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THE NATION'S SAFETY AND ARMS CONTROL

Also by Arthur T. Hadley

THE JOY WAGON
DO I MAKE MYSELF CLEAR?

THE
Nation's Safety
AND
Arms Control

by
ARTHUR T. HADLEY

NEW YORK *The Viking Press* MCMLXI

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First published in 1961 by The Viking Press, Inc.
625 Madison Avenue, New York 22, N.Y.

Published simultaneously in Canada by
The Macmillan Company of Canada Limited

Library of Congress catalog card number: 61-11262
Printed in the U.S.A. by The Colonial Press

To Mary

*whose tolerant suffering through the writing of my books
is a definite indication of the magic in marriage*

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Preface

ANYONE WHO PICKS UP A BOOK ON A SUBJECT SO VITAL AND YET so full of danger and special pleading as arms control wants some information on the book's background. Why is it important that a book on arms control be written at this time? Whose opinions does it represent? Is there new research and information on the subject?

For the past three years, largely without public recognition, there has been a great deal of intensive scientific study of the problem of American security in the kilomegaton age. This research has been conducted by individuals, by private and government research organizations, and at specially convened conferences. A growing number of these studies have skirted the fringes of arms control, and some have faced it squarely. As a result, quite a bit of new information lies scattered about the American scientific community.

Recognizing this, a group of scientists, largely physicists, of whom the guiding spirits were Victor F. Weisskopf and Jerome B. Wiesner, had wanted for several years to hold a Summer Study that would bring the new information together and explore the technical problems of arms control. Weisskopf, a physics professor at the Massachusetts Institute of Technology and presently a

member of the Directorate of the European Organization for Nuclear Research (C.E.R.N.), was one of the senior scientists at Los Alamos. Wiesner, then head of the Research Laboratory of Electronics at M.I.T., is now Special Assistant to the President for Science and Technology.

The scientists decided that if a Summer Study could be arranged, among the participants should be an author whose mission would be to produce "a lay work on the problems and possibilities of arms control." While the study was being organized, I was asked whether I would be the author taking part. Most of my non-fiction writing had been directly in the field of national security rather than arms control, but like the elephant's child I have insatiable curiosity. I attended several of the organizational meetings of the Summer Study. At these meetings three factors stood out to increase my enthusiasm for the project. One was the extremely practical attitude toward arms control taken by the majority of the scientists, who showed no tendency to substitute idealism for national defense. Second was the fact that the arrival of the Soviet Union not just in the nuclear age but in the kilomegaton age, plus the intercontinental ballistic missile, had altered some of the conventional assumptions about national security. Third was the availability of new information already mentioned.

I then checked informally with a few of my friends who held or had held high office either as civilians or officers in the Defense Department. I wanted to find out whether anyone outside the government could attempt a book on arms control, or was too much of the information on which such a book would have to be based secret? Some of those I talked to, as was to be expected, were not overly enthusiastic about arms control, but all agreed that secret information was not necessary to produce a reliable, informed book. Naturally in writing this book no classified information has been used. Where necessary, informed people have been consulted to obtain a reliable estimate.

I therefore agreed that, if the Summer Study materialized, I would take part, but made the following suggestion. Since none

of us knew in advance what the study would produce, I would not just report the results of the study, but use its information as a jumping-off point, winnowing, expanding, and checking its results, through my own interviews and research with other scientists and defense experts. This was agreed and is the pattern that has been followed.

Meanwhile, the group led by Weisskopf and Wiesner had gained the backing of the American Academy of Arts and Sciences and had obtained a most generous grant from the Twentieth Century Fund. Under these twin auspices the Summer Study was held. The study proved of immense value, and without it this book would have been extremely difficult to write. As planned, I have used the information developed during the study as a basis for further research and interviews. For a great many of the latter I am indebted to the American Academy of Arts and Sciences, whose name proved an open sesame everywhere.

But this work is not merely a synthesis. There is no way to synthesize "yes" and "no." The belief that there is always an ideal meeting ground somewhere in the middle can be recognized instinctively as false by anyone who has ever had one foot on a dock and the other in a small boat drifting away. When choices have had to be made between conflicting viewpoints, I have made them, indicating I have done so. The phrase most often used in prefaces runs something like: "The errors of this book must be laid at my door; the moments of inspiration probably belong to others." In this book there is much truth in that customary politeness.

The main participants in the Summer Study are listed in the bibliography. I would like here to acknowledge my particular debt to Arthur Barber, Air Force Cambridge Research Laboratory; Hans A. Bethe, professor of physics, Cornell University; George Bing, Lawrence Radiation Laboratory; Donald G. Brennan, Lincoln Laboratory, M.I.T.; Bernard T. Feld, professor of physics, M.I.T.; Herman Kahn, the Rand Corporation; Marvin I. Kalstein, Air Force Cambridge Research Laboratory; Henry Rowen, the Rand Corporation; Thomas C. Schelling, professor of economics, Harvard University; Victor F. Weisskopf; and Jerome B.

Wiesner. These are singled out not to slight the good work done by other members of the study. Their thought processes happened to mesh with my own.

Others who have freely given me of their time and knowledge, both in discussion and in criticizing the manuscript, are: Dean Acheson, Harold Brown, the Honorable Alastair Buchan, Rear-Admiral Sir Anthony Buzzard, Retired, Air Chief Marshal the Honorable Sir Ralph A. Cochrane, John W. Finney, William C. Foster, Lieutenant General James M. Gavin, Edmund Gullion, Michael Howard, Paul Nitze, Martin Ohrne, Robert Oppenheimer, James A. Perkins, L. C. Van Atta, and Albert Wohlstetter.

I would also like to thank *en masse* the various government officials who felt their official positions precluded them from being thanked individually for their help.

Finally, it is impossible for me to write anything that touches on the nation's security without acknowledging my intellectual debt to that incredible mixture of hard wisdom and humorous insight, Robert A. Lovett, Secretary of Defense during much of the Korean War. Once again I should repeat that my thanks to all these for helping should not be taken as constituting their endorsement of what I have written.

I have tried to lay out the facts clearly and without emotionalism. There is too much heat being generated by arms control now, without adding to it. The alternatives are difficult enough by themselves. They need no writing tricks or loaded words to highlight or blur their outlines. Where there are not enough facts available to justify anything more than a most tentative conclusion, I have said so.

The book has been kept as non-technical as possible. As a typical example of what occurs throughout, in the section on the nuclear test ban the statement is made that a bigger bang for the warhead is not as important as increased accuracy in a missile. This is done without going into the ratio on which experts base such a statement: $\frac{(N)(y)^{2/3}}{(a^2)(p)^{2/3}}$ where N = number of missiles, y = yield in megatons, a = accuracy, p = pounds per square inch

of overpressure to which the missiles are protected. Major sources are listed in the bibliography, in some instances with notes as to the particular portions of the book they bear on.

This book would never have been completed without the expertise and devotion of my research assistant, Nancy Hoepli, whom I was able to hire through the generosity of the Twentieth Century Fund. The subject of arms control is complex and poorly indexed, but with her past newspaper and United Nations experience she found her way through it with accuracy and speed. Whenever the foot of fancy began to be placed in the mouth of fact, she extracted it firmly and with patience. My debt to her is immense.

THE NATION'S SAFETY AND ARMS CONTROL

CHAPTER ONE

Introduction

The Kilomegaton Decade

EVERY CITIZEN LOOKING AT THE NUCLEAR WORLD MUST HAVE MORE than a fleeting wish that modern weapons could be limited or abolished. Yet aside from an occasional political promise there has been practically no informed public discussion of this issue. Into this vacuum has leapt every form of extremist from retired generals to active Communists, all with their own empires to defend. Inside a few universities and foundations theoretical work has been done on limiting modern arms, but for the most part such work has been technical and fragmentary. The general public has been left to drift without the knowledge necessary to form opinions.

Since the first atomic bomb exploded in 1945 the United States has come up with seven major disarmament plans, the Soviet Union with eight. Yet during this time, for as long as a year, there have often been four officials or less in the entire United States government working full time on disarmament and arms control. Between World Wars I and II, inside and outside the League of Nations, there was continuous discussion of disarma-

ment. Some of the plans considered seriously ranged from calling for a ten-year holiday in warship building to outlawing the acquisition of dirigibles.

The number of plans, the disagreement between plan and plan, the lack of serious government effort, the past history of disarmament, combine to give the whole subject of arms limitation an air of unreality. It appears a Utopia in which politicians must occasionally dabble for propaganda purposes, but whose actual existence is not possible in this world.

That the subject of arms limitation should rest there is unfortunate. For while extreme solutions are impossible Utopias or cynical feints to take the eyes of the world off the ball game, there is a great deal that can be done to make the world more safe and stable than it is today. And this progress toward security can be achieved without sacrificing, indeed while increasing, the over-all security of America. The attempt to limit the likelihood and destruction of nuclear war primarily by increasing the stability of the world is the new approach to the problem of national survival made by arms control. This book is an attempt to outline the actual military situation in the world today and to indicate where and how the new principles of arms control can be applied.

The problem of arms control can be compared to the choices before a British householder who had had a large delayed-action bomb dropped in his back yard during the Battle for Britain. The householder could pretend or convince himself that the bomb was a dud and go about his life as if his back yard were as it always had been. He could go away to the seashore and abandon his former life and home. He could take a hunk of TNT and blow the bomb and his house up, which got rid of the awful tension of the threat. Or he could call the bomb-disposal squad and have some expert begin the slow, infinitely difficult and dangerous job of defusing the bomb.

The latter method, the expert, technical approach, represents the attitude of this book toward the new problems posed by nuclear arms. Those who believe that there are no new problems

with nuclear weapons, that they are just a bigger bang killing a few more people, and that the thing to do is to stop thinking about them and learn to live with them, will be out of sympathy with this approach. So will those who believe that the problem of nuclear weapons is insoluble, that they are so terrible their use is highly unlikely, and that the more weapons we build the more unlikely their use becomes. The expert approach will be particularly out of favor with those who believe there is some dramatic solution, a panacea, such as destroying all nuclear weapons, that will recork the atomic genie into the bottle of past history.

This book explores some of the complicated but practical measures that can be taken to defuse the problem of nuclear arms. It also provides certain criteria by which arms control schemes can be judged. It does not claim to answer the problem of American survival—that is a broader question, even as defusing unexploded bombs was not the only problem facing Britain in 1941. But now that the unexploded bomb is in everyone's back yard, the possibility of destruction is becoming universal and control assumes a greater urgency.

And nuclear weapons are in everyone's back yard. The assumptions and risks in the present military situation are examined in detail in Chapters Two and Three, but a quick look here indicates the urgency of the problem. At present the United States is manufacturing plutonium, one of the basic nuclear explosives, at the fastest rate in its history. A new plant is being built at Hanford on the Pacific Coast to do so. This at a moment when the weapons in the United States stockpile have an explosive power roughly equivalent to 35 kilomegatons (35 billion tons of TNT). This is $1\frac{3}{4}$ million times as much explosive as the 20-kiloton (20 thousand tons of TNT) bomb dropped on Nagasaki, or enough bang to provide 10 tons of explosive for everyone in the world. In the form of TNT this much explosive power would fill a string of freight cars stretching from the earth to the moon and back 15 times. Since the Soviet Union is estimated to have around another 20 kilomegatons in its stockpile, we are in an explosive world.

