and management personnel. A secret production reactor, on the other hand, demands certain resource requirements which create enormous security problems. While the building may appear simply as a large "bay" structure, the large cooling requirement means that it must be located by a very large lake or a large river. The thermal rise of the water downstream or in its vicinity would be sufficiently marked to excite speculation by local or traveling persons. Therefore, it would be almost mandatory to locate such an installation in a very remote area with adequate patrols in the vicinity to maintain such isolation. This would mean a "closed" housing site nearby. The only other alternative is to locate the plant near some extremely large source of industrial thermal pollution and depend upon this proximity to cover the thermal effluent arising from these clandestine operations. If this latter were the case, the large building and/or fencing would then be necessary again.

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During substantial nuclear weapons production, an isotope separation plant would present the most difficult facility to keep undetected. It would either loom massively or sprawl massively when compared to the installations around it, and stand out starkly if erected in an area by itself. Its large energy consumption could only be explained (partially) if it were identified as a major magnesium or aluminum electro-reduction plant. Guarded fencing or entry would only confirm already strong suspicions.

Explosives and electronics manufacture requires very little security, other than select personnel clearance, if the operations are conducted at a cover plant already producing explosives or electronic components. The proprietary nature of explosive formulations and electronic circuits, even in socialistic countries, makes a certain amount of secrecy and classification a usual phenomenon, and would thus be meaningless. If no such industry existed in any certain nation, the creation of such departments in the military complex of such a nation would appear quite rational.

WEAPONS LABORATORY

If security were neglected, the weapons laboratory, itself, would be the most difficult of all facilities to identify. However, because of security requirements, it offers a few indicators. There are no physical plant indicators that would differentiate such buildings from those of many other installations.

Staffing

A typical weapons laboratory staff may consist of: a) approximately 100 scientists (10 mathematicians, 25 physicists, 5 organic chemists, 5 radiochemists, 5 inorganic chemists, 5 chemical engineers, 5 metallurgists,

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30 mechanical engineers, 5 electronic engineers, with the remainder electrical engineers, ceramicists, nuclear engineers, etc.); b) approximately 150 technical support personnel; c) 100 craftsmen; d) 100 administrative support and technical information personnel; e) 100 maintenance personnel, and 50 security personnel. Thus a total of 600 people would need to be housed in offices, laboratories, shops, and device assembly areas. The largest item would be laboratory facilities.

Materials

Since the fissile, explosive and electronic materials may be acquired from existing clandestine sources, the most unique of the materials entering this facility would be the inordinate amount of complex instrumentation. This, combined with a computer facility (or the time sharing access to one) and some occasional requests for exotic liquified gases and reagents, would be the only manifestation that it was a laboratory. However, even this does not necessarily indicate a weapons laboratory.

Security

Because the weapons laboratory contains all of the ingredients in a capsule of a nation's secret nuclear weapons progress, the security arrangements would probably be more stringent than at any other facility wherein only a single component is produced.

This security would be manifested by shipments under armed surveillance, couriers, warning signs, and a multitude of fences which would delineate primary and secondary exclusion areas. The fences and inner areas would probably be brightly lighted at night. Guard posts would possibly be undisguised.

Entering and exiting personnel would be badged or carry I. D. cards. These precautions would be necessary even if the installation were located deep within an army base.

Proving Sites

Two types of testing sites may be required. A small site for the test firing of explosive configurations and for hydrodynamic shock phenomena studies. These may be done in more isolated areas of proving grounds already in existence and maintained by industrial explosives manufacturers or by armed forces ordnance departments. While this would be the most logical approach and require much smaller security requirements, it may be that the weapons agency would develop its own H. E. testing site. In this case, it probably would be fenced and patrolled and located in a nearby area that is fairly isolated.

The second type of proving site that may be required is for the detonation of near-critical or barely critical devices. This operation would demand even more stringent security and more complicated facilities constructed underground, or undersea. It would be quite desirable to recover all of the material so detonated, or at the very least, a representative portion of such material. This requires substantial tanks buried underground or underwater, and recovery facilities immediately adjacent.

Location

While the weapons laboratory may be located in an industrial or military complex, it would be more likely to use a less populous covering installation, such as a more remote (but easily accessible) bureau of mines laboratory,

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hydroelectric generating station, military reserve, university field extension, etc. This reasoning is prompted by facilities requirements, as well as the fact that the threat to secrecy is proportional to the number of uncleared people in close proximity to the installation. Consequently, the requirements of accessibility to consultants, computer, power, and communication facilities must be balanced against population density when searching for a site.

