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RESEARCH MEMORANDUM

THE DIFFUSION OF NUCLEAR WEAPONS TO
ADDITIONAL COUNTRIES:
THE "Nth COUNTRY" PROBLEM

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SUMMARY

The diffusion of nuclear weapons to additional countries might come about through indigenous development programs, through assistance from the present nuclear powers, or through a combination of both. This diffusion, sometimes called the "Nth country" problem, has been of great concern in discussions of disarmament and U.S. nuclear assistance programs. It has been widely held that the spread of nuclear capabilities is disadvantageous for U.S. security and that an effort to stop it should receive highest priority in disarmament policies. It is the purpose of our study to examine the validity of this proposition. To do so it will be necessary to estimate the political and military effects that might arise from a further diffusion of nuclear capabilities. Such an undertaking is necessarily fraught with great uncertainties.

"Nth countries" -- that is countries other than the United States, the Soviet Union, the United Kingdom, and France -- could develop a capability to make Nagasaki-type weapons at a cost of perhaps three quarters of a million dollars per bomb, and a capital outlay of 100 to 250 million dollars. The technical and economic feasibility of acquiring atomic weapons, however, does not necessarily mean that many countries will have the desire

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or determination to make this effort. So far only Communist China has indicated that it intends to manufacture its own nuclear weapons.

In order to evaluate the advantages and disadvantages from the diffusion of nuclear weapons we must weigh a variety of risks. A central issue is the effect of "Nth countries" on the defense of U.S. allies and other non-Communist countries against Communist threats or aggression. With the passing of U.S. strategic superiority the defense of these areas may become increasingly difficult. A selective spread of more or less independent nuclear capabilities to Western allies might more effectively deter encroachments on the free world. However, this spread might have undesirable side-effects both military and political.

Another important problem is whether the rise of "Nth countries" might increase the risk of an accidental war between the major powers. The diffusion of control over nuclear weapons could make an unauthorized or otherwise isolated use of nuclear weapons somewhat more likely. The risk of accidental war, therefore, would depend increasingly on how far the major powers introduced reliable safeguards into their alert postures, so as to minimize the risk of inappropriate reactions to isolated events. But such safeguards will grow in importance regardless of the "Nth country" problem.

Considerable concern has been expressed that irresponsible

small or medium powers might create serious international problems with their nuclear weapons. This danger is obviously more distant in time than the threats arising from the present East-West conflict. It is possible that adequate international controls will be developed in response to this danger if and when it arises. Nevertheless, since such later opportunities are uncertain, measures to prevent or postpone this danger should be pursued now, provided they do not create other more serious risks.

Unfortunately, the measures that might be politically feasible in the present world situation do not promise really effective control of the undesirable aspects of nuclear-weapon diffusion, although they might slow them down. A U.S.-British-Soviet treaty on the suspension of nuclear testing has sometimes been suggested as a means to keep other countries from developing nuclear weapons. Such a treaty might inhibit the more cautious countries from developing these weapons, but irresponsible or aggressive powers are not likely to observe the spirit of this agreement merely because of the example of the signatory powers. It is precisely such countries whose development of independent nuclear capability is most undesirable. For example, it seems improbable that Communist China would accede to the test suspension agreement without demanding vast concessions in return. Furthermore, nuclear weapons could be developed without testing and might even be used militarily, much as the United States used an

untested weapon at Hiroshima.

Other measures that might be jointly sponsored by the United States and the Soviet Union would also founder on the fact that many sovereign nations would not accept a restriction of the right to manufacture atomic weapons while the major powers enlarged or even retained their stockpiles. Furthermore, the effectiveness of such measures would largely depend on the voluntary adherence of all other countries, unless one postulates joint U.S.-Soviet action against any violator.

The infeasibility of rigorous control measures, however, does not rule out U.S.-Soviet agreement on milder measures that could slow down, though not prevent, indigenous weapon developments. The International Atomic Energy Agency is an example of such limited co-operation. Since the peaceful atomic energy programs contribute so much to the capacity of an "Nth country" to develop nuclear weapons, restrictions against the military diversion of these programs should be pursued vigorously, perhaps even at the cost of delaying the peaceful uses of atomic energy.

The United States can also take measures unilaterally to reduce some dangers from the diffusion of nuclear capabilities. As said before, nuclear assistance to selected allies may be desirable to cope with the overriding danger of Communist threats and aggression, in spite of the later possibility of unfavorable

"Nth country" developments. However, the United States should insist on firm agreements or a veto power in order to control the use of its nuclear assistance, so that it would have a legal right to intervene (by withdrawing the weapons or otherwise) should an ally later want to employ nuclear weapons contrary to U.S. interests. Furthermore, the United States should strongly insist that the countries which receive nuclear assistance observe high safety standards to prevent an accidental or unauthorized detonation.

PREFACE

This study is a joint effort by Bernard Brodie, Alexander L. George, Alice L. Hsieh, Arnold Kramish, Hans Speier, and Fred C. Iklé. We have attempted to arrive at an integrated analysis and a single set of conclusions. However, the aforementioned contributors do not necessarily agree with all parts of this report.

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I. INTRODUCTION

The possibility that more and more countries may acquire nuclear weapons has received much attention in discussions of disarmament and U.S. nuclear assistance programs. Concern has been expressed lest diffusion of nuclear capabilities upset international stability and increase the danger of general war. As a result, many people believe that this problem -- sometimes referred to as the "Nth country" problem -- should receive high priority in measures for arms control. Indeed it has been argued that disarmament may turn out to be impossible and will certainly be more difficult in the future unless immediate steps are taken to control the "Nth country" problem.

The urgency with which some people view this task can be conveyed by quoting statements on the subject made in recent years by Western political leaders. At the opening of the London disarmament conference in 1957, Selwyn Lloyd, British Foreign Minister, discussed the increasing defense burden and technological developments, and exclaimed:

How much worse will this situation become if the possession of nuclear weapons spreads to more and more countries. Let us make no mistake that this will inevitably happen unless the countries represented here can reach some early agreement to end the race in nuclear weapons.¹

¹United Nations Disarmament Commission, March 18, 1957, p. 7.

Senator Hubert Humphrey wrote:

If decisive action is not taken soon on agreements to control and curb the weapons of mass destruction, so many countries will possess them that control will no longer be a possibility.²

Hugh Gaitskell, leader of the British Labor Party, stated in a speech at Walsall, June 28, 1959:

I view the spread of nuclear weapons to the nations of the world as a prospect fraught with the utmost danger. Unless something is done to stop it I believe that within the next ten years this problem is going to dominate the whole international situation.

The "Nth country" problem has been prominent in disarmament discussions for another reason as well. Some Western officials and public opinion leaders believe that the prospect of a further diffusion of nuclear capabilities is perhaps of even greater concern to the Soviet Union than to the West. Therefore, it is felt, this problem offers a particularly promising avenue for working out some kind of disarmament and arms control agreement with the Soviet Union.

U.S. policy must indeed concern itself with the danger that nuclear weapons may fall into the hands of irresponsible countries. It is certainly the constant objective of U.S. foreign policy to avoid general nuclear war, whether launched deliberately by the

²"Works for Peace," The Progressive, October 1959.

Soviets, occurring "accidentally," or brought about through irresponsible action by countries other than the United States and the Soviet Union. The independent possession of nuclear-warfare capabilities by an increasing number of countries may well add to the problem of keeping the peace and avoiding general war.

The diffusion of nuclear capabilities may have a variety of other consequences as well. Thus the U.S., in formulating its policies on this particular issue, should also take into account the following:

- (1) The implications of additional independent nuclear powers for the global balance of power.
- (2) The effect of U.S. policies regarding nuclear sharing on the viability of the Western system of alliances.

The dangers to the peace are many. Those stemming from the "Nth country" problem are more indirect and remote than some others. The greatest threat to the security of the U.S., presently and in the foreseeable future, resides in the growing power and ambitions of the Soviet Union and its Communist allies. The "Nth country" problem cannot be considered and dealt with effectively except in the broader context of the military and political threat from the Soviet Union and other Communist countries, particularly China. To emphasize this point, as we

do here, is to draw attention to the urgency of the problem, as an important factor in disarmament and arms control. Disarmament is itself only one facet of the problem of achieving security, both for the United States and for the rest of the free world. The "Nth country" problem, therefore, cannot be dealt with in isolation but only in a broad framework which considers all the major objectives and tasks that confront U.S. leaders as they attempt to shape foreign and military policy to face an uncertain and difficult future.

For a variety of reasons, the problem of bolstering the defense of our allies and so-called "peripheral areas" becomes increasingly complex and difficult as we enter the 'sixties. Foremost among these reasons is the passing of U.S. strategic superiority and the Soviet achievement of nuclear parity. This shift in the strategic balance has exceedingly grave, though not immediately catastrophic, implications for the task of defending other parts of the free world against the political-military pressure of the Communist bloc. U.S. strategic nuclear capabilities and the threat of massive retaliation become increasingly less credible as a deterrent and increasingly less likely to discourage Communist aggression short of an attack on the United States. This does not necessarily mean that the Communists, under the protective shield of Soviet strategic deterrence of the U.S., will start local wars more

freely than in the past. But it does mean -- has already meant -- that the Soviet leaders and their Chinese ally attempt to exploit their new "position of strength" by nuclear blackmail and other pressures short of war in order to undermine our alliances and the political will of both our allies and ourselves. In Western Europe, for example, the danger is not that Soviet military aggression has become more likely but rather that in the altered strategic context Soviet pressures and maneuvers may bring about a gradual, indirect erosion of NATO. In the Far East, too, under protection of the Soviet deterrent shield, the Chinese can, without initiating a major war, combine political and military pressures so as to cast doubt on the firmness of U.S. intentions in the area and to enhance the influence of their conventional forces.

Partly in anticipation of, partly in response to, these developments, the U.S. and some of its allies have been forced to search, however reluctantly, for an alternative to the threat of massive retaliation as a basis for the security of Western Europe. In recent years the United States has undertaken a policy of selective sharing of nuclear capabilities, the British have developed their own strategic nuclear deterrent, and the French have been developing their own atomic weapons. Outside of NATO, both the Swedish and Swiss governments have

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considered the possibility of acquiring nuclear capabilities, although without reaching a decision.

European doubts as to the certainty of American protective action in a crisis -- action which would expose American cities to Soviet retaliation -- have led to the suggestion that Western European countries should have some nuclear capability of their own to render them less vulnerable to Soviet nuclear blackmail. A possible movement in this direction was indicated by John Foster Dulles in July 1957, when he announced a decision to supply warheads to NATO allies in the event of a Soviet attack:

We do not ourselves want to be in a position where our allies are wholly dependent upon us. We don't think that is a healthy relationship. Therefore we are studying ways whereby, through perhaps a NATO stockpile or weapons and various arrangements of that sort, there can be assurances to our allies that, if they are attacked, if war comes, they will not then be in a position of suppliants, as far as we are concerned, for the use of atomic weapons.

A further extension of selective nuclear assistance, therefore, is one of the means by which the U.S. may attempt to bolster the defense of the free world in the altered strategic context of the 'sixties. Nuclear assistance may consist in the sharing of strategic or tactical weapons or both and may involve various degrees of U.S. control or it may take the form of technical help for the development of independent capabilities. What the relative worth -- political as well as military -- of any form of nuclear sharing

will be for the security of different parts of the free world is far from clear. In part the answer to this question depends upon the evaluation of available political and military alternatives to the diffusion of nuclear capabilities as ways of providing for the security of our allies. Various alternatives that depart more or less radically from present practices have been suggested, for example, disengagement, atom-free zones, and better conventional capabilities. The development of U.S. policies on the diffusion of nuclear weapons must be closely co-ordinated with efforts to identify and provide for the shifting security requirements of our allies, both within NATO and in other areas.

Until a desirable and feasible security posture for the United States and the free world in the decade immediately ahead has been agreed upon, we are not in a position to decide what kinds of nuclear assistance, if any, are necessary or desirable. In view of the uncertainties involved, time rather than firm decisions may prove to be what we want most. This paper, therefore, limits itself to examining the possible consequences of alternative approaches to nuclear assistance and the "Nth country" problem.

We should note, too, that the political and psychological aspects of the diffusion of nuclear weapons could change radically were there to be an accidental nuclear detonation or were the

defensive use of these weapons in a local war to lead to the devastation of the defender. Depending upon the circumstances and consequences, political opposition to nuclear weapons might increase in many countries, and certain governments might become more reluctant to acquire or to use these weapons for national defense, especially if they could allege that only interests of other allied countries were at stake. In order to simplify our task and to avoid excessive speculation, we have generally excluded these two scenarios from our analysis.