This nuclear material is not just sitting in the stockpile like gold at Fort Knox. It is in the form of ready-to-go weapons. The B-52s of the Strategic Air Command, when they fly on airborne alert over the United States and Canada, on the average carry 25 megatons, 25 million tons of explosive power, in their bomb bays. (They carry roughly between 20 and 30 megatons, depending on the distance to their targets.) A 25-megaton explosion causes casualties from blast and instantaneous radiation alone, without considering the equally deadly effects of lingering radiation, at 11 miles from where it explodes. (Twenty-five megatons is more than 12 times the amount of explosive dropped by all the bombers in World War II, including the two atomic weapons.) Further, while the figure is highly secret, there is every indication that the Strategic Air Command together with the Tactical Air Command could take off against the Soviet Union, provided they have not been attacked and are given some warning, with between 18 and 20 kilomegatons in a given day.

The 55 kilomegatons in the combined United States-Soviet stockpiles are an incalculable amount of destruction. If both sides were ever able to fire all their weapons at each other, something that for reasons to be discussed in Chapter Three seems highly unlikely, the result would be over 90 per cent population destruction in both countries. Yet even this is still some way from the Death of Earth, or "DOE" reaction. The Death of Earth would occur if enough weapons were fired to produce sufficient radioactivity to destroy all life. Scientific consensus places 55 kilomegatons at about one-eighth of the way toward the Death of Earth, or $1/8$ DOE. Fortunately the amount of fissionable material needed to achieve the DOE reaction does not increase uniformly. As the full DOE approaches, the amount of fissionable material necessary rises precipitously. Thus while 55 kilomegatons is considered $1/8$ DOE, 500 kilomegatons is often cited as only $1/2$ DOE.

The weapon to close the gap between the kilomegatonnage available now and the DOE reaction has already been hypothesized by defense scientist Herman Kahn. Called the "Doomsday Machine," it is a multi-megaton weapon whose cost is placed any-

where from 10 to 100 billion dollars, usually closer to 10. If anyone should want to construct such a weapon, estimates are that it can be built in ten years. The "Doomsday Machine" is not designed to be fired at the enemy. It is triggered in one's own country and in the course of several weeks it takes the enemy's country out along with everything else. It is the ultimate weapon and the ultimate deterrent. But is a world in which a fair number of nations have such a weapon "secure"?

To stress the risks in the present situation is not to suggest that just any arms control plan is better. The question is one of degree. The dangers in the present, almost uncontrolled piling up of nuclear armaments must be thoroughly understood, but so should the dangers in arms limitation and control plans. Risk must be balanced against risk. Under a close look, and such a look is given at a few current plans in Chapter Five, many disarmament proposals, such as general and complete disarmament or unilateral abandonment of atomic weapons, will be found not only to endanger the values of our society but actually to increase rather than decrease the chances of a nuclear war. Other measures discussed in later chapters of this book actually do appear to reduce the possibility and destructiveness of war without throwing United States security out the window.

Prior to the first atomic explosion at Alamogordo, it could be said that arms races were more the symptoms than the causes of national distrust. Negotiations to limit arms were like treating smallpox by putting calamine lotion on the spots. Today it is still true that the arms race is in large part a symptom of division among nations, but the tensions created by its higher level and greater danger are themselves a definite cause of international instability. A long reduction of tension between the Free World and the Communist would bring about a reduction of armaments. But some forms of arms control would help reduce the tensions themselves and help lead to more cordial relations.

The term "arms control" rather than the word "disarmament" has been used deliberately. "Disarmament" has picked up quite a bit of vague emotional baggage in its somewhat checkered

career. Its concern is the actual reduction of arms and military forces and its goal, customarily, is the absolute elimination of all forces. Arms control is the direction of a country's military policy to reduce the likelihood and violence of war. Disarmament may be part of an arms control plan, it usually is in its final stages, but not necessarily. Paradoxically, as later chapters will show, the controlled development of some particular new weapons and forces may sometimes be more productive of world peace than disarmament. Indeed a portion of today's crisis stems directly from the uncontrolled disarmament of the United States following World War II.

A great deal of time can be spent defining exactly what arms control is. Several highly respected treatises on the subject do so. But when the verbal smoke of several chapters has been cleared away, the suspicion remains that arms control has merely been defined as a "good thing."

Arms control, like national defense, is a deliberately broad term. For example, better schools and higher teacher salaries for America come under the heading of educational policy. But both also contribute to the United States' ability to defend itself and therefore have some bearing on defense policy. So warning against surprise attack, providing for evacuation of cities, making missiles secure against a nuclear attack, while primarily all defense measures, can also be important parts of arms control, along with such more traditional concepts as weapons limitation and international inspection. Indeed as the book develops it will be seen that arms control is not something apart from national defense. It is not a question of defense or arms control. Rather arms control is part of a national security policy. With a concept as new as arms control it is probably unwise to seek a precise definition. The test of arms control is whether it produces tangible results. And reality has a habit of shaping its own definitions.

The basic need for examining arms control springs from the real danger that nuclear weapons with all their present and future killing power will be used in a major war. But the consideration of arms control is forced on America for other reasons.

Like it or not, arms control will be continually under discussion in the world's forums. The peoples in the smaller, underdeveloped countries want the menace of atomic war lifted from over them so desperately that they will listen to any pied piper with a plan. And from the Stockholm peace appeal to outlaw atomic weapons to their mid-1960 proposal for general and complete disarmament "within four years or during another period agreed upon—and under effective international control," the Soviets have shown themselves master pipers.

America must have proposals too, not just to compete with the Soviets, but because the world expects a moral nation that developed the nuclear weapon to have proposals. American proposals can either be meaningless propaganda exercises, so that the United States joins the Soviets in a mutual effort to flummox the decent aspirations of mankind, or they can have substance for which America can argue with conviction, knowing that if they are accepted they will be workable and beneficial.

Before they are presented to the world, American proposals require careful preparation. The proverbial 20-20 hindsight indicates that acceptance by the Soviets of President Eisenhower's "open skies" proposal made at Geneva in 1955 could have contributed to a major American disaster. The proposal called for an exchange of blueprints of military installations between the Russians and the United States, the blueprints to be verified by mutual aerial inspection. At that time the B-36s, B-47s, and some thirty B-52s of the Strategic Air Command (SAC) were crowded together on some thirty airfields. There was a shortage of funds, personnel, extra air crews, and necessary spare parts for airborne alert, and no structures to store the planes underground.

The "open skies" proposal would have assisted the Soviets in pinpointing the location of all SAC planes. The Soviets with their bombers then had the nuclear capability to hit the airfields and destroy the planes on the ground. The added information from "open skies" would have increased the temptation of the Soviets to strike first. The President at the time he made the proposals had not been adequately informed about the readiness of SAC.

Disarmament proposals, like good champagne, require careful processing.

Not only do the people in the neutral, underdeveloped countries passionately want to discuss disarmament, but public opinion in America and the Atlantic Alliance, particularly in Great Britain, continually presses for new solutions to the problem of nuclear survival. If American official policy is barren of workable proposals around which people can rally, all sorts of bizarre schemes of undoubted appeal but dubious value or worse attract national attention. If these proposals divide or weaken the Free World, the Soviets will be quick to exploit them. Yet such debilitating plans are bound to appear and absorb the national energy unless American proposals are put forward.

The shadow of Red China broods over every discussion of arms control. The picture of Red China in 1970 that appears in the best United States intelligence estimates is horrifying even for the kilomegaton era. By 1970 the heavy industry of Red China will have developed to a point where it will be greater than that of India, Japan, and all her other non-Communist neighbors combined. By 1975 her output should be roughly comparable to that of Russia today. And this industrial complex will perch on top of a vast rural slum in which the peasants will still exist close to starvation. Figures on future growth of a country like Red China where so much is secret are always speculative, but where some check is available, as in coal, cement, oil, and electrification, the results are already spectacular.

Red China already has an army of 2 1/2 million men, the largest after Russia's in the world. It has vast organized reserves and militia forces, and an expanding air force, including 1800 jets. By 1970 it appears likely there will be placed on top of this a nuclear capability that will not fall too far short of the Soviets' today. And the leaders of this society have minimized birth control measures so that their population should jump from the 600 millions to the 800 millions in the next ten years. With such a population explosion Red China's leaders can be expected to shrug off the expense of nuclear war in terms of human lives. The

prospect of a bellicose, unsatisfied Red China as a major nuclear power is not appealing under any circumstances; but in a non-arms-controlled world the prospect is appalling.

It is not pushing plausibility too far to envisage in 1970 the leaders of Red China seated around the conference table listening to the Party Chairman as he says, "Comrades, we know we are superior in doctrine to everybody else, we know we work harder, yet we were held back so long by the colonial powers, including both Russia and the United States, that the harder we work now the more we fall behind. This way we won't catch up. But comrades, if strategic nuclear war came and we all started equally from the radioactive rubble the morning after tomorrow, then which would be the country of the future?" And even if after such a meeting the Red Chinese did not go out and push the buttons, the possibility that they might gives them vast capabilities for blackmail.

Many consider arms control plans a waste of time because they are impossible of fulfillment. But one school of thought goes even further and sees discussion of arms control as positively harmful for America. Those who feel this way argue that not only are arms control plans unworkable, but discussion of arms control plans cannot help but weaken the moral resolve of the West to fight if necessary. And on that resolve rest both the defense of the Free World and peace. The mere consideration of arms control is apt to be, they feel, a form of dangerous unilateral disarmament.

There are elements of truth in these arguments. In large measure peace does rest on the ability and willingness of the West to defend itself. Many arms control plans are Utopian, won't work, and do endanger the West. But not all plans. Not to consider arms control for fear the discussion will undermine the nation's resolve is to attribute to the United States a determination to suffer for its ideals of mouselike proportions. In humans a response whose basis is so insecure it cannot stand conscious scrutiny is decidedly unhealthy. Similarly, to depend for national survival on an attitude built on such a slight foundation that alternate solutions cannot be examined is to depend ultimately on weakness.

Like it or not, in the latter half of the twentieth century we all live on the frontier. It is a frontier from which there is no retreat to a more civilized rear. And the hostile tribes are armed with the same weapons as ourselves. There is constant danger, if we are bellicose, if we are passive, if we panic. No matter what we do we may have to use our weapons, even if we have arms control. But hopefully with arms control the possibility that nuclear weapons will be used diminishes.

At some instant perilously close to the start of the nuclear exchange, if not before, both the East and the West may decide that arms control is to their advantage. Should this happen it behooves America to have a plan ready. If the world situation deteriorates and war comes, the fact that America has tried conscientiously and genuinely to control nuclear weapons will greatly affect the moral fortitude with which the nation faces that dark hour and so perhaps influence the result. If, on the other hand, a conflict should arise after arms control has been in force and been even partially successful, the conflict may be limited to at best a non-nuclear local war, worse, a major war in which nuclear weapons are not used, or, at the worst, a major nuclear exchange that while devastating both East and West still spares large portions of mankind. In the kilomegaton world arms control does not have to guarantee perpetual peace to be successful.