WEAPONS PRODUCTION

In a weapons program of any substantial scale, it is probable that each of the common material components would be fabricated by an appropriate industry specializing in the production of such material. To duplicate such facilities for the sole purpose of weapons component production would be both uneconomical and more easily detectable by any interested observer.

Within industries such as explosives manufacture, metal working, electronics, etc., it would be only necessary to require security clearance for the production and administrative personnel involved. Since in all likelihood such manufacturers already would be devoting a certain percentage of their production to orders for conventional ordnance components, the security already existing for this purpose could be quietly upgraded to a more stringent surveillance without causing any undue comment on the part of uncleared personnel.

Materials

The explosive component of nuclear weapons could be fabricated in the same security area of a plant as the explosives fabricated for conventional bombs, shells, etc. The same reasoning applies to the nuclear weapons cases

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which would be fabricated by the manufacturers of torpedo bodies, shells, conventional bomb cases, etc. The electronic circuitry could be included in the military orders for radar and communication components. Except for the possible expansion of facilities and personnel, none of these component fabrications are particularly detectable.

The fissile component of nuclear weapons has been covered in the preceding MATERIALS section.

Security

The assembly of all received components presents a much more difficult problem than the security requirements of the components manufacture. Here, as in the development laboratory, all components of the weapons are assembled at one point; thus, security is a prime prerequisite of location.

Location

Again it is doubtful if a populated area would be chosen. Since this is a clandestine operation, it would be necessary to find an excellent cover agency, normally inaccessible to natives or tourists. The alternative is to establish an assembly plant in a remote location that is accessible by heavy-duty transport.

It would appear that an armed forces proving ground or ordnance depot would be a perfect cover. The buildings required for the assembly of weapons are neither singular in appearance nor large in number. Consequently, the appearance or expansion of an ordnance plant at an ordnance depot or proving grounds would probably not excite much curiosity. However, it would be necessary to use the typical fence and guard force to maintain building security integrity within such a complex.

Wastes

Radioactive effluents and other wastes arising from the production of fissile material are among the strongest indicators that may be found.

DELIVERY SYSTEMS

The delivery vehicles utilized by any nation with a nuclear warhead stockpile will be a large part of the overall cost in developing a viable nuclear presence. The type of delivery system will be governed in large part by that nation's geopolitical environment as well as the technological sophistication of its production resources.

Aircraft

Even in technologically underdeveloped countries, the presence of purchased fighter-bombers would permit the use of low-yield nuclear weapons. Because of the limited range, such ordnance may be used defensively or, in the case of a neighboring country, offensively. In either case, modifications would have to be made to the ordnance-carrying hardware of such craft. In more technologically developed countries, with aircraft production capability, especially designed aircraft could be produced having extended range. The appearance of such heavier aircraft in a normally defense oriented air force of lighter craft, could be suspect.

Rockets

Only the technologically developed countries of wealth and production capacity could mount a convincing system of nuclear warhead rockets. The test firing of such carriers during development would be difficult to conceal, as would be their fabrication, transport and emplacement.

Production

The conversion or production of aircraft for nuclear weapon delivery, should permit aeronautical experts to detect such modifications or designs as being inconsistent with the delivery of conventional bombs. Rocket production would be even more apparent because of the difficulty in concealing the obvious size and configuration. Rocket motor and fuel testing sites are noisy and difficult to conceal. Mobile launchers and hardened emplacements are of unique design and whether in a remote location or on shipboard, would present enormous transport problems if secrecy were to be maintained.

Stockpiles

The appearance in various armed forces ammunition dumps of special storage bunkers that have an inordinate amount of instrumented internal surveillance cables emanating from and leading to manned security buildings would be suspect.

Security

The special security procedures of fencing, lights, guards, and inspections that would appear around certain areas within ordnance dumps, military preserves, proving grounds, airfields, etc., would be suspect.

Service Schools

Highly classified armed forces training schools would be necessary to develop the cadres used in operating nuclear ordnance. These would have to be located near the stockpiles and their carrier vehicles to provide field training for these trainees. The appearance of an elite force of trainees, separated from trainees of conventional arms, would be suspect. The affection

that all armies have for insignia, may well be an indicator, however enigmatic such emblem may be. The creation of an elite naval, airforce, or artillery group could be suspect.