Finally, we need to remind ourselves that the power of the United States to prevent or control the spread of nuclear-weapons capabilities is limited. In general, the U.S. has the following choices of action: (1) to accelerate the spread of nuclear capabilities to non-nuclear nations more or less selectively; (2) to attempt to slow down this spread, by unilateral action or jointly with the United Kingdom and, later, France; (3) to attempt to prevent the spread by means of a strong international agreement.

Soviet power to prevent or control the spread of nuclear capabilities is subject to corresponding limitations. For example, it is doubtful whether the Soviet Union could prevent the independent development of a nuclear capability by Communist China or, if it was able to do so, whether it would

be willing to accept the political costs involved. However, the Soviet Union might withhold technical assistance from the Chinese program to develop nuclear weapons or grant assistance only most sparingly.

II. POTENTIALITIES AND TECHNICAL ASPECTS

THE TRANSFER OR SHARING OF FINISHED WEAPONS

No transfer involving either a sale, loan, or gift, of finished nuclear weapons has so far occurred between any two countries. Nor has such a transfer ever been seriously proposed by any country. However, there are no international agreements or technological obstacles of any kind that would stand in its way. The transaction that comes closest to it is the furnishing of design information and special nuclear materials by the United States to the United Kingdom; but the latter, of course, has proved a nuclear capability of its own. A step further from weapons transfer are the arrangements between the United States and several of its NATO allies by which support systems and delivery capabilities for nuclear weapons are transferred to the ally but the nuclear warhead remains under formal U.S. control. These sharing arrangements are not without technical difficulties. Maintenance activities require trained U.S. personnel and special facilities. The storage of the warheads necessitates safety precautions against unauthorized handling, sabotage, or accidents involving HE explosions and possible contamination.

The Soviet Union, to our knowledge, has not shared nuclear weapons with any of its East European satellites or its Chinese

ally. It has threatened to station nuclear facilities in Eastern Europe in response to U.S. sharing with NATO countries. So far there have been no indications, however, that the Soviet Union has seriously contemplated sharing nuclear weapons with other Communist countries.

INDIGENOUS DEVELOPMENTS AND THE PEACEFUL USES OF NUCLEAR ENERGY

The development of an indigenous capability for the production of nuclear weapons in "Nth countries" -- that is nations other than the United States, the Soviet Union, the United Kingdom, and France -- will be largely affected by the programs for peaceful uses of atomic energy, specifically by the operation of reactors for electric power or research purposes.

The United States, in its program of nuclear assistance for peaceful uses, either controls the nuclear materials supplied through direct inspection arrangements or contemplates the delegation of inspection rights to international organizations like Euratom and the International Atomic Energy Agency. The Soviet Union, on the other hand, goes to great pains to point out that there are "no strings attached" in its bilateral assistance treaties. However, the majority of the Soviet assistance programs are carried out in satellite nations where the ordinary means of intelligence and personnel control can readily be applied to the

atomic projects. Non-satellite countries getting assistance, such as Yugoslavia, Egypt, and Iraq, have only very minor nuclear programs, and the vast majority of individuals engaged in them are Soviet trained. There are opportunities here for future control and observation, in addition to the information available through regular sources.

The most important difference between American and Soviet controls appears to be that the Soviet Union is not encouraging the construction of fuel fabricating and reprocessing facilities outside of its borders. If all fuel fabrication and processing must be carried out within the Soviet Union, the latter retains a very effective control of materials. The recipients of Soviet assistance do not receive fuels in homogeneous or non-integral form, but are supplied with distinct, easily inventoried numbers of fuel rods so that they do not even have the opportunity to divert the small amounts that might be ascribed to processing losses.

It must also be noted that the contemplated scale of Soviet assistance for peaceful uses is not anywhere as vast as that of the U.S. program. For example, the United States has committed 5,140 kilograms of U-235 to future International Atomic Energy Agency programs, while the Soviet Union has committed only 50 kilograms. The amounts contracted for outside the Agency are similarly disproportionate.

No matter how effectively materials supplied for peaceful projects are controlled, the techniques used on these materials will gradually enable assisted countries to attain the knowledge and capability to apply similar techniques in the production of plutonium for weapons. Providing that the assisted country either has the requisite raw materials or can obtain them from non-controlled sources, there is no doubt that it, and almost any nation so situated, can obtain a bomb capability, with sufficient time and capital expenditure.

As regards the availability of the raw material, namely uranium, proven world reserves appear to be continually on the increase. This is reflected in the steadily declining prices which the United States has had to pay. For example, the average domestic price in 1956 was \$11.60 per pound of uranium oxide. By 1959 this figure had declined to \$9.30. In the long run the average world price for the oxide concentrate may be as low as \$6 per pound and there will be plenty of it. Neither the United States nor any other nation can possibly absorb the entire world supply in order to prevent misuse of the material. While it may be expected that some suppliers of uranium will be willing to market their product under a control arrangement, these very controls will severely limit the demand. India, for example, is reluctant to accept controlled materials. In the absence of an

international control agreement, uranium may be expected to become a free commodity without any strings or controls attached as to its use.

In addition to the information which is now available in the world scientific literature and to the experience which a nation will gain in running a peaceful nuclear research program, there is a great deal of information available which is directly applicable to weapons design. For example, the physics of fast reactors will reveal many of the parameters in prognosticating bomb performance. Some papers even give the critical mass of spheres of plutonium and U-235 metal untamped, or tamped as in a bomb. The openly published quantities for the latter are approximately 6 kilograms for plutonium and 16 kilograms for uranium-235.³

An "Nth country" will initially, and for some time, pursue only a plutonium program because it must recognize the well-known difficulty of the U-235 technology as compared with that of plutonium. Furthermore, much less information has been released about U-235 production. The fact that every nation so far to

³W. B. Loewenstein and D. Okrent, "Physics of Fast Power Reactors," Peaceful Uses of Atomic Energy, vol. 12, United Nations, Geneva, 1958, Paper #P/637; R. T. Ackroyd and J. D. McCullen, "Albedo Calculation Methods," Peaceful Uses of Atomic Energy, vol. 12, United Nations, Geneva, 1958, Paper #P/16.

have developed nuclear weapons has first tested plutonium bombs will discourage a potential "Nth country" from doing otherwise.

The plutonium may be produced either in a power plant or in a reactor which is designed simply for the production of plutonium alone. To obtain a rough approximation of how many bombs a power plant will produce, let us project a plant with a 150-megawatt electrical output operating at a modest efficiency of say 20 per cent some 300 days per year. Assuming a reasonable conversion factor of 8/10th of a plutonium atom for every U-235 atom burned, this plant will produce the material for one Nagasaki-type bomb every ten days or for 30 bombs per year.

Without the power adjunct, the same reactor having a thermal output of 750 megawatts will produce the same number of bombs. If there is a real demand for economical power in that country, the circumstances of loading the plant would tend to produce a lesser quality bomb than would the pure thermal power reactor, but if economical power were sacrificed, quality could be improved.

With regard to quality, i.e. plutonium-240 content, there is general worldwide recognition (via the public U.S. AEC plutonium price schedule, if not elsewhere) that a cautious entrant in the atomic bomb race should initially manufacture very high quality plutonium, at least until he obtains a better understanding

of how bombs work. This, incidentally, suggests that to inhibit military diversion from peaceful power programs, all nations should be encouraged to utilize atomic power systems whose economies are very poor, unless exceedingly high burn-ups are achieved and correspondingly low quality plutonium is produced.⁴

To use the plutonium for a bomb, it must be purified and fabricated into metallic form. Now the handling of plutonium is not simple for it is an extremely toxic substance. The maximum permissible body burden is less than half a microcurie. For those engaged in extensive plutonium handling, elaborate health and safety procedures must be put into effect. Also required are metallurgic studies of plutonium which normally would not be encountered in a program designed merely for the production of atomic power (except in certain stages of an advanced "fast" reactor program). All of this entails additional monetary and personnel investment. It should be noted, however, that when plutonium is developed as a power reactor fuel the necessary health and safety techniques can be carried over to a weapons program.

⁴ A more detailed discussion of this and other control aspects of peaceful atomic energy programs is presented in a forthcoming book by Arnold Kramish, The Implications of the Peaceful Uses of Atomic Energy for U.S. Foreign Policy, Council on Foreign Relations, New York, 1960.

In addition to the core of the bomb, which is the nuclear material, an atomic weapon involves highly developed chemical explosive techniques and the manufacture of electronic equipment to detonate the bomb properly. Most of these techniques, since they do not involve nuclear reactions, can be developed independently of the acquisition of nuclear materials. Nor do they involve the facilities or personnel ordinarily identified with atomic energy programs. Hence these ancillary activities could be carried on clandestinely until the very moment the nuclear material was actually inserted, and yet not conflict with possible international controls of fissionable materials. This fact underscores the vital importance of fissionable material itself in any control scheme.

Regarding the costs of plutonium to an "Nth country," let us consider the United States plutonium price schedule. The price for plutonium bought back from foreign bilateral recipients is \$12 per gram of metallic plutonium. This is calculated purely on the basis of fuel value relative to U-235 and on the basis of U-235 production costs. The actual costs of plutonium production is reflected somewhat more accurately by the price for weapons plutonium of \$30 per gram or more (depending upon the quality) which is paid to domestic atomic power producers. This cost of \$30 per gram is the outcome of over a decade of operation,

construction of new plants, and continuous cost reductions. The cost of plutonium to an "Nth country" will probably lie somewhere between the 1945 U.S. figure of about \$200 per gram⁵ and the present \$30, because a new entrant will be able to take only partial advantage of new technologies. Let us say that the plutonium production costs for an "Nth country" are about \$100 per gram or \$600,000 for the nuclear material in each of its bombs. Adding costs of other bomb components, testing, etc., a bomb might cost an "Nth country" over three quarters of a million dollars. This is exclusive of capital investment in facilities. Moreover, this is a steady rate cost and does not at all reflect the real cost of the first bombs produced.

It is difficult to make estimates of the total capital cost. If the production is tied to a power program, the cost of a natural uranium power-producing reactor similar to Calder Hall would run about \$630 per electrical kilowatt, so that for a 150-megawatt electrical plant, operating at 20 per cent efficiency

⁵ The 1945 U.S. plutonium costs can be calculated from open data. The Smyth Report makes it clear that by the summer of 1945 three reactors were operating at Hanford. Allan Nunn May revealed the operating level of these as 250 megawatts. Using a reasonable conversion factor of .8 to .9 for this type of reactor we obtain a production rate of about 200 kilograms per year. The 1945 Congressional Hearings gave the operating cost of Hanford that year at \$3,500,000 per month. This then corresponds to a unit production cost of about \$200 per gram in 1945.

and producing the same amount of plutonium as was originally produced at Hanford, the power plant cost would run about \$100,000,000. Improvements in technology should roughly halve these costs so that eventually the plant will cost around \$50,000,000. To this must be added the capital cost for uranium processing plants, fuel element fabrication and re-fabrication, and bomb fabrication and research facilities. This will bring the total costs well over \$100,000,000 and probably into the quarter of a billion dollar category. This is not inconsistent with an expected reduction of costs below those of the 1945 U.S. program.

Thus the sums involved in weapons programs are large, but a capital outlay of 100 to 250 million dollars and a cost per bomb of three quarters of a million dollars would fit into many military budgets. The defense budgets of France, Canada, West Germany, and Italy exceed a billion dollars each, and the next six largest military budgets of non-Communist nations, namely those of India, the Netherlands, Spain, Australia, Japan, and Indonesia range from over 600 million to about 400 million dollars. We are forced to the conclusion that almost any large or medium-sized nation can acquire a nuclear weapons capability, though the time required will vary considerably from nation to nation.

COMMUNIST CHINA AS AN "Nth COUNTRY"

The most important "Nth country" is, of course, Communist China. Little is known about the Chinese nuclear program. It has been described in Chinese statements as a topmost scientific concern, and the commander of the Chinese Communist Air Force, General Liu Ya-lou, has asserted that China intends to manufacture its own atomic weapons. He wrote in May 1958:

In the not too distant future our Chinese workers and scientists will certainly be able to manufacture the most modern airplanes and atomic bombs. By that time, we will not only have absolute political superiority, which has always been the case, but also will be able to manufacture atomic weapons and guided missiles ourselves to cope with any enemy that may dare invade our country and destroy world peace. By that time, another new turning point will probably appear in the international situation, with the result that the socialist camp will become still stronger and the imperialist camp still more impotent, and the revolutionary movement of the world -- and in Asia in particular -- will march forward in still braver and stronger strides.