CHAPTER TWO

The Armed World Today

IT SEEMS INCONGRUOUS TO LEAD INTO A STUDY OF ARMS CONTROL with a discussion of defense, military strategy, and weapons. It is as if one had started a book on monasticism by describing the joys of the flesh. But in order to know where America should go and what arms control should aim at, a basic understanding of today's military picture is necessary.

The picture is simple and should not be as difficult to put together as it is. However, unfortunately, information about America's defenses is not only confused by secrecy but also clouded by political charges, interservice rivalry and industrial salesmanship and advertising. During a Congressional debate on the defense budget a general from the Strategic Air Command (the bomber force) testified that no matter what air defense did, the bomber would always get through. A few days later a general in the Air Defense Command testified that no bombing attack could possibly succeed in the face of a determined, well-planned air defense. In the fight for the public's funds, the public often ends up bewildered.

The theory around which American strategy is organized today is "deterrence." Deterrence is keeping the enemy from doing

what he wants to do to you through fear of what you will do to him if he does. The key fact about deterrence is that it is a psychological as well as a military concept. It rests upon a state of mind in the Russians and Red Chinese. The primary goal of America's building up its forces is not to defend a piece of territory, or keep the seas open, or defeat the armed forces of the enemy. These are halfway houses. First, United States nuclear forces exist to deter the enemy from ever using his nuclear forces. Second, they exist to deter the Russians from many less serious aggressions, such as annexing Berlin.

There is some element of deterrence in all forces. The same Nazi Panzers that overran France also deterred the British from a cross-channel attack until the Americans and the British had built up massive armies. Deterrence as it actually applies, as with the application of most concepts, is a question of degree. But the Nazi Panzers existed primarily to defeat the enemy forces in battle. Today the majority of United States weapons are not based on the concept of defeating the Russian forces. They are not designed to battle Russian forces. They are designed, and the distinction is vital, to stop the Russians, deter them from ever using their forces, because of the punishment Russia itself will suffer if she attacks.

To approach the problem from another angle, for since deterrence is the theoretical cornerstone on which America's present defense rests it must be understood thoroughly: according to the doctrine of deterrence, the Russians refrain from taking West Berlin not because the West has the forces to defeat them in Germany, which the West does not, but because America has the forces to devastate their homeland.

Since deterrence is a psychological concept, it will work only if the Russians and the Red Chinese are convinced they will be hurt if they attack. The conviction they will be hurt has two parts. First, they must be convinced that at the crucial moment America will use its weapons. Second, they must believe that American weapons can reach them in sufficient numbers decisively to hurt them. At present there is room for doubt on both counts.

And American efforts to dispel these doubts alarm the United States allies and increase the tension in the world.

Since 1952 the United States has been relying almost exclusively on the Strategic Air Command (SAC) to deter the Communist world from attacking either the United States or its allies. From 1948 to late 1949 the United States also relied on SAC plus its then atomic monopoly. Between 1950 and 1952, deterrence having failed to stop the Communists from invading South Korea, the United States was relying on SAC plus a hastily expanded ground force. While, as was said, there is some degree of deterrence in all forces, primarily the ground forces and their supporting aircraft in Korea were not deterring the enemy from attacking; they were beating him when he attacked.

While the UN forces were fighting in Korea, other factors were at work on the enemy to deter him from expanding the war in Asia or Europe. Paramount among these factors were the growing strength of NATO, the existence of SAC, the determination shown by the United States to fight in Korea, and United States ability to win limited, high-explosive wars because of resources in skilled manpower and industrial capacity.

There has been a great deal of argument over the simple facts of what went on in Korea. The argument has been fanned not only by politics but also by the individual armed services trying to prove that they did it all. The shouting and the counter-shouting were unnecessary, for the facts are plain. The deterrent failed to prevent war. (To claim it didn't fail is to argue Korea wasn't a war.) Once war occurred, the deterrent worked to impose certain limits on the conflict, and that is a great deal.

Unfortunately, the shouting over who did what in Korea obscured a vital fact. The weapons that had been built to deter war, the bombers of the Strategic Air Command, had done just that until they failed and the Korean war started. Then they could do no more. Once the deterrent had failed and a less than total war had started, it became necessary to fight that war with other weapons. It would be wonderful, just as perpetual Christmas would be wonderful for children, if a weapon could be designed

that would both deter general war and then fight a small war if the deterrent failed. Unfortunately, in this age of specialization such weapons don't exist.

Note that this inability to use strategic weapons in anything but a major all-out war occurred in Korea even before the Russians had enough nuclear weapons to reply in kind to American use of nuclears, either inside Korea or out. By 1958, at the time of the Lebanese crisis, when the Russians had enough nuclear weapons to threaten America and Europe directly, the United States went out of its way to restrict its nuclear forces, strategic and tactical. The United States met the Lebanese crisis with airborne soldiers and seaborne Marines. The Strategic Air Command was deliberately kept away from the area, and the Army was even forbidden by presidential order to land any of its short-range rockets that might possibly carry a nuclear warhead.

The implications of relying exclusively on nuclear weapons, particularly strategic nuclear weapons, to stop all forms of aggression have still not been fully realized. The great increase in world tension and likelihood of all-out nuclear war resulting from such a policy, particularly as more and more nations possess nuclear weapons, are of such critical importance that this policy is examined by itself in the next chapter. At present we need to examine an equally disturbing lack in America's strategic forces that decreases their ability to deter safely even all-out nuclear war.

After the Korean war the United States again reverted to the policy of relying for practically all its military strength on its strategic nuclear striking force, SAC. This was the policy of massive retaliation, first spelled out by Secretary of State John Foster Dulles in January 1954 and later refined to the concept of deterrence. The nuclear bomber force of the United States was built up. From taking only 35 per cent of the military budget in 1953, the Air Force rose to taking 46 per cent in 1960. The Army, which had gotten 38 per cent of the budget in 1953, dropped to getting 23 per cent of a budget 2 1/2 billion dollars smaller by 1960. In

the same year SAC alone got 20 per cent of the total defense budget or just 3 per cent less than the entire Army.

This was the famous policy of "more bang for a buck." This policy, combined with the concept of deterrence, placed America in its present military position. It implied that forms of defense other than those which maximized the bang could be held down, since the big bang would scare the enemy from attacking. And such is the time it takes to build new weapons that America must stay in the position it has been placed in by this policy for several years. The problem now is to understand where we are and formulate policies that bring us out into a more stable world.

On the surface, just by its name the policy of "more bang for a buck" raises certain questions about itself. Does it not give the advantage to the country with the fewest bucks, the Soviet Union? The more it is examined, the more the question arises: What does the policy actually buy? If a man has been taking a beautiful, svelte, willing blonde to "21," and is thrown over and winds up taking a fat, pimply girl out for a hamburger, he may console himself with the thought that he is getting more girl for a buck. But an outside observer might be more struck by other differences. In what position is America?

The Vulnerable Deterrent

The United States relies primarily for deterrence today on the soon-to-be-retired B-47s and newer B-52s and B-58s of the Strategic Air Command. There are some 2500 of these planes scattered at some 40 SAC bomber bases throughout the world. The critical, little-understood fact about this deterrent force is that Soviet missiles have made the bombers of the Strategic Air Command, as they sit on the ground at their bases, extremely vulnerable to Russian attack. It now appears they always were greatly more vulnerable to sneak aircraft attack than was thought, but this is past history. While there is a reasonable amount of

security around the bases, the location of the bases is not secret. Missiles can target them and reach them.

Until recently the extreme vulnerability of the nation's strategic bombers went almost completely unrecognized, even by the Joint Chiefs of Staff. The fifteen- to thirty-minute ground alert for a portion of SAC's bombers was not even put into effect until 1958. President Eisenhower himself, when his celebrated Gaither Committee reported to him in 1957 on the vulnerability of the Strategic Air Command, refused to believe the report and asked the committee to check again. The committee rechecked the length of time it would take to get a substantial number of United States bombers off the ground and came back with additional evidence. Then Eisenhower was convinced.

Prior to that time the President, along with most United States defense leaders, had thought that a significant portion of SAC, enough to damage the Russians seriously, could be in the air and therefore safe from Russian attack in a matter of minutes. In actual fact, this ability to get sufficient SAC bombers rapidly into the air existed only if the United States had received a week's warning of the possibility of a Soviet attack. With such warning the planes could be fueled and bombed up and the pilots gotten ready. Without such warning it would take close to a day to get the necessary bombers airborne. The strategic defense of the United States was based on receiving intelligence information that the Soviet Union's strategic air command was preparing to launch a nuclear strike. The danger in relying on anything as intangible as this went unrecognized.

The vulnerability of U.S. forces has slightly decreased today. However, now the Russians have the intercontinental ballistic missile. The missile flight time from the Russian bases to the SAC bases in the United States is, on the average, twenty-five minutes. Planes and unprotected missiles on the ground are vulnerable to 3 pounds per square inch of overpressure. (This is written 3 psi and is about the force of wind that occurs in a hurricane.) The present largest Russian missiles have a ten-megaton warhead which produces 3 psi, the necessary overpressure

to destroy unprotected planes and missiles out to 11 1/2 miles from its point of burst. As of today, the missile is accurate to within a mile.

This extreme vulnerability of SAC's missiles and planes to Russian attack greatly increases the instability in the world and the possibility of an all-out nuclear war. Perhaps the most frightening aspect of the situation is the temptation offered the Soviets. If they can destroy SAC, they are home more or less free. For example, it takes three Polaris submarines, each loaded with sixteen missiles, to equal the megatonnage of the bombs carried in one B-52. And as long as SAC is as vulnerable as at present, the opportunity is always there for the Soviets to take.

Realizing belatedly that the Soviets have the ability to destroy an unready SAC, the United States is forced to take frantic, expensive measures to reduce the vulnerability of the strategic force. And these measures in turn increase our hostile posture, frighten our allies, cause the Soviets to take additional protective measures, and so sharpen the world tensions and undermine our alliances. The dangerous instability of the world is thus increased both by the vulnerability of SAC and by the measures the United States is forced to take to counteract that vulnerability.

To overcome the extreme vulnerability of its bomber force to Soviet missiles, the United States has allocated the funds to place one-eighth of its bombers on "airborne alert." A portion of these are in this status already. These planes of SAC cruise in the air for extended periods of time with their nuclear bombs ready to go. This is expensive, though necessary, in terms of spare parts, extra planes, extra crews, and gasoline. Other plans call for taking SAC bombers off their military fields and stationing them at the commercial airports of the major United States cities that have long enough jet runways to handle them. This cuts down on the vulnerability of SAC by increasing the number of targets the Soviets must hit. It also makes targets of all United States major cities, but in all probability they were already that anyway.

In addition to these measures, a portion of the nuclear

strike capability has been given to the single-engine fighters of the Tactical Air Command. These single-pilot jets stand with their nuclear weapons ready at the ends of runways around the borders of the Communist world from West Germany to Japan. Some are just twenty minutes away from their targets. With them are the various limited-range missiles the United States has sent abroad, the Thors in Great Britain, the Jupiters in Italy and Turkey, and the Matadors in West Germany. By the sheer number of their locations these weapons make it more difficult for the Soviets to be certain that they could damage the United States nuclear force sufficiently with their first blow to escape reasonably free themselves.