Conventional Weapons Effect

The position of a small or underdeveloped nation that possesses a nuclear stockpile, and who is surrounded by hostile neighbors, or a single hostile giant neighbor, may well be reflected on the emphasis it places on its conventional forces. That is a deterioration in equipment and numbers of both conventional weapons and armed forces personnel may signal a secret nuclear capacity. Reliance upon such a nuclear deterrence, as well as the costly development and maintenance of such a capability, may sap the will or the ability to maintain high-caliber conventional forces with modern ordnance. Because of these pressures, this deterioration of conventional forces may begin well in advance of any significant nuclear stockpile.

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SECTION II: THE RAPID DISAPPEARANCE OF INDICATORS WITH TIME

A primary program objective has been to originate a list of indicators that would signal the existence of secret facilities participating in the production of nuclear weapons. This author believes that many of the indicators which have been discussed would have been valid ten years ago, but are completely submerged and rendered meaningless in the burgeoning nuclear power industries existing today. In the 1970's, the proliferation of reactors and plants devoted to fuel preparation and fuel cycle processing mean that huge quantities of fissile material shall be accumulated. Unfortunately, the physical indicators that arise from these overt operations are identical to those emanating from any clandestine operation in the production of fissile material.

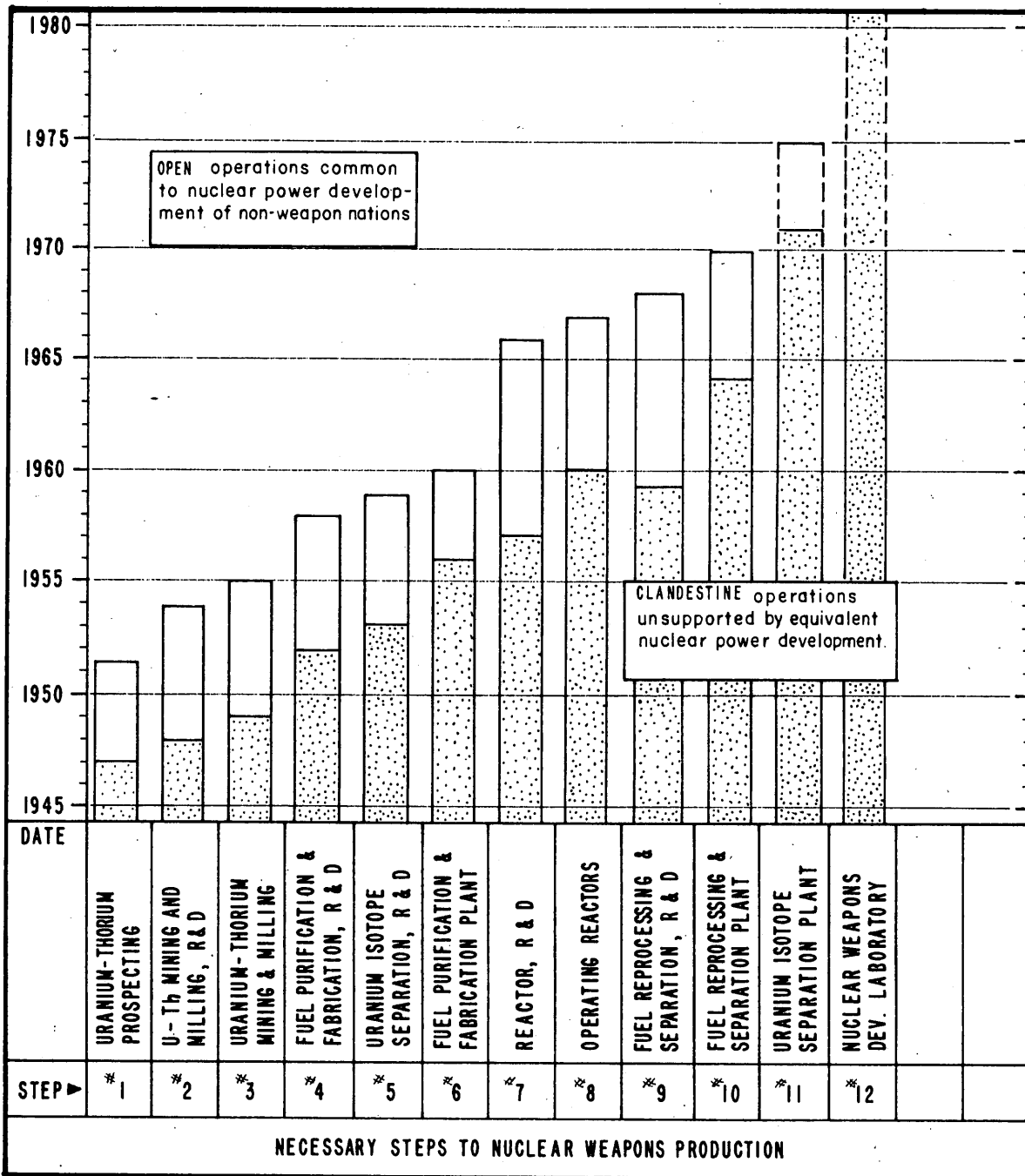
The increasing number of nations (in the years following 1965) that have come into possession of such overt facilities as part of their nuclear power generating programs makes the detection of weapons production synonymous with the "Safeguards" programs being formulated today.