The progress that the Chinese can make in an indigenous program depends greatly on the amount of Soviet assistance they receive. China was included in the Soviet Union's 1955 program for peaceful nuclear sharing. However, the research reactor (heavy water type with heat output of 6,500-10,000 kilowatts) and the cyclotron promised to China at that time did not become operative until mid-1958. Further agreements on Soviet scientific and technological assistance, in areas that included physics and peaceful uses of atomic energy, were signed in late 1958 and 1959. Reports in 1958

that the USSR was prepared to supply China with more atomic reactors remain unverified. If we assume that the first research reactor from the Soviet Union is China's only nuclear reactor, we can estimate when and to what extent China might produce nuclear bombs from it. As indicated before, the critical mass of a tamped sphere of plutonium may be approximately 6 kilograms. This amount will provide the Chinese with a primitive Nagasaki-type weapon. The use of lesser amounts will not be possible until a higher degree of understanding and technical confidence is achieved, which might require a testing program. On the basis of the scant information available on the Chinese heavy water research reactor, we have estimated that it will produce the 6 kg. in approximately 4-1/2 years, operating uninterruptedly except for fuel loadings and down-times. During this period the Chinese, if they are engaged in a bomb program, will be performing all of the necessary nuclear and non-nuclear research adjunct to the manufacture of an atomic bomb. This period probably also provides sufficient time for the construction of the plutonium separating and fabricating facilities which will be necessary.

Thus on a superficial basis it appears barely possible that Communist China could make an atomic bomb by 1963 with the plutonium of the presently known reactor facility alone. However, the most pertinent aspect of this process is that during this

time the Chinese will have to have nine separate loadings of 2 per cent enriched uranium which can only be supplied by the Soviet Union. If the Soviet Union continues to supply each loading on time, without questioning the fate of the irradiated fuel rods and the plutonium contained therein, it would be possible for the Chinese to build up the requisite plutonium stockpiles. However, this would imply an implicit Soviet go-ahead to the Chinese on the construction of an atomic bomb.

If the Chinese should decide to embark upon an independent bomb program without explicit Russian blessing, they undoubtedly would not want to rely upon the uninterrupted supply of enriched uranium from the Soviet Union. Rather they would use the research reactor for purposes of training and to obtain data which would enable them eventually to construct plutonium production reactors using heavy water and natural uranium (which apparently is obtainable domestically within China). The construction of such facilities would require heavier capital expenditure, a higher level of technical competence and manufacturing ability, and, for China, probably more time than the four years hence indicated above. If China were successful in such an independent program, however, she would then have a greater bomb production capability than she would have through the tedious diversion from the research reactor over a long period of time.

POSSIBLE FUTURE TECHNOLOGICAL DEVELOPMENTS

Anticipated long-range technical developments in certain aspects of peaceful nuclear energy may enhance the ability of other nations to achieve an advanced, less inspectable weapons capability. For example, if thermonuclear power becomes a reality, the same machines which produce the power will be copious sources of neutrons. In a rather simple arrangement, thermonuclear machines could be packed within bulk quantities of uranium and/or thorium, thereby producing large quantities of plutonium and/or uranium-233. Practically all aspects of the peaceful thermonuclear program are likely to become a matter of public knowledge and pressures from the scientific community will certainly demand that any future break-throughs also be made public.

It is probable that the fissionable material facilities associated with thermonuclear reactors would require as high a degree of technological aptitude as the production of fissionable material in an ordinary nuclear reactor. For example, cooling and moderation would be required in the masses of uranium and thorium, and this might demand a high level of fuel fabrication technology. Of course, after plutonium and U-233 had been formed through conversion, the same sort of separation techniques would be necessary as are required in conventional production. Thus it seems that the advent of thermonuclear power would be significant,

not in reducing the level of technology required to manufacture weapons but perhaps in allowing greater production of sensitive materials from the more easily obtainable raw resources, particularly thorium.

Beyond this, however, a break-through in thermonuclear power, combined with efforts to obtain a "cleaner" bomb, might lead to a weapon technology which could minimize or eliminate the use of fissionable materials. It is true that the recipe for such a bomb might be the result of very sophisticated technology and extensive testing, but many clues about it would become public knowledge because of the relation between this technology and peaceful programs. Thus we might reach the time when fissionable materials would not be required by an "Nth country." Such an advanced weapon would probably still depend on large quantities of thermonuclear reactants. There are many problems inherent in the production and handling of these which are different from those in plutonium production, but they are not insurmountable obstacles.

Other possible developments in thermonuclear power might make it still easier to produce nuclear bombs without fissionable material. This would render international controls upon bomb production even more difficult, since the control systems now envisioned depend mainly on the continuing production of weapons that use fissionable materials.

III. MILITARY AND POLITICAL EFFECTS

EFFECTS ON THE SECURITY OF WESTERN ALLIANCES AND FRIENDLY COUNTRIES

It would seem on the face of it that anything which makes a friendly state stronger vis-à-vis the Soviet Union is to our strategic and political advantage. By acquiring a nuclear capability any ally of the United States would gain deterrent power in peacetime, and in war be better prepared either to defend itself successfully or at least to exact a higher price from the aggressor. Upon closer consideration, however, the acquisition of nuclear weapons is not without problems. To view this controversial subject in proper perspective, one must set forth in some detail both the advantages and the disadvantages of a wider dissemination of nuclear capabilities in the Western alliance.

At the outset it should be noted that the net gain from a wider diffusion of nuclear weapons is affected either by the specific terms under which nuclear sharing is arranged or by the indigenous developments that bring about such a diffusion. For example, certain disadvantages of an agreement by which the United States would share nuclear weapons with an ally might disappear if the arrangement were made jointly with a group of allied powers. It is possible that political difficulties from

U.S. sharing with France would vanish if the arrangement were made with the Western European Union, although other disadvantages could ensue from this alternative.

What are some of the main advantages and disadvantages of a wider diffusion of nuclear weapons in the Western alliance?

Effect on Conventional Armament

Possession of a nuclear capability may cause a nation to relax its conventional armaments effort, especially with respect to the mobilization of military manpower. The American nuclear capability may have been partly responsible for such a relaxation not only at home but also in other NATO countries. A further spread of nuclear capabilities might amplify this tendency so that a new nuclear power would become less able to meet limited crises with limited, conventional means. In the interests of both the United States and the alliance as a whole, therefore, it appears desirable that nuclear sharing arrangements should not lead the receiving countries to reduce their conventional military effort.

This proviso naturally raises, in acute form, the question of who is to pay for the shared nuclear capability. If the conventional military effort of the receiving country is not to be constricted, then anything it might pay towards its added nuclear capability will require an expansion of its military

budget for the purpose. Presumably the countries concerned will already be paying all they think they can afford for defense, or at least all they wish to spend.

Effect on the Cohesion of the Alliance

Nuclear capabilities in the hands of smaller members of the Western alliance may either weaken or strengthen the cohesion of the alliance, or they may do both at the same time. For example, such capabilities may lessen the dependence of smaller powers on the United States. While it cannot be maintained that the capability of allies for independent action is undesirable in principle, such independence is clearly undesirable if it undermines collective security against Communist encroachments. It is the ability to act independently of the alliance which an arrangement for sharing (and American policy generally) must try to curb.

France's current efforts to acquire an independent nuclear capability have as their aim not only greater strength vis-à-vis the Soviet Union, but also greater independence of U.S. policy and advice. While the latter objective raises political problems regarding the structure and cohesion of NATO, the consequent difficulties will not necessarily be more serious than those now arising from French dissatisfaction with her present status in NATO.

The cohesion of the Western alliance may be weakened by a spread of nuclear weapons for quite a different reason. American willingness to share them with allied powers may increase apprehensions that the United States will not honor its commitments to come to the aid of its allies if they are attacked. In Europe such apprehensions have mounted in recent years, because many Europeans feel that in the event of a serious crisis in Europe the United States will prefer a compromise with the aggressor to the risk of a full-scale nuclear exchange between the United States and the Soviet Union. Given these fears, the European allies may paradoxically interpret U.S. nuclear assistance as proof that the United States intends to dissociate herself from her allies in the event of a Communist attack on Europe, on the plea that the allies are capable of defending themselves.

In the nuclear age, the ancient institution of the military alliance operates under novel burdens, and we have as yet relatively little idea how it will work under these burdens in a serious crisis. In the past, a nation risked less in honoring its alliance obligations than it does today, because then it had a limited-liability obligation while at present, given the nature of nuclear war, its obligation is virtually unlimited. Europeans, especially those who are critical of the United States, are likely to entertain doubts about the viability of the alliance in

the event of imminent war. Such doubts are shared by those governments which are dissatisfied with American policy. In the event of additional agreements on nuclear sharing, therefore, the political complexion of the allied governments, and in particular their attitudes toward sharing, is likely to influence the cohesion of the alliance more than the agreement itself. For this reason it appears unwise for the United States ever to press an arrangement for sharing upon an apathetic or unwilling ally. Nor would it be prudent to reduce American forces stationed in a country simply because the United States has concluded an agreement on sharing with that country.

While some Europeans are afraid that we may not honor our commitments, others are frightened by the idea that the American nuclear capability will be introduced too readily into a conflict that could be kept limited to conventional weapons. For this reason many people in allied countries fear not only Communist aggression but also American defensive support with nuclear weapons, since it would turn any war in Europe into a total war for Europeans. A spread of nuclear capabilities might increase this particular fear, which, in the most extreme case, might not only weaken the cohesion of NATO but undermine its very foundations. Indeed, this is what some pessimists in the West predict and all Communists hope for.

It is not likely that such extreme developments would occur merely in consequence of arrangements for nuclear sharing. If they did occur, it would rather be in consequence of even more far-reaching changes in the international situation, such as a radical shift in the balance of nuclear power in favor of the East, lack of political skill and resolution on the part of the West both in composing its internal differences and in meeting the Communist challenge, or a series of Communist successes in foreign and domestic policies.

The cohesion of the Western alliance might perhaps be strengthened by a spread of nuclear weapons to the extent that frictions arising from the present unequal distribution of nuclear capabilities were reduced. Our allies are greatly inferior to us in weaponry. Nuclear sharing could help in the future to bridge this technological chasm and assuage some of the resentment it might cause.

Generally speaking, the United States should seek to make any nuclear sharing arrangements that it is willing to consider contingent upon political improvements of the alliance. To be sure, such a "bargaining approach" can be taken only if allied governments want American nuclear assistance. In recent years, however, various proposals have originated in Europe with the aim of strengthening the alliance through particular nuclear

assistance agreements, for example, a pool of nuclear weapons for the Western European Union or for NATO as a whole.

Effect on Fighting and Deterrent Power

The contribution of specific nuclear capabilities to the military power of a Western ally vis-à-vis the Soviet Union (or other Communist countries) must be weighed against the contribution of alternative weapon systems, both conventional and atomic. For each country, this evaluation would be based on the characteristics of the nuclear system and would have to consider such factors as the choice of weapon yield (tactical vs. strategic), the mix of delivery vehicles, the vulnerability of the system relative to that of alternative weapon systems, logistical requirements, maintenance and production costs, and command and control arrangements. We are not dealing here with specific weapon systems and countries, but are confining ourselves to the problem of the diffusion of nuclear weapons among the Western allies in general.

On the technical side, three points are generally valid:

(1) A small country will find it exceedingly difficult to have a second-strike capability. Its territory would probably not be large enough to make even a mobile system sufficiently invulnerable to a first strike, so that only an advanced and expensive system like Polaris would have a fair chance of

surviving a surprise attack. Apart from the vulnerability of the delivery system, there is also the difficulty of maintaining a command and control system that can survive a first strike.

(2) The cost of a nuclear warhead or of a bomb amounts to only a small fraction of the total cost of the weapon system. Particularly if the ally should receive the warhead through a nuclear assistance program (under some form of U.S. control), the decisive economic issue would be the financing of the delivery and support systems.

(3) The delivery systems are subject to fast obsolescence, much more so than the nuclear warheads, and this fact makes it difficult for a smaller country to maintain an effective nuclear capability without outside help (as France has indicated she plans to do).

It appears that the outstanding shortcoming of nuclear capabilities, whether "strategic" or "tactical," in the hands of a small country would be their vulnerability to a first strike. Unless their vulnerability could be overcome, these capabilities would contribute little to the deterrence of a nuclear surprise attack directed only against the small country possessing them. Deterrence of such an attack would depend on the potential aggressor's fear of a worldwide adverse political reaction (e.g. a tightening and expansion of the Western alliance

system), and, above all, on the risk of a military reaction by the allies of the attacked country.