However, all these weapons remain vulnerable to Soviet attack. In the language of the trade they are "soft." They are the sort of weapons a country would build that was not worried about being attacked first, a nation planning to strike the first blow. It must seem strange to the Russian rulers that while America is committed never to strike first, and there is evidence the Soviets believe this, the United States builds soft weapons, the logic of whose use dictates that America plans to strike first. Or do the Soviets realize the truth, that America just has not understood the problem?

Equally important, soft weapons cannot have very many safety features since they have to be ready to react instantly. Since America's bombers and missiles cannot afford to be caught on the ground, the planes must be airborne and the missiles prepared for firing at the first hint of an alarm. Hence the elaborate radar warning lines DEW and BMEWS (Distant Early Warning and Ballistic Missile Early Warning Systems). At the suspicion of an attack there is a mad scramble to get planes aloft and safe. Once the planes are aloft, "fail-safe" systems must operate so that they return to their bases without attacking in the event of a false alarm. Several such alarms have already occurred. Making the situation even more tense is the fact that if SAC is "scrambled" and sent aloft on a false alarm or ruse, for the

next one to three days it is "down," refueling and refitting on the ground and therefore extremely vulnerable.

The Russians in their turn, with their own forces also vulnerable and realizing that America is ready to strike at any instant, are ready at any instant to strike themselves. So, gulping cups of coffee or mugs of tea to stay awake, the sentinels on both sides constantly survey each other through the dark watches of the kilomegaton night, eyes glued to the radar screen, fingers on the buttons.

Further, the dispersion both sides have been forced to make of their soft weapons, plus the speed with which they must react, makes control of them more difficult. Radio communications are fallible, especially when they must be designed to be secure from enemy interference and work in a matter of instants. So a great deal of power to launch a nuclear strike is in the hands of local commanders. This increases the possibility of a general war's being triggered by an accident, an error of judgment, or a more serious human failure.

While the possibility of a "mad major" starting a general nuclear war is remote, with less vulnerable weapons and more control the possibility could be made decisively more remote. The more insecure the force, the faster it has to strike. The Matador missiles, standing unprotected in Europe, are fired by one man who sleeps beside them. Plans call for the Minuteman ICBM, a secure missile, which when in place in America by 1962 will be protected to 100 psi, to be fired by three men in three different blockhouses going through a complex series of operations.

More bang for a buck has placed America in a strategic situation similar to that in an old Wild West town where the legendary sheriff was slow on the draw. He would have to walk around town with his guns always in his hands. One can see him telling a stranger, "This here is a peace-loving town and I aims to keep it thataway. But I'm a little slow on the draw, which is why I always walk around town with my guns loaded

and pointed at people." Surely one could not be too surprised if the stranger decided to settle somewhere else, especially if the sheriff occasionally had hiccups during elections.

However, if the sheriff is slow on the draw, he has no choice but to have his guns out. Better a hostile pose than dead. America's present posture is hostile and does increase world tensions, but it is better than having the planes vulnerable on the ground, the missiles slow in firing. However, the hope would be that some day the town would get a new sheriff with more skill; or that the United States would modify its policy in favor of forces less vulnerable to attack and therefore not so dangerous in their posture.

Basically, today the United States possesses a first-strike force: a force that is only effective if it attacks first. American forces have not been designed to accept a Russian blow and then strike back effectively. This places temptation before the Soviets and leads to American insecurity. In turn the United States must adopt the only crash programs possible: long-range bombers actually in the air, super-ready missiles, and dispersion, all of which increase the instability of the world.

Interestingly enough, this has come to pass because of a form of arms limitation. The United States adopted a policy of limiting the amount of money it spent on arms to that necessary to maximize explosive power. The extra money was not spent to make United States weapons secure. Were the weapons secure, the opportunity of destroying them would not be open to the Soviets; and United States arms could stay in their holsters like the guns of an expert sheriff.

Secure Weapons and the "Balance" of Terror

The United States at present is moving to make its forces secure. Forces that have the ability to take a nuclear blow and then strike back are known as secure or "second-strike" forces. Obtaining them is the vital first step toward world stability.

For as long as insecure forces remain, the temptation to the enemy to strike first is there. In the nuclear age forces are secured and given second-strike ability in three ways: by hiding, by hardening (digging them in and pouring concrete around them), and by building defense weapons to protect them.

With its closed society, the Soviet Union relies to a great extent on hiding. The secret location of its missile bases gives the Soviet Union much of its ability to survive a nuclear strike and hit back. This is one of the reasons why inspection and overfly such as the U-2 seem so provocative to the Soviet leaders. However, the same secrecy that helps enable them to strike second also gives them part of their ability to mass missiles for a secret first strike.

The United States achieves what second-strike it has through a mixture of programs. The Polaris submarines, each submarine with sixteen intermediate-range missiles aboard, are hidden under the sea. Roughly fifteen Polaris submarines will have been launched by 1963. The next generation of land-based missiles, the Minuteman, is secured in two ways. The fixed Minuteman, 60 feet long with a range of 5500 miles, the first 150 of which will be in place by mid-1962, is sunk into a concrete case in the ground which protects it to 100 pounds per square inch of overpressure, 100 psi hard. The same 10-megaton Russian missile that had to burst within 11 1/2 miles of the soft bombers or the Atlas and Titan missiles to destroy them must land within 1 1/2 miles of the protected Minuteman.

Present plans call for five mobile Minuteman squadrons to roam the country on trains, ten trains to a squadron of thirty to fifty missiles. In this way they will be hidden from the Soviets, since the Soviets can never be quite sure just where the missiles will be at any given moment.

However, neither Polaris nor Minuteman gives much bang for a buck. The dollars spent on them do not go just to maximize megatonnage, but also to give the weapons second-strike ability. The Polaris warhead is roughly 0.6 megaton, as is that of the Minuteman. Hopefully (in the world of arms and arms control

words sometimes assume a certain irony), by 1964 the warhead on the Polaris will be 1 megaton and that on the Minuteman 2. At present the insecure Titan and Atlas missiles have approximately 5-megaton warheads while the B-52 carries an average of 25 megatons. Not all the weapons the United States is presently planning to buy are second-strike. For example, the Air Force continues to push for the exceptionally vulnerable B-70 bomber.

These secure weapons such as Polaris and Minuteman have been criticized as part of a "Maginot Line complex." In fact, they are the exact opposite. The Maginot Line was built to prevent an invader from entering France. The line was designed actually to stop an invasion. Secure weapons mean completely the reverse. They mean that no matter how much of America Russia destroys there will still be enough United States nuclear weapons around to wreak havoc on Russia and consequently make the price of attack prohibitive for the Soviets.

For example, if two-thirds of the planned 1963 force of fifteen Polaris submarines survived, they would be able to fire ninety-six megatons at the Russians, assuming a 0.6-megaton warhead. While this, more explosive than has been fired in all the wars to date, is not much of an attack by modern standards and probably not enough by itself to deter a Soviet attack, it still threatens the destruction of forty Soviet cities, assuming four missiles fired at each city.

With their present insecure weapons, both sides can now strike back at each other even if the other strikes first. But to be able to do so, both have to adopt the super-ready posture already described, with all its tensions and dangers. When both the United States and the Soviet Union have weapons that are reasonably secure against a surprise attack, the risk in striking first will be greatly increased. At the same time the need for super-swift reaction to any suspected attack will be reduced, for a secure missile does not have to be fired until the responsible commander is absolutely certain war has come. The terror will still be there. But with the departure of the decisive advantage of

surprise, the temptation to use it and the fear of its sudden use will have lessened. This is the so-called balance of terror.

Many see in this balance, this system of mutual deterrence, the hope for the continued security of the world. The United States and the Soviet Union will both be able to destroy each other's populations but not each other's weapons. In effect, we are back in the barbarian world where hostages are exchanged. America's population is hostage to the Soviet Union for the behavior of American leaders. And the Russian population is hostage to America for the behavior of their leaders. No matter who starts the war, the hostages may be destroyed. This is a sobering thought. But even in international relations, a field where there aren't many strong reeds, it is a weak reed on which to build hope for continuing peace. Left to itself, the balance of terror is not a stable balance.

Military equations are complex, involving a great many variables. And when to these tangible variables is added the psychological concept of deterrence, the balance of terror becomes more of a phrase than an actual fact of international existence. Some of the destabilizing factors in the balance are so important that they are considered in greater detail later. But they are mentioned here so that the whole complexity of the missile age can be seen.

To begin with, there is no guarantee that the terror will ever move into balance. If, when America begins to have reasonable numbers of secure missiles in mid-1963, the Soviet Union is relying on large numbers of soft first-strike missiles, the situation will continue highly unstable. For the Soviet deterrent will be fully effective only if they strike first. And with vulnerable missiles Russian fears of a first strike by the United States will continue.

Even if the situation were to occur where the secure second-strike forces of both countries created a period of balance, at any instant a scientific breakthrough might destabilize the situation. At present both sides are working hard on anti-missile devices; indeed there is some impressive evidence the Soviets are working

harder than the United States. Unilateral development of an anti-missile device would destroy any balance of terror, for one side could then strike or threaten to strike the other with relative impunity.

Some of the anti-missile devices considered by the United States illustrate how the space age moves into the realm of the truly fantastic. The possibility of putting vast quantities of gravel into orbit in space as an anti-missile defense was seriously investigated. Any intercontinental ballistic missile would be punctured by this mass of orbiting gravel as it fell back toward earth and its target. At fantastic expense, it is technically feasible to get the necessary amount of gravel up there. However, that amount of rock in the sky would have so darkened the earth that a significant change in the world climate would have resulted.

Besides scientific breakthrough, strangely enough one of the most upsetting developments in the balance of terror would be for Russia or the United States to undertake a massive civil defense program, particularly one with facilities for the mass evacuation of cities. For in the kilomegaton age evacuation of cities may have replaced general mobilization as the most provocative step short of war that a nation can take. The perplexing problem of civil defense will be detailed later. Here it is sufficient to point out that a massive Soviet civil defense program would give the Russians a method of removing their hostages before they attacked.

Two other factors that threaten the balance of terror are the dangers of a general nuclear war's starting through accident, and of the expansion of a small war into a major nuclear one. Minimizing these twin dangers is one of the most urgent problems of arms control. The danger of a small war's spreading to a major one, called the problem of escalation, is part of the danger of relying on the nuclear deterrent to prevent minor forms of aggression and is discussed in the next chapter. The possibility of accident, however, is increased by the present insecurity of United States strategic forces and so is outlined here.

At present there are several nuclear accident teams in the

United States on twenty-four-hour duty. A number of times a year the alarm rings and the teams rush out. A Bomarc with a nuclear warhead has caught fire and burned in New Jersey. A Corporal missile with a nuclear warhead has rolled off a truck and into a Tennessee river. A B-47 has dropped a nuclear bomb, of which the high-explosive parts fired, in Florence, South Carolina. These actual examples are not given to cause panic at the danger, but to indicate the possibility of accident exists. United States nuclear arms are designed as safe as possible, but they are still weapons built to go off. There is nuclear explosive on the tips of American torpedoes, in the noses of our anti-aircraft rockets, inside our depth charges, in the half-tracks of the infantryman and in missiles hanging beneath the wings of planes leaving vapor trails overhead.