The chart presented on the next page is an attempt to graphically depict these spreading technologies that may no longer be indicators of weapons production, but manifestations of power programs.

A study of this graph indicates that as of today only the nuclear weapons development laboratory remains as a separate facility to be operated clandestinely.

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LEGEND
 [White Box] YEARS PRIOR TO APPEARANCE OF FACILITY IN A NUMBER OF NON-WEAPON NATIONS.
 [Stippled Box] YEARS PRIOR TO APPEARANCE OF FACILITY IN THE FIRST NON-WEAPON NATION.

NOTE: CHART BASED SOLELY ON REPORTED AND ESTIMATED FISSILE FUEL TECHNOLOGY CAPABILITY.

This is, without doubt, the easiest facility to operate without significant indicators in a nation having a complete nuclear power program. From the production sources of fissile material have always emanated the strongest indicators of clandestine production. No nation needs such clandestine facilities today. Either outright diversion or clandestine use of open facilities already existing in the 70's are all that are required.

It has been estimated that by 1973 (from existing reactors operating or nearing completion) from 25 to 50 Kg of plutonium will be added daily to the worlds non-weapon supply. Much of this will be owned by commercial sources and non-weapons countries. Dr. S. Eklund, Director General of the International Atomic Energy Agency, points out that, by 1980, 70 tons of plutonium will be produced each year. About a third of this will be present in non-weapons countries. This third corresponds to 100 atomic bombs per week.

During this era a non-weapons nation's inventory of fissile material is available for fabrication into weapons in a matter of months if a clandestine weapons laboratory has done its job well and if its planning commission has organized (on paper) the coordination of existing fabrication plants for immediate use in a contingent "crash" program.

In summation, there is no immediately conceivable single indicator. We are faced with the need to develop an effective safeguards program to detect any clandestine production of nuclear weapons.

Safeguards

The authorization of the International Atomic Energy Agency as the safeguard agency under the Non-proliferation Treaty (NPT) (Article III) appears

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futile when viewed in light of existing techniques and instrumentation for use in detecting any small continuous flow diversion or clandestine use of facilities for larger production. In fact, AEC Commissioner C. E. Larson, at the Nuclear Safeguards Symposium at LASL (October 1969) expressed doubts as to whether a foolproof safeguards technology could ever be reached. There was general agreement among the experts assembled that there was no existing system that could not be circumvented. This plus the fact that no enforcement powers or penalty procedures are included in the Non-proliferation Treaty, make it difficult to understand how this responsibility given the IAEA can be a credible deterrent.

Objections to IAEA inspection may be foreseen:

1. Private reactor, fuel processing, conversion plants, etc., all have certain proprietary processes or equipment which they wish to keep secret. Therefore, there would be objections to any inspection system that would reveal these proprietary aspects.
2. In a competitive nuclear industry, the imposition of inspections, inventory controls, sampling, batch holding, and accounting procedures that interfere with the normal production system would certainly be resisted. The expected lack of cooperation with such surveillance will be understood by any engineer or administrator assigned to do a certain task in a competitive industry.
3. To be even partially effective, safeguards inspection must be a form of both overt and covert espionage. Article III, Section 1, of the NPT, states "...safeguards required by this Article shall be followed with respect to source or special fissionable material whether it is being produced, processed

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or used in any principal nuclear facility or is outside any such facility."

This, basically, would seem to give IAEA inspectors carte blanche to investigate any sector of the subject nation they deem necessary. It is doubtful if any nation would permit this type of intrusion into all aspects of their society, industrial complex, military establishments, and all other similar areas that are zealously protected by nationalistic governments and their peoples. It is, perhaps, this nationalistic spirit that has kept the Treaty from garnering, to date, no more than 23 of the prerequisite 40 signatures needed for passage.

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