The worldwide political and military risks of a conventional attack against a small Western ally might seem less to a potential aggressor than those of a nuclear first strike. However, against a conventional attack the local nuclear capabilities would have deterrent value because the aggressor would be uncertain whether the invaded country might not severely "punish" him with a nuclear response.⁶ This leads us to one of the most important aspects of more widely diffused nuclear weapons, their relation to nuclear blackmail.

Effect on Nuclear Blackmail

There is a possibility, to which some attach great importance, that the assumed value of a nuclear capability in the hands of a smaller country may prove fictitious because at the moment of need the possessor may be inhibited by threats from using it. It has been argued that relatively small nuclear capability, whether strategic or tactical, would at best be able to inflict no more than severe punishment upon an aggressor of the first rank and thus raise the cost of aggression. It could

⁶This statement assumes that the nuclear capability of the small country could not be destroyed by high explosives, not always a foregone conclusion.

not be expected to crush him, since this would require the efforts of the alliance as a whole. The powerful aggressor might warn the small country in possession of a nuclear capability that even if invaded it had better not decide to use nuclear weapons. The threatened country would be risking nearly total destruction if it ignored the warning and might be persuaded not to use its nuclear weapons but to surrender instead.

We must put this possibility in the proper perspective, however, and consider it from the point of view of a potential aggressor. In the future, the Communist bloc may want to expand its sphere of influence and disrupt the Western alliance system by a conventional attack against a non-nuclear Western ally which might be inferior in conventional strength. The formal guarantees of the Western alliance notwithstanding, the aggressor might expect to deter U.S. nuclear intervention by the threat of total war and devastation of the United States. However, if the country to be invaded had nuclear weapons, the potential aggressor might be less confident that he could deter a retaliatory nuclear blow. The aggressor would have to weigh the risk that even his threat of total physical destruction might not prevent the invaded country -- whose national existence he was about to destroy -- from using nuclear weapons. The potential aggressor would have to realize that if his intimidation failed

he would suffer most grievous damage, surely out of proportion to his military "victory," especially if the conquered territory were totally devastated.

While these considerations speak for the deterrent value of dispersed nuclear capabilities, it cannot be ignored that an adventuristic, irresponsible aggressor might sometime ignore these risks, or pretend to ignore them, and try to undermine the determination of the country he was threatening.

The concept of "nuclear blackmail" has been used broadly to cover rather different types of threats with nuclear weapons. One type consists of threats of nuclear devastation made in connection with actual aggression, to induce a country to surrender before it uses its nuclear weapons. This is the possibility which we just discussed. The other type, for which the word "blackmail" is more appropriate, is an attempt to intimidate a country in peacetime by threatening that its resistance to concessions demanded might lead to nuclear war and the total devastation of the threatened country.

What might be the effect of more or less independent nuclear capabilities in the hands of smaller countries on blackmail of this second type? A small country without nuclear weapons could not inflict any significant damage on a mighty nuclear power like the Soviet Union. If the small country's confidence

in allied support had been eroded by nuclear blackmail against its allies, it could not completely dismiss a threat of nuclear devastation against itself since the blackmailer would have no serious penalty to fear from such action. A small country able to retaliate with nuclear weapons, however, could have greater confidence that the blackmailer would not dare to let his political demands lead to a nuclear war since he might suffer severe damage. To put the point differently, a blackmailer who seems to risk much more than he stands to gain is unlikely to intimidate a determined victim into making major concessions. In order to reduce the danger of retaliation the blackmailer would have to plan a nuclear surprise attack to obliterate the nuclear capabilities of the small country. But the threat of surprise attack is not an effective form of political pressure, because for blackmail to be successful, the victim country must believe the threat, and if it believes the threat it will not allow itself to be surprised. It will rather alert its forces, take measures for their protection, and thus increase the risk to the aggressor of a first strike against itself.

The "Provocation" Factor

"Provocation," in the sense of an incentive for adopting some hostile course of action, bears on the "Nth country" problem in three ways. (1) The Soviet leaders may be "provoked" to some kind of action by a Western state's acquisition of nuclear weapons, even if it acquired them independently. (France's independent acquisition of nuclear weapons has not seemed to perturb the Soviet Union greatly, although it may react differently hereafter.) (2) The Soviet leaders may react more strongly against a country's acquisition of nuclear weapons if the U.S. has contributed to their acquisition. (3) Spread of nuclear weapons among non-Communist countries may add to Soviet insecurity and -- in a general way -- increase East-West tensions.

Inevitably, the U.S. is confronted with major decisions bearing on the "Nth country" problem where the provocative effects of its policies must be considered. This question arises both with respect (1) proposed U.S. defense measures (e.g. nuclear sharing with our allies) and (2) American rejection of Soviet proposals looking toward joint action, e.g. on atom-free zones.

In examining the provocative effects of our policies with respect to the "Nth country" problem, certain general considerations are basic.

(1) Inasmuch as a U.S. policy on the "Nth country" problem is designed to deter some aggressive Soviet course of action, we

must assess Soviet incentives for taking this action. If, as seems likely, the Soviet Union continues to apply strong political pressure on the free world, as it has on West Berlin, perhaps including nuclear blackmail, the United States may be obliged to take decisions which incidentally provoke the Soviet Union to initiate some hostile measure.

(2) There is a broad range of responses open to the Soviet Union to U.S. actions which it regards as "provocative." It could resort to a first strike on the United States at one extreme, or slightly increase in its defense effort, at the other.

(3) In the past, the Soviet leaders have not shown themselves readily provoked into an aggressive course of action by Western defense measures. For example, the debate on the European Defense Community in late 1954 brought heated Soviet charges that EDC was a highly provocative and dangerous plan which, it was strongly implied, would lead to powerful Soviet reprisals. Yet, within a few months, the Soviet leaders had signed the Austrian peace treaty and later, at the Geneva summit meeting, brought U.S.-Soviet tensions to a new low point.

Actual Use of Tactical Nuclear Weapons

So far we have been talking mainly of nuclear weapons used in a strategic role. Let us now assume that a smaller Western country possesses certain nuclear weapons which it plans to use

tactically in ground warfare should it be attacked by land forces.

Much of the past discussion of limited war problems seems to have taken completely for granted that the tactical use of nuclear weapons could be rather easily distinguished from their strategic use. Tactical nuclear weapons are usually conceived as small, of 2 or 3 KT, or even fractions of a KT. There is no question at all that ground forces using nuclear weapons would be much more effective in the field against other ground forces than they would be without them. They would have enormously greater fire power at a very great saving in logistics, even with the smaller nuclear weapons, and that fact is quite enough to warrant the closest consideration by military experts of the tactical use of nuclear weapons.

Political leaders, however, have to take a somewhat larger view. In the first place it is sanguine indeed to assume that we already know how to keep wars limited. We live in a world in which, if there is going to be a general war, it makes a great deal of difference who strikes first -- the idea that there is no great strategic advantage in doing so is pure myth -- and that fact in itself makes the danger of general war appreciable, if not considerable. So long as that is the situation, the big

problem in limited war is knowing how to keep it limited. We are very far from having the answers to that problem, but it seems a fair presumption that the problem is made more difficult -- certainly not less so -- if nuclear weapons are introduced into tactical use.

In that connection we also have to re-examine the notion that tactical weapons are bound to be small. It is certainly true that small nuclear weapons are bound to be much more efficient destroyers of men and machines than so-called conventional weapons, and it is also true that small nuclear weapons could find many uses on the battlefield where they might be as good as, or even preferable to, large ones. But unfortunately these considerations are not enough to eliminate large ones. For it is also true that large weapons -- into the megaton range -- could also be very useful on the battlefield, and for that matter much more effective in most uses than the small ones. A small nuclear weapon shot from a bazooka could undoubtedly destroy a tank, but a thermonuclear weapon dropped from one of the smaller combat aircraft could destroy all the tanks and men over a quite wide area.

In short, we have all sorts of ideas about how to use small weapons tactically, but, where both sides have nuclear capabilities, almost no idea about how to confine battlefield use of nuclear weapons to small ones. Until we do, and in fact until we have a good deal more than merely ideas on the subject, we must assume that the battlefield use of nuclear weapons is very likely to include also the larger varieties.

In addition it has to be stated that while it is easy enough to visualize advantages in the use of nuclear weapons so long as one is using them unilaterally, most of these advantages fade out the moment we begin to conceive of mutual use. It appears also that a great power engaged in aggression against a small one has a much greater latitude than the latter for "raising the ante" with respect to the sizes of bombs it wants to use tactically. The smaller power may not have any of the larger nuclear weapons at all, and is especially likely not to have them if it acquired or developed its nuclear capability on the mistaken notion that there was a rigid distinction between "tactical" and "strategic" nuclear bombs. However, its ability to use nuclear weapons at all provides its larger opponent with an excuse -- which may or may not be a critical factor -- for using its own weapons, including the larger varieties.

These considerations suggest that while the experts should ponder the tactical use of nuclear weapons, they should also ponder how to keep nuclear weapons out of tactical use. For it is likely to prove much easier to keep them out altogether than to try to limit their use to the smaller sizes.

Until we have a clearer assurance that the use of tactical nuclear weapons by a small Western country in the event of ground attack is compatible with the need to keep limited war limited, we cannot assume that the diffusion of these weapons, by whatever means, to such countries, would improve the outcome of an actual limited war.

The deterrent effect of tactical weapons, as said above, seems to be less questionable than the military effect in actual ground warfare. The very uncertainties connected with a tactical nuclear war must make the outcome of local aggression highly doubtful if not extremely risky to the aggressor.⁷

⁷This seems also to have been the thought expressed by John Foster Dulles: "In the future it may thus be feasible to place less reliance upon deterrence of vast retaliatory power. It may be possible to defend countries by nuclear weapons so mobile, or so placed, as to make military invasion with conventional forces a hazardous attempt....Thus, in contrast to the 1950 decade, it may be that by the 1960 decade the nations which are around the Sino-Soviet perimeter can possess an effective defense against full-scale conventional attack and thus confront any aggressor with the choice between failing or himself initiating nuclear war against the defending country...." ("Challenge and Response in U.S. Policy," Foreign Affairs, October, 1957.)

EFFECTS ON THE SINO-SOVIET BLOC

The diffusion of nuclear weapons must also present many problems to the Soviet Union, although not quite the same ones that confront the United States. It seems unlikely that the Soviet leaders would want to encourage the spread of nuclears in Eastern Europe, or that an East European satellite would dare to develop its own weapons without Soviet consent. Nuclear capabilities wholly or partially in the control of an East European satellite would exacerbate the latent conflicts within the Soviet bloc and jeopardize the stability of the Communist regimes. But this does not preclude the possibility that the Soviet leaders might at some time find it desirable to engage in a form of sharing with signatories of the Warsaw Pact, singly or collectively. They might even proclaim to the world that the satellites had independent nuclear capabilities, but keep tight control of actual weapons themselves. As part of the deceit, the Soviet Union could keep dummy weapons in the satellite countries.

The only major contender for "Nth power" status in the Soviet bloc is Communist China. There is every indication that China intends to become a nuclear power. The possession of an atomic capability, even a very small one, would be of considerable significance for China. Membership in the "nuclear club" would reinforce its claim to great-power status and leadership in Asia.

In the more distant future it might free China to initiate military operations independently of Soviet approval, even if these operations directly affected U.S. interests in Asia. In the more immediate future, even the token possession of nuclear weapons might make the Chinese confident that they can keep military operations in the area at a conventional level by introducing uncertainty into American planning and discouraging the United States from using nuclear weapons for fear of a nuclear response. This would enhance the coercive power of China's conventional forces in Asia by casting doubts on the firmness of U.S. intentions toward its Asian allies.

In practice, China's acquisition of a nuclear capability would effect an important change only in those areas of the Far East where the U.S. nuclear deterrent could be considered operative, such as Japan, Korea, Taiwan, and the Philippines. It would not affect areas where indirect or low-level aggression was the preferred method, except in so far as doubt might be cast on the firmness of U.S. intentions in the region as a whole. Shielded by the U.S. nuclear deterrent, which provides a broad counterbalance to the Sino-Soviet posture, and by the physical presence of American forces in the area, many free Asian nations (neutral or pro-Allied) may feel able to adopt or to continue a non-Communist orientation. China's entry into the

nuclear club might well lessen the effectiveness of the U.S. posture in the Far East.