The balance of terror is also affected by the ever-growing amount of manufactured nuclear explosive. Nobody really understands all the implications of the continued increase in fissile material. How many Doomsday Machines are enough? What happens five years from now when a dozen more nations may have nuclear weapons? How long will it be before the nations of the world, by piling up nuclear stockpiles, have made a Doomsday Machine without realizing it? What does the uncontrolled future look like?

Even if the balance of terror can survive when there are only two major nuclear powers, what happens when there are several more, including Red China? For, in the nuclear age, Red China cannot be ignored. The exact amount of aid Russia has given Red China in her nuclear weapons program, if any, is not known. However, evidence that the Red Chinese Army and Air Force were orienting themselves toward nuclear weapons began appearing as early as 1955. In 1958 Red China officially announced a nuclear reactor was in operation outside of Peking and set up its own atomic energy program. The nation has all the materials necessary to manufacture nuclear weapons and is known to be mining uranium in Sinkiang province and manufacturing plutonium from it. Most experts expect the explosion of a genuine

homemade Red Chinese nuclear device sometime in the vicinity of 1963.

Red China will place her nuclear capability on top of an already formidable force. Her 2 1/2-million army is the second largest in the world. The 2500-plane air force has some 1800 jets, and in back of these ready forces stand vast layers of reserves and militias. And, as already noted, this whole is imposed upon a society whose growing population enables its leaders to accept large numbers of casualties. It is difficult to visualize how the balance of terror will regulate itself when Red China joins the ever-expanding nuclear club. And then what happens in the world of growing nuclear plenty when some of the smaller, less responsible powers make or are slipped a few nuclear weapons of their own?

To leave the balance of terror to regulate itself is to rely on hope, an insecure foundation for national policy and peace. Stability will be achieved only through conscious effort of the major powers, particularly the United States and Russia. One of the most fascinating aspects of United States-Soviet relations today is that almost unconsciously both nations appear to have recognized the need to impose certain restraints on themselves. These present *de facto* or tacit arms control measures are important to examine as indicating the type of first steps toward mutual arms control that is possible. They also show some of the backward steps both the United States and the USSR would be wise to avoid.

There is one outstanding example of arms control in recent history: the United Nations did not bomb north of the Yalu River nor were atomic weapons used by the UN forces in Korea. At the same time, the Communists did not attack either United States air bases in Japan or the United States aircraft carriers operating along Korean coasts.

In the present situation there are a number of moves that both sides have refrained from making that would greatly destabilize the world. Neither the Russians nor the United States have yet furnished their allies with nuclear weapons. The United

States could give nuclears to the Hungarian underground, Turkey, Chiang Kai-shek, Israel, and West Germany. The Russians could give weapons to East Germany, Red China, Egypt, Ghana, and the Algerian rebels. Neither side does.

Both sides could build and test much bigger nuclear weapons. Using the Nova rocket that the United States is planning for its space probe, America could with some effort have several 500-megaton weapons by 1963. So could the Soviets. Possibly both sides are building such weapons; but there is a good deal of evidence that neither side is.

Neither side tests its missiles by firing them toward each other. The Soviets could test their missiles by firing them into the Mediterranean off the Riviera during a French government crisis. They do not. Nor are Polaris submarines tested in the Adriatic. In the air both sides refrain from shooting down the patrol planes of the other, though the Soviets occasionally violate this. The United States does not sink the Soviet trawlers that run radar patrol off American shores.

Neither side practices political assassination of top officials, nor jams each other's internal communications. The United States has refrained from testing nuclear weapons since serious negotiations started on this subject in 1958. Exactly how much the Soviets have refrained from doing in that time is not known, but in any event they have not tested any megaton weapons, since such explosions could have been spotted. Neither side has started a massive underground shelter program for civil defense. These *de facto* controls are minor and are capable of being abandoned at a moment's notice; but they indicate that, where controls are seen by nations to be in their interest, they are possible.

This, then, is the present nuclear weapons world in which Russia and the United States exist. Both sides are relying largely on weapons that are hugely more effective if they strike first than if they strike second. The threat of these insecure, multi-megaton weapons is used by both sides to deter not only an all-out attack on themselves but also other lesser provocations.

The United States relies on them to block Soviet moves in West Berlin. The Soviets threaten to use them against America if America aids anti-Castro forces in Cuba. This brings up the serious questions: In such a world what happens if the deterrent fails? And what are the chances of its failing?

To minimize the chances of the deterrent's failing, the United States in some areas is moving to reduce the advantage of surprise attack to the Soviets by building secure, second-strike weapons. Other moves being made to guard against surprise attack bring their own perils with them. Ahead loom major problems, from Red China to Doomsday Machines. On hand are only the barest of *de facto* controls.

What does happen if the deterrent fails? And when the great nuclear deterrent must be used to defend the entire periphery of the Free World, what are the chances of its failing? For the reduction of terror cannot seriously start in a perilously unstable world. Neither side will trust the other enough to lower its own sword. The first steps toward arms control are steps each side can take unilaterally to reduce the risk of nuclear war and stabilize the world. Then, as the environment improves, controlled limitation, and even reduction, of arms become more possible.

CHAPTER THREE

If the Deterrent Fails

THE LAST CHAPTER HAS SHOWN HOW, THROUGH THEIR VULNERABILITY, American strategic weapons may fail to deter an all-out nuclear strike against the United States; and dealt with some of the dangers the United States has been forced into through efforts to remedy that vulnerability. But the deterrent can fail in another fashion. For the United States relies on the nuclear deterrent not only to prevent an all-out strike against America, but also to contain a less than major emergency: an invasion of Iran, of Formosa, a Communist take-over in Egypt, or the fall of Berlin. These are the areas in which failure of the deterrent appears most likely. This chapter outlines some ways in which such failure may come about and what the results would be.

The present United States policy of deterring all forms of aggression by threat of nuclear strike was succinctly stated in September 1960 by the retiring Chairman of the Joint Chiefs of Staff, General Nathan F. Twining of the Air Force. Said Twining: "The American capability for decisive, war-winning response to any attack must be kept sure whatever the costs. It is the only reliable guarantee of the peace. Forces that cannot win will not deter." On the surface this statement may seem reasonable. But

in the kilomegaton world where the Soviet Union can decisively strike the United States, a man has to define what he means by winning.

Just what would happen if the Soviets made certain moves around the periphery of the Communist world has been the subject of intensive study in Congress, the State Department, the Pentagon, and in some academic circles. Usually these studies take the form of "war games." In war games certain hypothetical situations are established and two teams set up. One team plays the United States, another in a different room plays the Soviet Union. In between are the umpires who decide on the results arising from the various military, political, and diplomatic moves made by the opposing teams. War games, if well played, have the advantage of forcing people to think about unpleasant alternatives. Their disadvantage lies in the word "game." Reality can sometimes vanish to a far remove.

In addition to exploring the results of Communist attempts to nibble at the periphery of the Free World, war games have also faced the possibility of nuclear accident. While the breakdown of deterrence from nuclear accident is less likely than from Communist pressure, the chance of accident is high enough to merit study. In particular there is always the fear that tension resulting from Communist pressure and an accident will combine to produce an extremely critical situation.

As a typical war game example: during the alarms produced by a Chinese Communist diplomatic offensive against Formosa, three United States bombers return to their base on Okinawa after a routine practice alert. Just before landing the tail plane has a flame-out and crashes. In the crash, through electronic failure, a thermonuclear bomb fires. A two-megaton explosion occurs, completely taking out the Okinawa base.

This is the easiest type of situation to cope with as it occurs on a United States base and not over hostile territory. But even here there are major problems. What do the pilots at the ready on the other base at Okinawa do when they see the nuclear cloud start to rise? Wait, or take off for their targets? Their prob-

lem is complicated further because radio communication is apt to be marginal in the confusion following a nuclear explosion. The bomb alarm goes off at the Strategic Air Command Headquarters in Omaha, Nebraska. A nuclear explosion has occurred on Okinawa. What does the duty officer do? Are the Russians about to attack and has one of their missiles fired early? Has one fanatic Red Chinese decided to try and trigger World War Three? Is this a trick to get most of SAC into the air? For if most of SAC goes into the air at once, they must all come down at about the same time, and then for about twenty-four hours while the planes refit and refuel they will be exceptionally vulnerable. Or is it an accident?

As a result of war games in which just such theoretical accidents were staged, changes have been made in United States nuclear weapons so that the duty officer's problem is easier now than it was some years ago. The jet reconnaissance plane dispatched to the Okinawa area will be able to report by analyzing the radioactivity that the explosion was caused by a United States bomb. There would also be a possibility that Soviet intelligence had learned how we mark our weapons, but that is highly unlikely. In any event the military commanders will know after about an hour that the odds are overwhelmingly in favor of the Okinawa nuclear explosion's having been an accident.

Then how does the United States convince the Soviets, first, that United States officers realize it was an accident and, second, that it wasn't a fake accident staged by the United States to provide an excuse to strike? And if there was such an explosion in Russia, how do the Soviets convince the United States it was an accident? These sorts of problems are best solved by an arms control agreement already in force that outlines methods of reassurance under such circumstances.

More likely than mechanical failure is human failure. Commanders, particularly under pressure in times of crisis, do not always follow orders. In 1958 twenty-five French planes bombed the town of Sakiet-Sidi-Youssef in neutral Tunisia near the Algerian border. At the time the French government took full re-

sponsibility for the attack. A week later the French Foreign Minister admitted that the French government, including the Minister-Resident for Algeria, had not known the attack would take place. The local air force commander had decided to make the raid on his own because reportedly the Algerian rebels were using the town as a base from which to infiltrate into Algeria. What happens if some Soviet or Soviet satellite commander takes such an action, with or without nuclear weapons?

Or, broadening the war game scenario, suppose the definite possibility of a Communist uprising in Iran comes to pass. The Shah and a few loyal commanders fight on in the south and appeal to the United States for aid. The United States, recognizing that if Iran goes Communist the entire Middle East will soon follow, and bound by her commitment under the 1959 bilateral defense treaty, scrapes together all the airlift it has at present and flies in two United States infantry regiments from Germany. The Soviet responds by moving three divisions of Kurdish volunteers across the border under the free Kurds' leader, Mullah Mustafa Barzani, who is also a major general in the Soviet Army.

Realizing that they are outnumbered and will be pushed out of Iran before more help arrives, the United States troops block the free Kurdish advance through the mountains of northern Iran with 5-kiloton nuclear weapons (one-fourth the power of the Nagasaki bomb). These are launched from the rockets carried with the two regiments. The Soviets strike back with their mid-range rockets, firing them from outside Iran at the United States regiments, particularly their rocket batteries. Investigation puts the Soviet nuclear explosions in the thirty-kiloton range.