To date the Soviet Union has not shown itself willing to bestow a nuclear-weapons capability upon the Chinese. The very factors that make an atomic capability attractive to the Chinese (see above) are likely to create concern for the Soviet leaders, who would surely deplore the loss of effective control over Chinese military moves, the possibility of being drawn into a war not of their own choosing and timing, and the risk that limited actions initiated by the Chinese might develop into general war.

The fact that the Soviet Union has given support to the concept of an atom-free zone in "the Far East and the entire Pacific Ocean area" suggests that Moscow may view this as a formula for maintaining its control over Chinese military operations, for limiting the occasions on which its deterrent shield might have to be invoked, and for eliminating the problem of nuclear sharing. For both parties, the concept, if accepted by the West, would have the real advantage of removing U.S. nuclear weapons from the Far East, would discourage the Japanese from considering a program to develop their own atomic weapons, would maximize the potential of China's conventional forces, and would permit China to pose before Asia as a non-atomic power behind the shield of the Soviet nuclear deterrent.

The ambivalent public position of the Chinese regarding the concept of an atom-free zone in the Far East and Pacific area and the sporadic nature of their support suggest that they are not prepared at present to commit themselves unconditionally to this policy. To do so before an international agreement on test suspension might prejudice their bargaining position with the Soviet Union regarding a grant either of atomic capability or of scientific and technological assistance to facilitate their own manufacture of atomic weapons. Moreover, a premature Chinese commitment to an atom-free zone would also prejudice China's bargaining position vis-à-vis the U.S. should a ban on testing be agreed upon. China's price for adherence to such an agreement might be not only U.S. recognition and U.N. membership, but also the establishment of an atom-free zone in the Far East and Pacific -- in effect, the removal of U.S. nuclears from the area.

Because of the sensitivity of most Asians to the question of atomic weapons and because China now has only conventional armed forces, some persons have already suggested that the U.S. should de-emphasize the role of nuclear weapons in that area and concentrate on an improvement of U.S. and allied conventional war capabilities. But it must be noted that the U.S. nuclear deterrent posture in Asia cannot be considered only in terms of the threat posed by Communist China; it must be considered in

terms of the counterbalance it offers to combined Sino-Soviet power in the Far East. In view of the varying types of threat posed to the United States in the Far East, the future may make it necessary both to retain a nuclear deterrent posture there and to improve conventional war capabilities.

Certain Far Eastern U.S. allies, however, are officially opposed to the stationing of any atomic weapons -- whether under indigenous or U.S. control -- on their territory. For example, the Japanese Government in the spring of 1957 sounded out public opinion on the question of Japan's acquiring a tactical atomic-weapon capability and was forced by public resistance to back down. There is at present no Japanese pressure for nuclear sharing. It is not impossible, however, that Japanese attitudes will change if and when Communist China acquires a nuclear capability. While Japanese public opinion has supported the concept of an Asian atom-free zone, it is highly questionable whether the Japanese Government would accept this proposition if it meant the removal of U.S. nuclears entirely from the Far East.

It has been suggested that further nuclear assistance by the United States to its allies, coupled with the absence of an international control agreement, might persuade the Soviet Union that China's requests for nuclear-weapons assistance should be taken seriously. Greater American nuclear sharing with NATO

countries, however, need not automatically mean stepped-up Soviet assistance to China. In the unlikely event that the Japanese were to accept nuclear-weapons assistance from the United States, the Chinese might find themselves in a position to exert greater pressure on the Soviet Union for similar assistance. Since a small Japanese nuclear capability would not appreciably change the balance of power in the area, however, this development need not provide the Chinese with a stronger argument for assistance than the present U.S. nuclear capability in the Far East does.

Soviet decisions of this magnitude are not likely to be greatly influenced by political pressures either from China or the West. The Soviet Union will make such decisions primarily in the light of its own security problems. But we must bear in mind that the Soviet Union may be prepared to grant to China a limited atomic capability if and when the risks of doing so can be minimized. Moscow might feel that minimal risks were involved if, for example, the Soviet Union succeeded in gaining a marked superiority over the United States in strategic capability. The Soviets might then be willing to share nuclear weapons with China under an arrangement whereby they would retain control over warheads. (The analogous U.S. controls are primarily de jure, not de facto.) Should the Soviet Union draw substantially ahead of the U.S., it might be willing ultimately to give the Chinese an

autonomous atomic capability without imposing any restraint on Chinese atomic blackmail and aggressions.

DETERRENCE OF PREMEDITATED SOVIET ATTACK ON THE UNITED STATES

Deterrence of a premeditated Soviet attack upon the U.S. depends first, of course, upon a powerful, assured capability to retaliate after receiving a Soviet first strike. Soviet knowledge of this capacity would tend to inhibit deliberate initiation of all-out war. But it is not easy to estimate with confidence the level of retaliatory damage (and other types of costs and risks) which the Soviet Union might find acceptable or unacceptable in any given circumstances. If the Soviet leaders are not strongly motivated to consider preventive war, then a relatively low degree of expected damage might suffice to deter them. Conversely, if they become strongly motivated to engage in a preventive war, it will take a higher level of expected damage to deter them.

In other words, the strength of the Soviet incentive to initiate all-out war is an important variable in deterrence. The U.S., therefore, should attempt not only to increase Soviet estimates of expected damage from U.S. retaliation but also, as far as possible, to lessen Soviet incentives to engage in a premeditated attack.

Soviet incentives for a preventive war are probably sensitive to a variety of considerations. Among them is the Soviet estimate of the likelihood of all-out war some time in the future and, further, of the possibility that it might break out in circumstances less than optimal for the Soviet Union -- e.g., through an "accident," a U.S. first strike, or Soviet pre-emption against an alerted SAC. For present purposes we need consider only the possibility that the Soviet incentive for preventive war might be increased by the prospect of further diffusion of nuclear weapons.

It seems likely that in opposing wider dispersion of nuclear capabilities the Soviets are motivated partly by a concern that such a development would complicate the problem of avoiding all-out war in the future. However, it is difficult to say how strong this concern is now or may become in the future, or for that matter whether it is as strong as other Soviet motives for opposing further diffusion of nuclear capabilities. In any case, it is the type of concern which would add something to Soviet incentives should they consider a preventive war. This can be recognized without exaggerating the role which it is likely to play in Soviet calculations. A Soviet decision for preventive war would be an extremely grave matter and would be influenced by a variety of considerations. Alternatives to

preventive war would be seriously weighed. If the prospect that dispersion of nuclear capabilities would make the world a more dangerous place added to Soviet incentives for preventive war, it would at the same time even more strongly motivate the Soviet Union to find ways other than preventive war in order to reduce these dangers.

Dispersion of nuclear capabilities might affect a Soviet decision for all-out war in other ways as well. If Communist China becomes a relatively strong nuclear power, the Soviet leaders may be more reluctant to exchange nuclear blows with the U.S. for fear that its ally would emerge as the strongest Communist or world power. This, of course, is not an immediate problem for the Soviet Union, and its deterrent effect on a Soviet decision to launch all-out war against the U.S. is likely to remain fairly modest until the time when Communist China has acquired an appreciable nuclear-weapons capability. In any case, if a U.S. retaliatory strike were also directed against China, Peking's power would be unlikely to increase relative to that of other countries. Nevertheless, the prospect that hegemony might pass to Communist China as a result of a U.S.-Soviet war at some remote date may add something to Soviet motivation for an early showdown with the U.S. But it seems unlikely that this could be anything but a small factor in Soviet consideration of preventive war.

Finally, the diffusion of nuclear capabilities, once it is accomplished, might be expected to discourage Soviet initiation of all-out war by increasing the number of targets that would have to be taken out in a Soviet first strike. It does not seem likely, however, that the spread of strategic nuclear capabilities within the free world would be on such a scale as to add significantly to Soviet first-strike problems and, hence, to the effectiveness of the Western deterrent.

CENTRAL U.S.-SOVIET WAR WHICH IS NOT PREMEDITATED BY THE SOVIET UNION

Expansion of Local Nuclear Conflicts

Here we are not concerned with the problem whether local wars in which nuclear weapons are used by the United States or the Soviet Union can be kept limited, but rather with the special question whether the diffusion of nuclear capabilities increases the risk that local wars might expand into all-out war. This latter question would depend in the first instance on whether or not the United States or Soviet Union were involved in the local war, and on whether U.S. or Soviet forces or territory were the target of nuclear attack by a third country. If the United States and Soviet Union are not involved in the local war, the danger of its spiralling to all-out war would seem to be fairly remote except under special circumstances. The danger

would be fairly low, for example, if Israel used nuclear weapons against the United Arab Republic. It would be appreciably higher if West Germany used them in a local action against East Germany, or if Communist China employed them against Japan.

In such local wars, whether the two major powers became involved and the resulting risk of all-out war would depend upon a variety of factors, such as:

(1) Whether the United States and the Soviet Union were allied to the smaller countries engaged.

(2) The extent to which, according to the subjective judgment of each party, important U.S. and Soviet interests were affected by the local conflict.

(3) The political justification for the use of nuclear weapons by a third country. (The Soviet Union might find it more difficult to react strongly against a country initiating use of nuclear weapons if that country did so in order to meet a clear-cut case of aggression which threatened its national survival.)

(4) The use made of nuclear weapons. (The risks of big power intervention against a country initiating nuclear warfare would be lessened if it made a discriminating, "defense" use of its nuclear weapons.)

(5) Whether the United States and the Soviet Union shared the belief that strategic deterrence was stable. (If so, their intervention in the local war would seem less risky, and hence might be more likely; but at the same time the fact of mutual

strategic deterrence would also make it less likely that the war would spiral to all-out war.)

Some of these factors would also operate in a more or less localized war which involved one of the major powers initially, for example, if a smaller country, engaged in a local war, used nuclear weapons against the United States or the Soviet Union. A Chinese nuclear attack on U.S. forces during a war over Formosa would be a case in point. The likelihood of all-out war resulting from the use of nuclear weapons by a smaller country would depend on the factors outlined above. A local war in which the United States and Soviet Union were participating in a restricted manner and which they were trying to confine to conventional weapons might be converted into a major nuclear war by the sudden and surreptitious use of nuclear weapons by one of the smaller belligerents in that conflict. Strategic employment of nuclear weapons by a small country against the zone of interior of one of the major powers or against important sanctuaries would be more likely to have this effect than a more restricted tactical use. This is related to a problem taken up in the next section, the possibility that an ally might deliberately want to start a central war.

On the one hand, in a local conflict the diffusion of control over nuclear weapons would make it more likely that these weapons would be used, that the stakes would increase, and that the war

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would expand. On the other hand, dispersed nuclear capabilities in non-Communist countries would tend to deter Communist aggression and thus make local wars initiated by Communist countries less likely. The belief that local aggression cannot be limited to conventional weapons and may even expand into all-out war may act as a powerful deterrent. But if aggressive small countries acquired nuclear weapons they might be tempted to start a local war against small neighboring countries so as to exploit the advantages of a first strike. We shall return to this problem later.

Direct Initiation of a Central War through Aggressive Acts of an Ally

Here we are concerned with the question whether independent nuclear capabilities might affect the risk that aggressive acts by a U.S. or Soviet ally might lead to central war.

One of the Communist arguments against German rearmament is that an irresponsible Germany might seek "revenge" by "unleashing" an East-West conflict. More specifically, it has been stated sometimes -- by Western as well as Communist sources -- that if certain U.S. allies were in possession of nuclear weapons they would be able to start World War III by attacking the Soviet Union or another Communist country.

While it is true that nuclear weapons offer greater opportunities for quick and destructive forms of attack, it must be remembered that a country which harbors and uses nuclear weapons

is more likely to become the target of the first retaliatory blow than a country which has only conventional capabilities. Thus, while nuclear weapons would give the allies such an enhanced capability that they might be tempted to open hostilities on their own, they would also have to take account of the increased danger of a retaliatory blow against themselves. West Germany has been accused most often by the Soviet government of wanting to start an East-West war. But this is precisely the country which would suffer most directly and immediately in such a war, perhaps to the point of losing its national existence.

There are additional reasons why a U.S. ally, if it were not totally irresponsible, could not expect to gain anything from an act of nuclear aggression for the purpose of starting a central war. First, the act of aggression would violate the terms of the alliance with the U.S. and might well fail to bring the U.S. into the war. The attacking country would then be left unaided to face certain defeat.⁸ Second, if the act of aggression did start a central war, it might do so by provoking the Soviet Union to a first strike (although with some warning to the U.S.), and this would reduce the West's chances of victory. For these

⁸This idea has also been expressed in a recent Soviet statement: "Can one be convinced that in the event the military circles in West Germany launch a war against the socialist countries, the NATO allies would participate in it? There is no such confidence under present conditions...." (Vasilyev commentary in a Moscow broadcast in German, September 11, 1959.)

reasons, the kind of attack we have described would appear self-defeating to the attacker. The risk of total destruction however, might cease to seem important to an ally if its very existence were threatened by Communist aggression.

From the point of view of U.S. interests, the serious question is whether one of its allies in control of nuclear weapons might sometime come under a totally irresponsible government. In its nuclear assistance program, the United States must carefully consider the responsibility and political stability of the assisted country. However, the estimates of future stability might prove wrong, or an irresponsible government might indigenously acquire nuclear weapons. In that case, it might still be possible for the United States to disassociate itself from such a country, if not explicitly at least tacitly. This would lessen the risk that an irresponsible aggressive act by such a country might draw the United States into a nuclear war.

We must also consider the analogous possibility that aggressive acts by Soviet bloc countries would be more likely to lead to a central war if these Communist countries had independent nuclear capabilities. The East European satellites have hardly enough independence in the military field to attempt a major aggressive act without Soviet authorization. This constraint does not apply to Communist China, which might become still bolder in its aggressive moves if it acquired nuclear weapons. Whether Chinese military

action (with or without the use of nuclears) leads to a central U.S.-Soviet war is not something that the Chinese can decide alone. This decision would largely remain with the Soviet Union and would be affected by a great many other facts, such as the form of U.S. counteraction and the Soviet strategic position. In fact, China's dependence on a favorable Soviet reaction might act as a restraint on Chinese aggression.

The Risk of Unauthorized Detonations

So far we have been concerned with acts of nuclear aggression that would arise from the governmental decision of a U.S. ally or of a Soviet bloc country. Beyond this, there is a risk that nuclear weapons might be used without the authorization of a government. For example, an unauthorized act by one or more individuals might result in the firing of an armed missile, or a nuclear attack by a fighter plane or bomber. Since both the Soviet and the U.S. governments know that an accidental detonation of a nuclear weapon is possible they have a strong motive to make proper alert preparations which will make it exceedingly unlikely that an unauthorized detonation could trigger a war. If a number of senior officers, however, conspired to commit an unauthorized act, not only one but several missiles (or planes) might be launched against their targets.

The question that concerns us here is whether the spread of nuclear capabilities to U.S. allies or Soviet bloc countries would increase the risk of unauthorized detonations. In theory at least,

this risk now affects all the existing nuclear-weapons facilities. Statistically speaking, the risk tends to increase with an increasing number of nuclear weapons, other things remaining equal. The diffusion of nuclear capabilities would probably not increase the world total of such weapons appreciably, but the safety standards or the responsibility of the personnel in control might be inferior to either the American or the Soviet safety standards. Clearly, the United States has a paramount interest in the safety of its own nuclear weapon systems and those of its allies. If the Soviet government ever transferred control of nuclear weapons to other Communist countries it would probably also insist on stringent safeguards against unauthorized acts. Indeed, the possibility of such acts might help to deter the Soviet government from sharing nuclear weapons.

Finally, we must ask whether independent nuclear capabilities among U.S. allies or Soviet bloc countries might not contribute to the initiation of a central war in a more indirect way. It could be argued that the spread of nuclear capabilities raises political tensions and leads to increased military preparations on both sides. These developments, in turn, might make the deterrence posture of the Soviet Union or the United States more taut, so that some misinformation or accidental event might be mistaken for an enemy first strike. In other words, it is sometimes argued that tensions from the spread of nuclear weapons

would increase the risk of accidental war.

The problem of accidental war may well become increasingly important in the missile era. However, more tension, more weapons, or more countries with weapons are not the most critical factors that might increase the risk of accidental war. The really crucial factors are the response time of the retaliatory forces and the character of the decision process, both of which are affected by vulnerability considerations. Regardless of the possible spread of nuclear weapons, the risk of accidental war hinges primarily on the precautions taken by the two major powers. The most promising ways to cope with this risk are better safe guards in the decision processes, and less vulnerable weapons systems that need not react instantly to survive an attack.

Deliberate Initiation of a Central War by an Uncommitted Power
Through the Simulation of a Central Attack

A central war that is initiated by the actions of a country not directly involved in it is sometimes called a "catalytic war." Here we want to discuss a special variant of "catalytic war" which involves the following scenario. A dictatorial government in possession of nuclear weapons concludes that it would benefit from an all-out war between the United States and the Soviet Union, since this would weaken or almost eliminate the two super-powers and open up new opportunities for conquest and aggrandizement. Therefore this government decides to

"catalyze" such a war through the simulation of a sudden attack by the Soviet Union on the United States, which it accomplishes by detonating nuclear weapons on U.S. targets (or conversely, through simulating a U.S. attack on the Soviet Union). Interest in this scenario has been shown by several people.⁹

It is here argued that this scenario, while not impossible, is so unlikely that very little weight needs to be given to it in formulating current U.S. policy. Our view assumes, however that the United States and its major allies maintain certain elementary precautions concerning nuclear weapon safety and the response to accidental events. The precautions will be required anyhow as a protection against risks that are much more likely than the "catalytic war."

Why is this "catalytic war" so unlikely? To begin with, the "catalyzing" event would have to be large enough to trigger

⁹For example, Richard S. Leghorn, "The Problem of Accidental War," Bulletin of Atomic Scientists, June 1958, p. 205, and Arthur Lee Burns, The Rationale of Catalytic War, Center of International Studies, Princeton University, Research Monograph No. 3, 1959. The idea was also referred to by General Leslie Groves: "...nuclear weapons will in not too many years bring about a complete equalization between big nations and little ones, and it will become then a case of who has the nerve to start something and who would be punished the most if he did start it," (Hearings before the Subcommittee on Disarmament, U.S. Senate, 85th Congress, January 1957, p. 1058), and by Senator Humphrey: "It is entirely possible, is it not,...that if you woke up some day to learn that an attack had taken place...the question confronting you is where did the attack come from, particularly with the intercontinental ballistic missile and other means of delivery." (Ibid., p. 1090.)

a central U.S.-Soviet war. This means -- given adequate precautions against "accidental war" -- that a single nuclear detonation would not be enough. A small nation would probably not have the delivery capability to place a large enough number of weapons secretly and nearly simultaneously on targets. A government that possessed the capability to carry out this operation, however, would still face enormous risks: (1) It might not survive the central war, (a) because of the repercussions from worldwide fall-out, (b) because it might be on the target list of one of the central powers and suffer direct attack. (2) If one of the central powers emerged as a strong winner, the instigating government would fall under its domination instead of gaining opportunities for aggrandizement. (3) The detonations might fail to trigger a central war and the instigators might subsequently be discovered and eliminated. (4) The operation might be discovered before the detonations were accomplished, with similar results.

In the distant future Communist China might be the nation most likely to emerge as the dominant power after a central U.S.-Soviet war. It is worth recalling here Tito's accusation that the Peking government was opposed to a policy of peace because, even if 300 million Chinese got killed in a world war, there would still be 300 million left who could dominate the

rest of the world.¹⁰ Even a strong Communist China, however, would face all the above mentioned risks if it wanted to trigger a U.S.-Soviet war through the simulation of an attack by one power against the other. Conceivably these risks might be ignored by an insubordinate Chinese military group who controlled enough nuclear weapons and delivery vehicles (say two Polaris-type submarines) to simulate such an attack. This idea brings us back to the problem of nuclear weapon safety for an unauthorized detonation, perhaps the only kind that would generate a real risk of "catalytic war."

To be sure, our criticism of this scenario simply underlines the fact that a government would be acting very foolishly if it cast itself in the role of "catalyst," and we do know that governments often act foolishly. But there are additional reasons why this special brand of folly is very unlikely to be practiced. For one thing, aggressive or expansionist governments have generally been extremely prestige-conscious. Enhanced prestige is indeed what they are after in seeking to expand. Nations concerned with prestige may make their preparations for war by stealth, but their desire for recognition would tend to preclude their initiating war by stealth. On the contrary, they are

¹⁰Tito's speech at Labin, June 15, 1958.

generally anxious to call attention to their bellicosity.

It is difficult to think of historical analogies to the catalytic scenario. Perhaps the sinking of the Maine comes close to being one, but if the Cuban rebels really caused her to blow up they had almost nothing to lose except U.S. sympathy. If the Spaniards did it, which now seems most unlikely, they certainly did not intend to provoke American intervention on behalf of the Cubans.

TENSION AND WARS OUTSIDE OF THE EAST-WEST CONFLICT

Although the conflict between Communist forces and the free world overshadows all other international problems, we cannot ignore the possible effects of the spread of nuclear weapons upon countries holding aloof from that conflict. Small nuclear capabilities might be acquired by uncommitted nations as a result of indigenous development. And if nuclear weapons ever become available for sale, an even larger number of countries may acquire them (although the delivery capabilities of small countries are likely to remain very rudimentary). Some smaller countries that are competing militarily with their neighbors might obtain nuclear weapons before their enemies and thus achieve a temporary advantage. This might compel their neighbors to follow suit in acquiring nuclear weapons, especially if they feel threatened by or hostile towards the small country which got nuclear weapons first.

Independent nuclear capabilities might also encourage a number of nations to pursue more nationalistic policies. This could create difficulties for the United States in regions, such as Latin America, where it now plays a dominant role. The United States might be forced to make still greater concessions in economic aid and might find it increasingly difficult to obtain diplomatic support from these regions for various international undertakings. Countries outside of the East-West conflict would not become economically more independent by acquiring nuclear weapons, and even militarily their strength would still be vastly inferior to that of the United States. It would be primarily the psychological advantage to be gained from the possession of nuclear weapons that might encourage these countries to embark on more aggressively nationalistic policies directed against the United States.

An uncommitted country that acquired some nuclear capabilities might attempt to subjugate a neighboring country through a single surprise attack on that country's capital (e.g. a Cuban atomic raid on Ciudad Trujillo, or an Israeli raid on Cairo). The aggressor might hope that the larger powers could do little about such a fait accompli. However, he would have to take the risk that the other powers might interfere and punish him, or at least deprive him of the gains from the successful surprise attack.

The diffusion of nuclear weapons to various countries increases the number of conflicts in which such a weapon might sometime be used. Some people have argued that even an isolated use of nuclear weapons would lead to more threats to employ them, more acts of nuclear aggression, perhaps even to clandestinely caused explosions, and that it would foster irresponsibility among many countries. Certainly the first use of nuclear weapons since 1945, if and when it occurs, will not be without considerable international repercussions, especially if other countries seem likely to follow suit. Aggressive use of these weapons would be loudly condemned everywhere. If a country that used nuclears the first time since 1945 were not a major power or closely allied with a major power, the international reaction might well be strong enough as to inhibit further threats of aggression with nuclear weapons. The international community -- even if still split into two major camps -- would have a strong interest in discouraging an increasing use of nuclear weapons among "neutral" countries.

IV. U.S. POLICY MEASURES

Under certain conditions somewhat more widely distributed nuclear capabilities seem to be advantageous for the United States; under other conditions the effects would be undesirable. Potential long-range developments, in particular, might cause some new dangers for U.S. security.

Theoretically, one might ask whether, on balance, the United States should be for or against the further spread of nuclear capabilities. However, the more practical question for U.S. policy makers, is whether certain available policy measures should be pursued either to enhance or to retard this spread under specific conditions. In answering this question we must not only weigh the advantages and disadvantages of the specific spread of nuclears, but we must also examine whether the proposed policy can accomplish its objective, and what are its side-effects and political or military costs.

Measures that the United States might take to affect the spread of nuclears could be unilateral, bilateral, or dependent on various degrees of international co-operation, either informal or through an explicit agreement.

DIFFERENT FORMS OF SHARING

Above we discussed some advantages and problems for U.S. security that might result from the spread of nuclear capabilities to allies or friendly nations. The primary purpose of nuclear assistance to other countries would be to enhance these possible advantages. But this assistance might also have secondary purposes, for example, to avoid some of the disadvantages of an unassisted indigenous weapons program.

There are a great many different ways in which the U.S. does or can provide its allies or even neutral countries with assistance in the field of nuclear weaponry. In a sense, the spread of nuclear capabilities begins with the stationing in foreign countries of weapon systems that are completely manned and controlled by the U.S., as for example in Spain, Morocco, and South Korea. The next step is the sharing of some information about nuclear weapons that permits allies to maintain supporting activities and equipment, or to possess dual-purpose systems, for instance Nikes fit for both high-explosive and nuclear warheads. Such arrangements exist with a number of NATO countries and with Australia. As a further step in the direction of foreign nuclear capabilities, the U.S. can turn over the delivery system to an ally, but retain formal control over the warheads through an agreement that the decision to employ the system has to be a joint

one. Such an arrangement has been made for IRBM's in the United Kingdom, and -- with NATO controls added -- in Italy and Turkey.