The United States troops are badly hurt, and to save them a carrier strike is launched against the Soviet rocket bases in Soviet Armenia with 100-kiloton weapons. In response, Soviet bombers strike at the carriers with weapons in the megaton range. This is known as the process of escalation, a small war getting bigger and bigger. The question is, how far does the escalation go? How long does the deterrent hold off strategic, all-out war? Who backs down? What should have been done?

All-out Nuclear War

The preceding sketchy scenarios have been taken up to the point of what happens then? But to explore the question of what is meant by winning, one situation should be pursued to its theoretical end under present United States policies and capabilities. One of the most probable and dangerous locations for trouble is Berlin. Let us assume that the Soviets gamble the United States is not willing to fight for Berlin and, using Russian troops, seal off the border between East and West Germany and seize Berlin. The deterrent has failed. Berlin is Russian.

Following its current strategy, the United States realizes that with its neglected conventional forces it cannot dislodge the Soviets from Berlin. United States diplomats warn that if Berlin continues in Russian hands, Western Europe is lost. Each side begins pressuring the other to back down. Finally the United States makes the response it has spent its money preparing for and launches a strategic nuclear strike against the Soviet Union. The exact amount of nuclear explosive the Strategic and Tactical Air Commands combined can lift against the Soviet Union in a twenty-four-hour period is a closely held secret. But 18 to 20 kilomegatons is an estimate that under average conditions is not too far off.

There is no doubt, after the United States delivers an 18- to 20-kilomegaton attack, the Soviets have lost. Between 85 and 90 per cent of their population become casualties in the first sixty days. Their major cities and seven-eighths of their industry are gone. Their leaders have miscalculated the effects of seizing Berlin.

The Soviet satellites also take heavy casualties; just how heavy is open to question, since the majority of these casualties would result from long-term fallout, which would vary in intensity with weather conditions. However, the probability is that, one day out of three, 50 per cent of the population in areas as far away as

Great Britain receive a lethal dose of radiation from the United States attack on the Soviet Union. The satellites, being closer to the Soviet Union, and countries to the south, such as Burma and India, which are downwind under most weather conditions, have significantly higher casualty rates.

This destruction of the Soviet Union would not be quite as great as that visited on Carthage by Rome. The Romans killed every Carthaginian adult male, sold the women and children to slavery, burnt the city, plowed the ashes under, and sowed salt in the furrows. But it would come close, or be of the same order of magnitude, to use the language of our time.

The Soviets would have lost. But has America won? In war games it is often assumed that the Soviets could deliver, as a second-strike capability against the United States, a 2.5-kilomegaton attack. Many feel this is a conservative figure. With each hundred 10-megaton missiles the Soviets produce they add another kilomegaton to their capability. The actual weight of an attack in the mid-sixties can perhaps best be calculated at 5 kilomegatons.

The Soviets can deliver such a large attack because it takes about one-half hour to ready a Soviet missile for firing. The Soviet radar stations along the Russian border and in the Arctic, plus the picket ships in the Atlantic, will pick up the bombers of SAC about 250 miles out. This gives the Soviets more than ample time to ready and fire their missiles. These missiles, in addition to being targeted against the SAC bases, United States atomic plants, and some major cities, also would probably take out portions of the United States Air Defense. Through these Air Defense holes those Soviet bombers which got off the ground would fly to attack their United States targets.

A 5-kilomegaton attack against the United States in the present state of civil defense preparation will kill about 140 million people, between 75 and 80 per cent of America's population, in the first sixty days. A lesser amount of nuclear explosive does much greater damage to the United States than to the Soviet Union because of America's geography, urbanization, and weather pattern. The number of dead will continue to rise over a further period as

long-term fallout, epidemics, lack of shelter, food, and medical supplies all take their toll.

There is always a great deal of dispute as to how many people are killed by fallout. The immediate blast and radiation effects, short-term gamma deaths, are easy to measure. But long-term fallout so depends on the material in the nuclear bombs, the height at which they are exploded, and weather conditions on the day that any figure is open to argument. The lethal dose, or LD, of radiation depends not only on the intensity of the radiation but on how rapidly the individual absorbs the radiation and for how long. The lethal dose or LD is expressed like this: 30/LD/50. If this particular ratio applied to the reader it would mean there would be a 50 per cent chance he wouldn't be around at the end of thirty days.

With luck and some more civil defense protection than now, 60 million Americans might well survive a 5-kilomeгатon attack, be able to grow food in non-contaminated areas, and bear children. A few of the children would be stillborn, perhaps as high as 8 per cent. One never knows quite how to present such figures as these. Facts are usually best presented dispassionately. Yet when such facts as these are presented dispassionately one is accused of being everything from a paranoid to a militarist.

In addition to the numbers of people left, there is the whole question of what sort of world the survivors would face. Here the experts disagree. Some, pointing to the fact that Norway and Finland survive successfully on populations of around 7 1/2 million, see successful patterns of civilization being re-established within a generation or two. Others believe the environment in the shattered radioactive world would be far more hostile. Civil defense measures certainly make a difference, but unfortunately there are also countermeasures to civil defense. Many who study the problem most oscillate in their views of what the post-attack world would look like.

Perhaps the best comment to make on the post-attack world is to look at one of the problems of that environment being seriously considered by Air Force scientists. Most post-attack

problems seem unbelievably macabre by pre-nuclear-attack standards. This particular problem concerns the minimum age at which Americans will be forced to eat the heavily contaminated food from radioactive farm areas. The least contaminated food is obviously restricted for children and nursing and expectant mothers; the next best for the people who can work hard. But there is not going to be enough of either of these two types to go around. Someone is going to have to eat the less desirable food. Probably the best age to start issuing ration stamps that entitle the consumer only to contaminated food is forty. After forty there isn't much calcium deposit in the bones, so that the danger of bone cancer is lessened. At any rate, bone cancer takes twenty years to form and in the post-attack world it is questionable how many survivors will live past sixty.

With 80 per cent of America's population dead and the survivors facing such problems, has America won this particular operation?

There are some definite replies to that rhetorical question. America hasn't lost. If the survivors, on picking their way out of the radioactive areas, had found themselves slaves to an only partially damaged Soviet Union or Red China, they would have lost. In the kilomegaton world it becomes more difficult to win, but it is still easy to lose. Nor has this attack come close to the Death of Earth, that moment when mankind pushes the extermination button. To approach one-eighth of the way to the DOE requires at least the almost simultaneous detonation of the entire United States and Soviet stockpiles, some 55 kilomegatons. In the exchange just considered, only 23 kilomegatons were used. Both sides used less than half their present stockpiles of nuclear explosive. It is such results as this that cause the experts to question whether either side will ever fire anything approaching close to all their weapons at each other.

Because of the extreme difficulty in predicting the long-term effects of fallout, there is no agreement on where the Death of Earth occurs. Ten thousand kilomegatons is a figure often used. But its accuracy is open to question. Trying to kill all life by nu-

clear radiation is like trying to put out a raging fire with water. A few bucketfuls of water undoubtedly dampen a few embers but one cannot see much difference. A few tons of water bring the fire under control. But to extinguish the last ember deep in the smoking ruins requires many extra tons more. This metaphor is at best only moderately consoling.

Is There a United States Nuclear War Policy?

These ultimate results of what logically follows if the nuclear threat fails to deter the Soviets from annexing Berlin have not been presented to argue that America abandon either Berlin or its strategic weapons. Berlin is part of the Free World and the key to Europe. United States strategic nuclear weapons are necessary to deter a nuclear attack against either America or its allies. But the results of the failure of nuclear retaliation to defend Berlin are important in deciding whether Berlin is best defended by threat of nuclear retaliation. Or is American security and the prevention of nuclear war best assured by meeting less than major aggressions, such as Berlin, by conventional forces equipped with high explosive?

As late as October of 1960 the United States Air Force and the Bureau of the Budget were in effect urging that the United States meet all threats by relying on the strategic nuclear threat. Both then argued in favor of further reduction of the United States conventional arms and soldiers in Europe and total reliance instead on air-delivered nuclear strikes. Their argument was the old one that it made no sense from "a purely military point of view" to plan to use anything but the most powerful weapons that America possessed. The implication was plain that any other point of view was politics and not worth much.

Probably arguing from "a purely military point of view" never made sense. Clausewitz, who wrote that much quoted but largely unread military bible, did not think it did. Certainly in the nuclear era, when the nuclear front is everywhere, when the

entire population is in the front lines, there is no longer a purely military point of view.

Nuclear weapons can now devastate America. And the destruction or survival of America is a political decision. There is therefore no difference between political and military goals. What makes sense from a purely military point of view, such as relying on nuclear weapons and reducing United States ground forces in Europe, has come to make no sense, period.

After looking at what will happen in a major nuclear exchange, the question arises: Does America really plan to use its nuclear arms if the deterrent fails to halt some Communist aggression short of an all-out attack? This is what the United States has said publicly that it will do. This is what United States plans and weapons are designed to do. This is what America has spent its money on. The belief that America will do so helps hold the Soviets in check. But is it what the United States actually will do if forced to act by the fall of Berlin or the invasion of Formosa? Or can Khrushchev possibly mean it when he says he will defend the Castro regime in Cuba by firing missiles against us? Both sides at certain times put their hands over their hearts publicly and swear they will answer minor violations of the peace with nuclear strikes, but will they?

There are definite physical signs that indicate America won't. If the United States is seriously preparing to launch this sort of attack if provoked, then the United States must logically also be preparing to receive a surprise strategic nuclear attack. For if the Soviets are convinced that they will be attacked with nuclear weapons if they attack anywhere on the periphery like Berlin or Iran, then before they attack on the periphery they will first try to destroy the United States. Only in that way can they attack the periphery with relative safety.

Yet the previous chapter pointed out how vulnerable American strategic bombers and missiles were to surprise attack. If America were really prepared to launch a strategic nuclear strike to defend all parts of the Free World, it must have occurred to America's leaders that, if the Soviet believed us, the chances of

their launching a surprise attack against us were quite high. America has said it would never strike first. America has declared the Free World's periphery would be defended with nuclear weapons. Yet America has not prepared to fight the type of strategic, nuclear war that must logically result from these two statements.

It is not only United States strategic weapons themselves that are unprepared for surprise attack; the command channels to control them are not designed to function in a nuclear war. The Joint Chiefs of Staff war room in the basement of the Pentagon, from which the war would be directed, is only protected to about 10 pounds overpressure from blast (10 psi). This makes it little better than an ordinary home bomb shelter. Not only is it vulnerable to a Russian missile bursting five miles away, but one of the major storm sewers of Washington runs close to the war room. In the event of a nuclear attack the chances are good that this sewer would fracture, flooding the JCS war room. This is hardly the command post a nation that must expect a surprise attack would prepare.

Tunneled into the sides of a mountain, another "secret" hide-away has been prepared for the Joint Chiefs and the President outside of Camp Ritchie, Maryland. Signs point to it so you cannot miss it in an emergency. Plans have been made to airlift the senior members of the Joint Chiefs and the President there by helicopter, taking about two hours. The more junior members with the vital war plans, code books, and combinations to the safes, make their own way there by car. The average flight time of a Soviet ICBM from firing to target is twenty-five minutes.