According to the 1958 amendment of the Atomic Energy Act, non-nuclear parts of atomic weapons, design information, and nuclear materials (but not manufactured nuclear components) can be furnished to a country which is in a defense arrangement with the United States and which "has made substantial progress in the development of atomic weapons."¹¹ This amendment has been used to initiate a nuclear assistance program with the United Kingdom. It could be similarly used -- if the United States so desired -- to furnish this assistance to France, after France has demonstrated "substantial progress in the development of atomic weapons." If the United States should not want to extend the same assistance to France for some reason, a certain amount of friction might develop within NATO since the French government

¹¹The intent of Congress with regard to the words "substantial progress" is that "the cooperating nation must have achieved considerably more than a mere theoretical knowledge of atomic weapons design, or the testing of a limited number of atomic weapons. It is intended that the cooperating nation must have achieved a capability on its own of fabricating a variety of atomic weapons, and constructed and operated the necessary facilities, including weapons research and development laboratories, weapon manufacturing facilities, a weapon-testing station, and trained personnel to operate each of these facilities." (Amendments for Cooperation for Mutual Defense, 86th Congress, First Session, Senate Report No. 513, 1959, p. 11.)

would feel that the U.S. had discriminated against it. This raises the important question as to the amount of discrimination the United States can practice in dispensing nuclear assistance.

The future scope of nuclear sharing, however, need not be limited to the above-mentioned forms. Further revisions of the Atomic Energy Act might permit the transfer of complete weapons to countries which have not demonstrated an indigenous weapon capability. Furthermore, no revision of the Act would be necessary if Congress approved an international agreement or if the Senate approved a treaty for nuclear assistance to specific countries.¹² Nuclear weapons assistance could also be given to a body like Euratom, which might better enhance the cohesion of the alliance than individual nuclear sharing arrangements with France, Germany, and Italy.¹³

¹²According to article 121 of the Act, such an agreement or treaty would supersede any conflicting part of the Act. (Hearings before Subcommittee on Agreements for Cooperation, Joint Committee on Atomic Energy, 85th Congress, 2nd Session, 1958, pp. 251-282.) In his press conference on February 3, 1960, President Eisenhower suggested that the Administration might seek some relaxation of the current restrictions on nuclear assistance to our allies.

¹³It has also been suggested that NATO or the Western European Union create a pool of atomic weapons with various degrees of U.S. assistance. General Norstad, in his speech in Pasadena, California, on December 6, 1959, mentioned the idea of NATO control over nuclear weapons as a possibility. The report of the defense committee of the Western European Union of October 30, 1959, recommended that WEU should create a small strategic nuclear deterrent.

The U.S. can exercise a wide choice in implementing the formal legal arrangements that admit nuclear weapons to foreign countries. U.S. control of warheads can be physically effective, for example if the warheads are kept on a large isolated base which is completely manned by U.S. personnel, or it can be almost purely symbolic. However control is exercised, the U.S. must consider the possibility that a nuclear assistance agreement might be violated once the nuclear weapons were in foreign territory. The seriousness of this risk varies, of course, from country to country. For example, if the U.S. transferred weapons (under U.S., joint, or foreign control) into a country with a somewhat unstable government, it would run the risk that a revolt or some other political change might bring a hostile government into power which could seize the nuclear weapons and use them for policies contrary to U.S. interests. The British experience with their conventional arms stores in Egypt is an example.

We have already commented on the idea that an irresponsible allied government, or irresponsible foreign personnel, might attack Soviet-bloc territory with nuclear weapons and thus bring about a central war. There remains the possibility that irresponsible personnel in a foreign country might make some other unauthorized use of a nuclear weapon received through U.S.

assistance.¹⁴ This is a question of weapons safety, which arises essentially with U.S.-controlled capabilities as well as with foreign-controlled capabilities. In view of this risk, the United States should insist in its nuclear-sharing arrangements that the recipient countries observe high safety standards in their nuclear-weapon systems, both for technical safety and to prevent unauthorized action in the command and control system. In fact, the United States should maintain a continuing interest in the safety of the nuclear weapons of allied countries and offer advice or suggest remedial action where indicated.

In a nuclear assistance program, the United States must carefully consider the controls which it retains over the weapons. This creates a dilemma. On the one hand, the U.S. wishes to control allied policies and insure that the allies will never use their nuclear capabilities contrary to U.S. interests. On the other hand, some of the previously mentioned advantages of more widely distributed nuclear capabilities -- such as their effect against local aggression or nuclear blackmail -- could best be realized by capabilities that are completely under regional or national control. A solution to this dilemma might be found in control arrangements that can be tightened up or loosened according

¹⁴This thought seems to have been of some concern in Congress when the 1958 amendment to the Atomic Energy Act was considered. See, for example, Representative Holifield's reference to the allegedly unauthorized bombing of a Tunisian village with a French-owned B-26 (*ibid.*, p. 250).

to the situation. If an assisted country threatens to develop policies contrary to U.S. interests, the controls could be tightened by stressing the restrictive aspects of the treaty, by withdrawing weapons for "maintenance," by increasing U.S. guards, etc. But to deter Soviet pressures the controls could be made to appear more uncertain. This might be accomplished by stressing the "gray areas" of the control arrangements, by indicating that the U.S. is not physically guarding all the nuclear capabilities of the threatened country, and by hinting that the need for self-defense might exempt a country from U.S. controls.

In the latter situation, where local Communist aggression or blackmail must be discouraged, indigenous nuclear capabilities might offer political advantages over shared capabilities. In the former situation, however, where the policies of an ally threaten to diverge from U.S. objectives, shared capabilities can obviously be more easily influenced by the U.S. than indigenous ones. This last point is an important argument in favor of a nuclear assistance program for allies which are about to develop a significant indigenous capability. Another argument in favor of U.S. assistance under such conditions is the saving of expenditures, which the ally could put to better use for supplementary conventional capabilities.

PEACEFUL USES OF ATOMIC ENERGY AND ROCKETRY

For several years the U.S. has entered into bilateral agreements with allied and neutral countries to provide assistance for the peaceful uses of atomic energy. These agreements contain specific provisions which prohibit the diversion of nuclear materials to weapons purposes.

Apart from these bilateral arrangements, other countries can seek assistance through the International Atomic Energy Agency for peaceful applications of atomic energy. Any country which receives such assistance must agree that it will not be used "in such a way as to further any military purpose."¹⁵ The recipient country must give the Agency the right to send inspectors, designated by the Agency "after consultation" with the recipient country. If these restrictions are violated, the Agency may call for the return of any materials or equipment made available, and report the violation to the Security Council. Presumably, if the Security Council agreed that a refusal to return the materials constituted a threat to peace, further sanctions might be initiated.

The agreement for U.S. assistance to Euratom provides more limited controls. Since the European nations objected to outside inspection, it was agreed that Euratom could carry out the supervision and inspection itself.

¹⁵ Statute of the International Atomic Energy Agency, Article XI, F. 4.

The experience with these arrangements for peaceful uses is highly significant in evaluating possible measures to curb indigenous developments of nuclear weapons. Proponents of a more active U.S. policy against the spread of nuclears often overlook the question of political feasibility. In addition to the objections of the Euratom nations to outside inspection, similar attitudes were revealed at the preparatory conference for the International Atomic Energy Agency, where India and many small nations wanted to minimize the inspection and control clauses.¹⁶ The position of India, potentially a large-scale independent nuclear power (in planning at least) is particularly important. From the very beginning of the International Atomic Energy Agency, and in all meetings and votes taken since, India has stood firm on her policy of not acceding to any control scheme which would bind her future program. The statement of the head of the Indian Atomic Energy Commission at the 1956 conference on the status of the International Agency cogently expresses the Indian philosophy:

The provisions are such that this chain continues indefinitely. Thus, as far as fissionable materials

¹⁶Hearing before the Subcommittee on Agreements for Cooperation, Joint Committee on Atomic Energy, 85th Congress, Participation Act for the International Atomic Energy Agency, July 2, 1957, p. 25.

are concerned, once it comes under an Agency project not only is it controlled but all its future generations are controlled. It is as if not only the recipient of aid were to be placed under bondage but his children, his grandchildren and all succeeding generations for ever and ever.

This reluctance to accept international or big-power controls suggests that many a sovereign nation would not voluntarily accept a restriction of the right to manufacture atomic weapons.

Assistance for peaceful uses of atomic energy unavoidably helps a country's capability to embark on a weapons program. The assisted country will improve its nuclear skills and technology in spite of any restrictions, and these skills can be transferred to a military program. In addition, if a country had no fear of sanctions for violating an international or bilateral agreement, it could suddenly divert to a weapons program any materials or equipment received. Thanks to the inspection provisions, however, it probably could not do this clandestinely.

In the more distant future, rockets for research in the upper atmosphere and outer space or for communication purposes might also become the object of international or bilateral assistance programs. This would lead to the similar risk that a country might divert its capability and equipment from peaceful rocketry to military missiles.

NUCLEAR TEST SUSPENSION AS A MEANS TO CURB INDIGENOUS DEVELOPMENTS

This is not the place to go through all the many reasons for and against an agreement to suspend nuclear testing. However, one of the reasons advanced by advocates of such an agreement is pertinent to our discussion. This is the argument that a suspension agreement would curb indigenous developments of nuclear weapons in countries which do not have them now.¹⁷ Would a test suspension agreement actually curb indigenous developments, especially the most undesirable ones?

It seems likely that an agreement among the United States, the United Kingdom, and the Soviet Union to suspend testing would inhibit to some extent the more cautious governments in their decisions, appropriations, and other efforts toward the development of a nuclear capability. This measure might thus slow down the world-wide growth of "Nth country" capabilities, but it might do little to prevent the most undesirable consequences of whatever growth took place. It is precisely the acquisition of nuclear

¹⁷ Senator Hubert H. Humphrey attributed this view to the Department of State: "The Department of State informs us that it is still the policy of the United States to try to restrict membership of the nuclear club and that one of the ways it plans to achieve this is through a successful outcome of the negotiations on an agreement for the controlled cessation of nuclear weapons tests to which all nations hopefully would adhere." (Speech on the Senate floor, July 17, 1959.)

capabilities by irresponsible or aggressive governments which is most undesirable. These governments would not be inhibited from the development and testing of nuclear weapons merely because the three big powers stopped testing their weapons, particularly since a development program could initially be hidden in projects for peaceful uses of atomic energy.

If a three-power test suspension treaty cannot stop the development of nuclear weapons in other countries, one might seek at least to stop the testing of these weapons. This would require that all nations with a potential nuclear capability accede to the treaty. Some nations might do so in response to domestic or world opinion or to political pressures from the three nuclear powers. At any rate, the treaty would lower the incentive to develop nuclear weapons for most nations. But it might not bring all nations under effective international control. We have already noted the reluctance of various countries to accept controls even for peaceful assistance programs. Countries which are not oriented toward maintaining the status quo are likely to accede to a test suspension agreement only at the price of considerable concessions, if at all. For example, Communist China might not only demand admission to the United Nations, but also that the United States remove its weapons from the Far East.

Unlikely as it may seem, let us assume for the moment that the conditions prescribed by all important countries for accession

to a three-power suspension treaty could be met. This would still leave the risk of clandestine or open violation of the treaty. Clandestine evasion would seem important only in the case of Communist China. While some countries would find clandestine evasion of test restrictions too risky or too expensive, they would not necessarily be precluded by a test suspension treaty from developing and manufacturing nuclear weapons, either secretly or openly. After such a program had made some progress, an aggressive country could allege, at an opportune moment, that other nations had violated the test suspension agreement, and suddenly start a crash program of testing and further weapons development; or it could try to test clandestinely till it was discovered.

A politically and militarily important capability could be developed without testing. We are faced with the inescapable fact that the first primitive bomb tests by the United States and the United Kingdom, and probably by the U.S.S.R., did not fail; and the principle of the bomb used at Hiroshima had not even been tested. History gives us no reason to expect that a nation's first atomic bomb, if simply designed, will fail. If a nation has grasped the principles of a Nagasaki-type bomb and feels satisfied with the results of the preliminary testing of the non-nuclear components, it can be reasonably confident that its first bomb will work. The bomb, for one reason or another, may not give the precise yield expected, but this will detract little from the achievement of detonation. Only when it comes to advanced nuclear

designs is there substantial risk of test failures. To progress toward a system of greater military potential, nuclear testing will be necessary, since the first families of weapons will consist of heavy, unwieldy devices which could not be delivered by missiles of fighter planes.

OTHER MEASURES TO CURB THE SPREAD OF NUCLEAR WEAPONS AND THE QUESTION OF MUTUAL U.S.-SOVIET INTEREST

Many persons who have dealt with disarmament problems hold the view that the United States and the Soviet Union have a mutual interest in preventing the spread of nuclear capabilities to many countries.¹⁸ They argue that the Soviet Union is greatly concerned about the acquisition of nuclear weapons by an increasing number of countries -- whether U.S. allies, uncommitted

¹⁸ In hearings on the International Atomic Energy Agency, Secretary Dulles testified: "It is my view that the Soviet Union does not want to see the availability of atomic weapons spread throughout the world. That is an inference which we draw from what we learn in our disarmament talks with them. But even more than that, it is logical that they should want to keep a relative monopoly, with one or two others, in this field of weapons rather than see it spread." (Hearings, Committee on Foreign Relations, U.S. Senate, 85th Congress, 1957, p. 17.) Senator Hubert Humphrey wrote: "The Soviet hierarchy may also be worried about the danger increasingly imminent, when other nations -- some not so responsible as the United States and Britain -- may possess nuclear weapons. It must be as obvious to them as it is to us that unless some international agreement over the new weapons of mass destruction is reached soon that nuclear arms in the hands of an irrational dictator may one day threaten the world." (Staff Study No. 8, "Attitudes of Soviet Leaders toward Disarmament," Subcommittee on Disarmament, Committee on Foreign Relations, Final Report, 1958, p. 340.)

countries, or Communist-bloc powers. Hence, according to this view, the Soviet Union will be motivated to come to an agreement with the United States, not only on measures against the spread of nuclears, but also on disarmament in general. This proposition involves two assumptions which must be carefully qualified: First, to what extent is there a true mutuality of interest between the United States and the Soviet Union; and second, under what conditions will the recognition of a mutuality of interest motivate the Soviet Union to come to an agreement?

According to the first assumption, the many different possibilities of nuclear diffusion can all be lumped together, evaluated as being undesirable on balance, and hence rejected as a package. Yet, surely it is clear that, for the near future, the United States wants to see its allies and other Western nations more capable to oppose the growing might of the Soviet bloc, and the Soviet Union wants to see them weaker. Under certain conditions independent or shared nuclear capabilities may make countries friendly to the U.S. stronger without creating difficulties that outweigh this gain. Where these conditions exist, American and Soviet interests are not mutual but diametrically opposed.

For the long run, the assumption as to mutual interest is based on the danger that both nations might face if irresponsible uncommitted powers obtained nuclear weapons. The Soviet Union, however, entertains a different picture of the long-range future

from that prevailing in the West. For example, it may expect effectively to control the more distant future through the expansion of Communism. An indication that it may not be very concerned about these distant dangers is offered by the negotiations preceding the creation of the International Atomic Energy Agency, where the Soviet delegation was rather reluctant to accept control measures that were meant to apply to other nations.¹⁹

Communist China, however, may be a case where the United States and the Soviet Union do indeed have a common interest in delaying the acquisition of a nuclear capability. The American interest is strong and clear; the Soviet interest is less certain, though it may be very substantial.

The validity of the second assumption, that mutual interest will motivate the Soviet government to make an agreement, is limited by two difficulties. First, the negotiatory problem. If the United States publicly and officially declares -- as it has done in the past -- that it values certain "Nth country" controls highly, it will have to pay a considerable price for

¹⁹During the United Nations debate on the I.A.E.A. the Soviet representative said: "The Soviet delegation considers that the inspection and control of recipient States, that is to say the underdeveloped countries, can only infringe their sovereign rights and retard...peaceful atomic industry....The Soviet Union concludes bilateral agreements on atomic co-operation with other countries on the basis of equality and mutual respect....The agreements contain no conditions referring to control and inspection...." (U.N. General Assembly, 30 October 1958.)

an agreement with the Soviet Union whatever the latter's views of its self-interest in the matter. The Soviet Union, ostensibly placing little value on such an agreement, might not have to make any sacrifice in order to bring it about.

The second difficulty lies in the fact that politically feasible agreements between the United States and the Soviet Union do not promise reliable and effective controls to prevent Chinese nuclear capabilities -- the one area of possible mutual interest. An open agreement by the Soviet government not to give nuclear assistance to China (say in return for a U.S. commitment to withhold this assistance from Germany or other allies) would seem to impose such strains on the Sino-Soviet relation as to be unacceptable to Moscow, and a secret or tacit agreement could be too easily evaded.

These two difficulties do not preclude the exploitation of mutual interest in other ways. For example, if the United States transferred nuclear weapons to the Japanese government, the Soviet Union might find it necessary to give similar assistance to their Chinese ally, although -- as mentioned before -- this is highly uncertain. However, if the United States can preserve its freedom to give nuclear assistance to Japan (upon request) or to other Far East allies, without committing itself in either way, it might force the Soviet Union to be doubly cautious about giving nuclear help to China. Should the Soviet government need a reason

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for refusing nuclear assistance to its Chinese ally, the latent possibility of American nuclear sharing in the Far East might be more effective than a formal international agreement against testing or nuclear sharing.

In Europe the pressures and counterpressures due to American and Soviet opportunities for nuclear sharing are even more complex. On the one hand, the possibility that the United States might give greater nuclear assistance to NATO countries might make the Soviet government more cautious in its political threats and more willing to permit arms control inspection. (There are indications, however, that the Soviet government is less concerned about U.S. sharing than it claims to be, and hence less interested in making concessions to prevent it.) On the other hand, the Soviet Union could threaten to make nuclear weapons available to its East-European satellites in order to exert pressure upon the West, although it may in fact be very reluctant at present to place nuclear weapons under satellite control.

We have shown above that test suspension and atoms-for-peace programs do not promise effective control of the most undesirable forms of nuclear diffusion, although these measures might remove the incentive for many countries to develop their own nuclear capabilities. Theoretically there are other international measures that would attempt more directly to halt the spread of nuclear weapons. Consider these three possibilities:

(1) The present nuclear powers could make an agreement to continue their practice of not transferring nuclear weapons to the control or possession of another country. The United States, however, has given design information and nuclear materials to the United Kingdom, a transaction which comes close to the transfer of finished weapons. While the Soviet Union might not wish for the time being to transfer nuclear weapons to another country, it might be unwilling to bind itself in an explicit agreement for fear of straining its relations with China. It would probably demand that the stationing of nuclear weapons on foreign soil also be prohibited, not just the transfer of legal custody. Soviet negotiators would almost certainly demand that such an agreement prescribe the kind of assistance which the United States has given to its British ally, and which it may soon want to give to France. But even if the Soviet Union were willing to enter a limited agreement that would not conflict with the U.S. defense posture, indigenous developments in potential "Nth countries," the crux of the problem, would not be stopped. These developments could only be halted by the second or third measures listed below.

(2) It is theoretically conceivable that all countries which have not yet manufactured nuclear weapons but are capable of doing so eventually might voluntarily enter into a binding

and enforceable international treaty never to produce them.²⁰

We have already commented on the reluctance of most countries to submit to controls. If such an agreement is to be backed up by inspection and controls, to be more than an unenforceable declaration, its universal acceptance seems even less likely than the voluntary accession of all states to a test-cessation treaty.

The latter would at least be a restriction that also applied to the big powers.²¹

(3) Finally, one can conceive of an agreement between the United States (plus the United Kingdom) and the Soviet Union to prevent, if necessary by joint military action, the development

²⁰The British Labor party urged such an international agreement on June 24, 1959. It was to include the United Kingdom (the British stockpile to be destroyed or turned over to the United States). It was never made clear how the proponents of this proposal expected to make other nations accede to the agreement. The pacifist wing of the Labor party first wanted the United Kingdom to give up its nuclear weapons unilaterally "to set an example." This suggestion was rejected by the party majority. As Mr. Bevan put it: "If I thought by setting an example they (the other countries) would follow suit, I would at once agree. There is, however, not the slightest evidence that if we set an example in Great Britain others will follow." (Speech at Cardiff, June 27, 1959.) The compromise position worked out, therefore, was that the United Kingdom would agree to give up nuclear weapons provided all other nations, except the United States and the Soviet Union, did the same.

²¹As long as purely declaratory measures do not put Western defense programs at a serious disadvantage, they may be of value in inhibiting the more responsible governments from developing or spreading nuclear weapons without urgent security reasons (for example, merely for sale to an uncommitted country). Ireland

of nuclear capabilities in any other country. The forcibly restricted "nuclear club" might even admit France and China. For the foreseeable future there is not the slightest chance that the United States and the Soviet Union would agree on such a drastic joint policy, which would threaten the sovereignty of dozens of countries and violate the United Nations charter to boot. Conditions may change ultimately so as to permit some joint U.S.-Soviet action, perhaps in a somewhat less drastic form. We shall return to such possibilities below.

POLICIES TO COPE WITH "Nth COUNTRY" PROBLEMS AS THEY ARISE

It has often been argued that the only time to control the spread of nuclear weapons is now, before more than three or four powers possess independent capabilities. This assertion ought to be qualified. It may be true that the progressive diffusion of these weapons is hard to reverse. In other words,

may have had this objective in mind when it proposed a resolution to the United Nations General Assembly, on November 13, 1959, recommending that the ten-nation East-West disarmament conference in 1960 examine "the feasibility of...an international agreement, subject to inspection and control, whereby the powers producing nuclear weapons would refrain from handing over the control of such weapons to any nation not possessing them and whereby the powers not possessing such weapons would refrain from manufacturing them." It is interesting to note that the Soviet bloc (plus France and Peru) abstained when this resolution was adopted by the General Assembly by 70 votes, with no opposing votes cast.

it seems likely that a country which possessed nuclear weapons would demand more in return for giving up these weapons than a country that did not yet possess them. And if two countries are hostile to each other, the acquisition of nuclears by one will spur the other to follow suit. But this does not mean that undesirable effects from diffused nuclear capabilities would be beyond control. Indeed, the possible dangers from "Nth countries" may be easier to control when they begin to manifest themselves, than beforehand by preventing the development of indigenous nuclear capabilities.

The argument that the diffusion of nuclear weapons is irreversible is also based partly on the contention that an agreement to abolish nuclear weapons would become more difficult to control with an increasingly larger number of countries in a position to hide finished weapons. It is certainly true that we know of no method to detect hidden nuclear weapons, and that this would constitute an immense problem if the United States and the Soviet Union ever tried to set up an inspection scheme to make sure that neither one kept any hidden bombs. The relatively very few weapons that other countries might eventually produce would add little to this problem.²² Furthermore, it must be remembered

²²The major powers could also hide their bombs in the territory of a trusted ally.

that is by no means certain that clandestine diversion of peaceful nuclear energy programs to weapons production could always be detected, although this task seems more manageable than the detection of hidden bombs.

Particular concern has been expressed that irresponsible small or medium powers might create serious international problems to the disadvantage of the major powers. If none of the major powers wants to back up such an "irresponsible" country and become involved in its conflicts, the threat could readily be controlled with the means now available to international organizations. For example, the United Nations Security Council might be a useful organ to enforce restitution of any gain from an act of local nuclear aggression.²³ A historical precedent for such action may be found in the U.N. settlement of the British-French-Israeli attack on Egypt. The Soviet Union, of course, did not openly co-operate with the United States at that time, but in a sense it consented to the settlement sponsored by the United States and Canada.

In an area where the major powers could not agree on joint international action, the threats from a smaller nuclear power

²³Since only the present four nuclear powers and Nationalist China have a veto power in the Security Council, a small "Nth country" could not obstruct the U.N. machinery.

might still be controlled by regional arrangements. For example, if a Latin American country threatened a neighboring country with nuclear weapons, the United States would probably not wish to see the Soviet Union enter as "peacemaker" if the American-Russian conflict should still be the dominant problem at such a time. Given some co-operation from the other hemisphere countries, however, the aggressor could be restrained, or if necessary punished, through an effort of the Organization of American States.

In these two examples we have suggested only the use of international bodies that already exist. It seems reasonable to expect that additional arrangements might be developed, or existing arrangements strengthened, if the irresponsibility or aggressiveness of independent nuclear powers became a serious problem, particularly after nuclear weapons had been used irresponsibly in a local conflict without direct involvement by the major powers. It is quite possible that the eventual diffusion of nuclear capabilities in various regions of the world will require a special effort by the major powers influential in these regions to prevent serious threats to peace. This development, however, need not necessarily result in a net loss for international stability.