There are other revealing lapses, conscious and unconscious, in America's preparations to fight the war it claims it is prepared for. The nation is "protected" against attack from Russian bombers by a vast electronic system of interconnecting anti-aircraft stations stretching from coast to coast called SAGE (semi-automatic ground environment). The vital parts of this system are not protected against blast in any way. A good hurricane will knock them out. This system, meant to detect and destroy Russian bombers,

was not designed to and cannot perform after the system itself has been under nuclear missile attack.

The Strategic Air Command contracts for expensive computers to help them fight the war and then places them in underground shelters which are completely vulnerable to Soviet missiles. The civil defense program and the anti-missile defense program, two vital projects if America were actually going to rely on a strategy that makes surprise nuclear attack against the United States likely, dawdle along with little military, Congressional, or public support.

So the question returns: Will America actually respond to less than major Soviet aggressions with an all-out nuclear strike or with actions that make escalation to all-out nuclear war likely? And if the answer is yes, in view of the disaster to the country—though the disaster for the USSR might be far worse—does the United States want to continue to plan to defend the periphery this way?

At the present time there is nothing much else America can do. The twenty-one NATO divisions in Europe, including five United States divisions, cannot cope with a Soviet thrust at Berlin. They cannot respond to another Hungary, if they should want to. The three divisions in strategic reserve in America, though crack divisions, lack the airlift necessary to move them.

At the same time, a great many brave men, from Norway through Iran to Indochina, have staked their lives on United States obligations to defend the periphery. These are obligations that must be honored even at the cost of over 80 per cent casualties to the United States. But while America prepares to stand by its commitments, it might look for ways of honoring them short of mutual catastrophe. To build the ability to do this may seem like a purely military measure, but it is legitimately part of arms control, for it greatly reduces the threat of general nuclear war. And this is a primary objective of any arms control plan.

The problems and possibilities of building a non-nuclear answer to meet limited Communist aggressions will be dealt with in Chapter Five on the first moves toward arms control. Here it

is important to look at some of the alternate plans currently proposed to escape the necessity of meeting every Communist challenge with threats of an all-out nuclear strike. For these proposals form part of the philosophy of United States defense today. These plans recognize the devastating nature of an all-out nuclear exchange but try to limit the exchange rather than find other methods of dealing with the aggression. The plans have about them a surface air of unreality which on closer examination seems to permeate their entire being. But they are being advanced seriously and so should be looked at.

Basically, all these plans are based on careful selection of the targets to be attacked (limitations of targeting doctrine), or the weapons to be used, or both. In the most general form the nuclear attack on one country by another is restricted to strategic military objectives, airfields, missile sites, atomic plants. Since both Russia and America are moving to protect these targets by hardening, digging them into the ground and/or putting concrete around them, these military targets will have to be attacked by ground-burst nuclear weapons to be effectively destroyed. An attack in this fashion maximizes the amount of fallout, since debris is sucked up into the thermonuclear cloud to be deposited later.

For the United States the present difference in casualties between a 5-kilomegaton attack directed just against military targets and one of the same size directed against military targets plus cities is roughly 25 per cent without civil defense, or 90 million killed instead of 140 million killed. It is no small thing to save 50 million people; but for the nation as a whole, how significant is this targeting doctrine?

Also at the present time the Soviet Union could not possibly afford to make even this slight distinction in targeting the United States. For, as previously mentioned, the United States plans to offset the extreme vulnerability of its bombers on the ground by taking many of them off their military airfields and dispersing them to the municipal airports located at the edges of America's major cities. The cities are thus military targets. Also many of the new hardened missile bases are being placed upwind

from major United States cities. These are the targets that must be attacked by ground-burst thermonuclear missiles which produce the maximum fallout. So once again the population of the cities cannot escape through some targeting limitations.

The most "sophisticated" form of the nuclear target selection is the intercity exchange. Under this concept, if the Soviets attacked Berlin the United States would announce that they were going to knock out one Soviet city, say Rostov on the Don, to show they mean business about protecting Berlin. After the Soviets had time to evacuate the city it would be destroyed. The Soviets would come back and knock out a United States city of the same size, say Buffalo. Both sides would keep trading cities one at a time until either American or Soviets cried enough and backed down.

Fortunately or unfortunately, the world does not run in such a rational fashion outside of universities or war games. In this irrational world, the possibility that either Russia or the United States will answer the first limited nuclear strike with everything they have will always be great enough to block use of such target selection systems.

Another doctrine proposed to avoid the consequences of an all-out nuclear exchange has been that of the blunting attack. This is the doctrine of pre-emptive war, that twin sister of preventive war who has changed her name as an aid to public acceptance of her nefarious business. There are two important comments to make about pre-emptive war. First, it won't work. It will not work because in the missile age, unless one side falls gravely behind, both sides will always be able to launch enough of their missiles to heavily damage the enemy even if attacked first. Second, the mere indication that pre-emption might be United States doctrine increases the temptation of the Soviets to pre-empt the pre-emption. If America and the Soviets are both committed to the doctrine of pre-emptive war, then in any major crisis each will look for the other to pre-empt and strike first. This increase in mutual trigger-happiness makes the chance of an all-out nuclear war frighteningly greater.

To limit or control the nuclear strike is not the answer to dealing with aggressions short of all-out war. What is necessary is to create other methods of defending Berlin, Formosa, Iran. When this has been done, the danger that any less than major provocation may explode into an all-out nuclear war will have been greatly reduced. And since America will then no longer have to rely on nuclear terror to defend the periphery, that terror itself can start to be reduced without increasing the chances of a Russian grab at such spots as Berlin and therefore of all-out war.

Then all the strategic nuclear deterrent will have to deter is major aggression by the Soviets or Red Chinese against America or its allies. The use of the United States nuclear strategic force to meet such an attack is logical. Therefore, America need no longer be bellicose about the deterrent. It is only when America must deter peripheral pinpricks with the nuclear strategic threat that the country must continually chant its willingness to use nuclear weapons and build up its nuclear stockpile as an earnest of its intent.

In today's military situation two facts produce the hyper-insecurity that makes limitations on arms presently impossible. There is the vulnerability of America's strategic deterrent, principally SAC, to surprise attack, and the dangers that flow from this vulnerability. There is also the reliance on nuclear war to solve practically all military problems.

As long as either of these two situations exists in extreme form, reduction of arms is close enough to impossible to be classified as impossible. For it is not only the presence of nuclear arms, but the absence of certain other types of forces that contributes to the terror and instability of today's world. That is why the arms controller finds himself in the paradoxical situation of advocating the build-up of certain types of arms as the first step toward arms limitation.

The next chapter shows how little the sorry history of arms control has done to remedy this situation. Then the book turns to possible ways out.

CHAPTER FOUR

The Sorry History of Arms Control

HISTORIES OF ARMS CONTROL TRADITIONALLY BEGIN IN THE SIXTH century B.C., when two bands of Chinese river pirates stopped fighting over who could loot what parts of the Shanghai River and settled the matter by conference instead. This voluntary peace agreement reportedly lasted one hundred years. Few later conferences can boast such success.

Modern disarmament starts at The Hague Peace Conference of 1899, called together at the bidding of Czar Nicholas II of Russia. The conference produced no significant reductions in arms but illustrated problems still present today, particularly how its place in the power balance affects a country's judgment. Then it was the United States, a country inferior in arms to the others, that played the role of spoilsport. America insisted on immunity from any force reduction, and balked at prohibitions on new weapon development as restraining "the inventive genius of our people in the direction of devising means of defense." The United States was particularly concerned at plans to bar "dumdum"

bullets and projectiles fired from balloons, arguing that such weapons might make war cheaper, quicker, and less harmful.

The First Hague Peace Conference of 1899 was followed by The Hague Peace Conference of 1907. Neither conference unfortunately was able to do much to mitigate the destruction of World War I. The participants emerged from World War I still trying to disarm. Article 8 of the Covenant of the League of Nations stated that "maintenance of peace requires the reduction of national armaments to the lowest point consistent with national safety and the enforcement by common action of international obligations." The Covenant went on to provide for a permanent commission to advise the Council on the implementation of these hopes.

While the League commission started preparing for a major disarmament conference, the maritime powers, operating outside the League, tried to limit sea warfare. They held three major naval conferences in Washington, Geneva, and London in 1922, 1927, and 1930. Among the features of the conferences were endless United States-British squabbles on the ratio between cruisers bearing 6- and 8-inch guns.

The world disarmament conference opened in Geneva in 1932 to consider sixty articles of a draft convention which the preparatory commission had begun to prepare six years earlier. The Soviet Union and the United States, neither League members, had participated in the commission's work. The Germans and the Russians both rejected the draft proposals, and the United States was highly critical.

The president of this conference, Arthur Henderson, former British Foreign Secretary, recommended that the conference limit its agenda to finding agreement on substantial reduction and limitation of all national armaments. The French, primarily concerned with German remilitarization, were after collective security, including armed forces under League jurisdiction. They also recommended internationalization of aviation and compulsory arbitration of disputes. The Soviet Union felt that any international security force would be controlled largely by states hostile to the USSR.

They pushed instead the spectacular disarmament plan offered by Maxim Litvinov, Soviet representative on the preparatory commission, a few years before, for "reduction to zero" of all arms. At the time the proposal was made it was supported only by the Germans and Turks, who supposedly were already restricted to minimal armed forces.

"New" methods of warfare, which now seem as ancient as the crossbow, were a primary concern of the disarmament conference. The United Kingdom recommended outlawing such "new" weapons as submarines, bombers, and gas. The United States backed the British and urged the conference to find the "most effective measures to protect populations against aerial bombing." The conference continued spasmodically until 1937 with no final agreement.

Nuclear Age Plans

With the end of World War II and the explosion of the first atomic bomb at Alamogordo, New Mexico, on July 16, 1945, the nature of the problem changed. In the nuclear era the need for arms control had taken the quantum jump. Yet arms control negotiations moved at the same pace as before, though the idea of international control over armaments was now supported, at least on paper, by a majority of the members of the new United Nations.

Article 11 of the United Nations Charter declared that "The General Assembly may consider the general principles of cooperation in the maintenance of international peace and security, including the principles governing disarmament and the regulation of armaments, and may make recommendations . . . to the Members or to the Security Council or to both." The Security Council was given the primary disarmament responsibility and the job of drafting specific proposals.

During the first six years the United Nations considered disarmament as two separate problems: the control of conventional arms and the control of atomic weapons. Not until 1952 was the

problem joined and the United Nations Disarmament Commission established.

To handle atomic energy matters the UN set up an atomic energy commission in January 1946. Its members were the states on the Security Council, plus Canada, which had assisted in developing the bomb. Its functions were to prepare proposals for the exchange of scientific information, the control of atomic energy for peaceful purposes, and the drafting of a system of control. At the same time the United States government requested a committee, headed by Dean Acheson, with the help of David E. Lilienthal and other experts, to draw up a proposal for the control of atomic energy for submission to the UN.

This Acheson-Lilienthal report, somewhat amended, was the parent of the United States proposal presented at the first meeting of the United Nations Atomic Energy Commission by the United States representative, Bernard Baruch. A key part of the Baruch plan called for UN sanctions against violations. The vote on sanctions was not to be subject to Security Council veto. The Baruch plan also called for "the creation of an International Atomic Development Authority, to which should be entrusted all phases of the development and use of atomic energy, starting with the raw material . . ." through to the finished product. The authority was to enjoy monopoly control of atomic energy and would have sole licensing power to permit its peaceful development.

While the diplomatic hand of the United States was proposing this plan, the rest of the government was making a number of contradictory moves that indicated a lack of any concerted policy toward the atom. The McMahon Act of 1946, designed to keep the atom American and civilian, vested complete control of atomic energy in a five-man commission of civilians. The understanding with the British, in force during the war, that gave them veto power over the employment of the A-bomb, was terminated. By 1948 the United States had reduced its conventional armed forces from 12 million men on VE Day to less than 1.4 million, so that the cornerstone, indeed the only stone, of United States military defense was that very atomic monopoly which was being offered

to the UN. Already United States arms control policy had begun to operate as something unrealistically apart from the rest of the government.

The Soviet Union's answer to the Baruch plan was to call for the destruction of all atomic weapons and stockpiles within three months. Then the Soviet Union would consider formulating a control plan, but only within the Security Council framework, where their veto was operative.

Over Soviet objections the major features of the Baruch plan were incorporated in the first report of the UN AEC. The next year, 1947, the Soviet Union modified its position and endorsed an international control commission with rights of inspection, but kept the condition that control would begin only after the United States had destroyed its bombs. The United States, having disarmed its conventional forces, could not possibly have made such a concession, even had it wanted to. After two years of effort to reconcile the Soviet position with that of the other members, the commission acknowledged it had reached an "impasse" and adjourned indefinitely.

The toe dancing at the United Nations over control of nuclear weapons (they were still known as atomic weapons in those simple days) and reduction of conventional arms continued through the explosion of the first Russian atomic weapon in September of 1949 and the beginning of the Korean war in June of 1950. In the fall of 1950 President Truman recommended that the subject of nuclear weapons and conventional weapons be considered jointly, which had been the Soviet position up to then. As a result, a new UN disarmament commission was created in 1952. In 1954 this commission spawned a subcommittee of the five powers principally involved. The parent body in turn was enlarged twice, the second time to include all United Nations members, at Soviet suggestion. Progress, zero.

At all the conferences the goal remained the destruction of nuclear stockpiles and the drastic curtailment of conventional weapons and forces. The steps that the various countries advocated to reach these goals varied as the military power positions of the

powers changed. For as the talks dragged on into 1955 and the stockpiles of atomic and hydrogen weapons continued to grow, the possibility of designing an inspection system capable of determining with any degree of accuracy the size of such stockpiles became far more difficult.

As a result the major concern of the negotiators turned from controlling stockpiles to inspecting the means of employing nuclear weapons and guarding against surprise attack. In the 1946 Baruch plan the nub of the arms control problem had been an effective international system to inspect and control the production and use of atomic materials. Less than a decade later stockpile inspection had become so difficult that a shift could be discerned away from the prevention of war by the elimination of atomic armaments to the deterrence of war by mutual disclosure and verification.

From 1954 on, a bewildering series of proposals for disarmament plus some form of inspection and controls flickered across the world scene. There was the Anglo-French memorandum on a "blueprint for world disarmament." There was Eisenhower's "open skies" proposal, rejected by the Soviets unless it was part of a general disarmament program. There was a Soviet proposal for ground inspection control posts, rejected by the West after the frustration of ground inspectors in Korea and because it was linked to an unsatisfactory German settlement.

In 1956 the Soviet Union abandoned prohibition of atomic weapons as a first step toward disarmament and pushed an arms-free zone. At meeting after meeting arms-free zones were discussed: the Eden plan, the Rapacki plan, the United States plan for inspection-testing areas. Finally Harold Stassen, the lonely and often unjustly accused nomad among government departments, folded his embattled tent as disarmament negotiator and left for the political fields. By 1958 discussions had broken down. The Soviet Union demanded that the Disarmament Commission include all the members of the UN and began boycotting the commission until its demands were met.

With disarmament inside the United Nations making no

progress, several moves were made to do something outside the UN framework. Two of these, the Conference on Surprise Attack and the efforts to ban atomic testing, are discussed later in the chapter. The third major move was the establishment of the Ten-Nation Committee on Disarmament by the Foreign Ministers meeting at Geneva in 1959. It was in this unwieldy body, consisting of Bulgaria, Canada, Czechoslovakia, France, Italy, Poland, Rumania, USSR, United States, and United Kingdom, that arms control negotiations moved sporadically to mid-1960. The goal remained "general and complete disarmament under effective international control." The progress remained meager.

The Nuclear Test Ban

While talks on the general subject of disarmament dragged on in London, New York, and Paris, a special conference to deal with a ban on nuclear tests met in Geneva on October 31, 1958. For the United States this conference has proven an unhappy experience. It split the scientific community, plunged political controversy deeply into arms control, and exposed dramatically the lack of any adequate United States homework on disarmament. Even as late as 1960 the United States had still spent only a total of 20 million dollars on the problem of nuclear test detection. The test ban conference recessed in 1960 with the United States tacitly accepting exactly what it wanted least: cessation of atomic tests without any controls.

World public opinion, in part aroused by Soviet propaganda, had placed tremendous pressure on the United States to halt nuclear testing. In 1957 an advisory committee to the AEC had reported that to continue testing at the level of 10 megatons a year for one hundred years would result in an average strontium-90 accumulation in the human bones of three times the maximum safe dose. The AEC group further estimated that such testing would result in 2500 to 13,000 genetically defective children born

a year. (Later AEC panels have not found the situation so alarming, nor has testing continued at anything approaching the 10-megaton rate.)

The emotional heat generated on the subject of banning nuclear tests makes even a thermonuclear explosion seem tame. Extremists on both sides were guilty of wild excesses in the manipulation of scientific fact. The pro-banners, squeezing the maximum amount of horror from incomplete, complex figures later proved inaccurate, painted a vivid picture of a world peopled by deformed freaks. On the other side the pro-testers began measuring lethal strontium-90 radiation in "sunshine-units," and comparing increased large-scale testing with the increase in radiation that would accrue from moving from New York to the mile-high city of Denver, where the atmosphere absorbs less of the cosmic rays.

To move into the radiation damage controversy in anything more lightly armored than a heavy tank is to risk immediate mutilation from one flank or the other. Fortunately, it is unnecessary. There is almost universal agreement that there will be no further large-scale atmospheric testing. If testing starts again, the smaller weapons will be tested underground, where the explosion and the radiation can be contained. Testing of large megaton weapons, if necessary, would be conducted in outer space, where, there being no atmosphere, there would be no atmospheric contamination.

The pressure for a test ban first started to build up when Indian Prime Minister Nehru proposed such a halt to the UN in 1954. The United States then maintained that further tests were essential for national security. Secretary of State John Foster Dulles, as late as April 1957, explained the United States policy as follows: "In the absence of an effective agreement regarding the control and disposition of fissionable materials, the United States is obliged . . . to use portions of its fissionable material to develop and refine its nuclear weapons as the chief deterrent to aggression and war."

Early in 1958 President Eisenhower and Premier Khrushchev exchanged letters which resulted in an agreement to call a conference of experts to study the technical aspects of a nuclear test

suspension. Over the past year the United States position had slowly changed from initially considering a test ban an integral part of other disarmament negotiations to accepting Soviet insistence that a test moratorium be a first step. There was strong opposition within the government to the direction in which United States policy was trending. Lewis L. Strauss, Chairman of the AEC, and Donald A. Quarles, Deputy Secretary of Defense, among others, opposed a ban on testing for the reasons cited by Dulles. They argued that further testing was essential for weapons development and that a test ban, should it last two years or more, could result in a breakup of the scientific community responsible for the development and manufacture of United States weapons.

The first "Conference of Experts to Study the Methods of Detecting Violations of a Possible Agreement on the Suspension of Nuclear Tests," as it was officially called, met in Geneva on July 1, 1958. It consisted of seven experts from Western countries and "delegations" from Russia, Poland, Czechoslovakia, and Rumania (sixteen in all). By the end of August the conference concluded it was "technically feasible to set up . . . a workable and effective control system for the detection of violations of an agreement on the world-wide cessation of nuclear weapons tests." The experts described a world-wide system of 180 control posts, with 37 in Russia and Asia and 11 in the United States, designed to detect atmospheric tests with a yield as small as one kiloton and identify them as nuclear "with good probability." The system would also do the same for the detection of underwater explosions, though identifying these as nuclear was more complex.

From the beginning, underground nuclear explosions were the problem. The only way presently known to detect underground explosions is by the vibrations they produce in the earth, and these vibrations or seismic signals are markedly similar to those of earthquakes. On the basis of the limited data from one explosion only, the "Rainier" underground nuclear test in Nevada the year before, the Geneva experts concluded the 180-station system could

detect underground nuclear explosions of 5 kilotons or more, and identify them as man-made about 90 per cent of the time. Within five months it was discovered the 180-station system could not perform as well as thought. And the failure to have done the scientific work to prepare for the test ban conference was to place the United States in later conferences in the embarrassing position of having to argue against conclusions to which it had already agreed.

The optimistic report of the experts was released on August 21, 1958. The next day President Eisenhower declared that the United States would be willing to negotiate a test ban. He also stated the United States would stop testing for one year beginning the day the negotiations began, unless the USSR resumed testing. Both the United States and the USSR held a major series of tests in the fall of 1958, with each side pointing accusing fingers at the other. Eisenhower further agreed to "suspend the testing of nuclear weapons on a year-to-year basis subject to a determination at the beginning of each year that . . . satisfactory progress is being made in reaching an agreement on and implementing major and substantial arms control measures." It is under this policy, slightly modified, that non-testing by the United States has continued.

The political Conference on the Discontinuance of Nuclear Weapons Tests convened October 31, 1958. In January 1959 the United States passed on to the Soviets the results which had just become available of the Hardtack II series of underground nuclear tests, held after the 1958 Geneva experts' report, which investigated further the effects of underground explosions. The United States also appointed a board under Dr. Lloyd V. Berkner to evaluate the new data. This board concluded that the ability to distinguish nuclear explosions from earthquakes was a lot less than previously thought, and that the annual number of earthquakes equivalent to a 20-kiloton explosion or less had to be revised upward. Finally the Berkner board concluded that the proposed Geneva system could identify only underground explosions

above 20 kilotons, not 5; and suggested various improvements in the Geneva system, including the addition of unmanned detection stations.

The Hardtack II tests also led Rand physicist A. L. Latter and his associates to look again at the possibilities of hiding nuclear explosions in big holes in the ground. The theory behind the "big hole" is that if the nuclear explosion takes place in a vast enough space underground, the seismic signal is not transmitted with customary force to the earth around the hole. The size of the hole, how easy it is to make holes of the necessary size, and the exact amount of reduction is still a subject of discussion. However, there is a good deal of agreement that the explosion transmitted may be reduced (decoupled) as much as three hundred times. In such a situation a 20-kiloton Nagasaki type weapon (20,000 tons of TNT equivalent) would produce a seismographic signal corresponding to 67 tons of TNT only. Under the Geneva system this would mean that even a 100-kiloton explosion would go undetected.

Caverns large enough partially to decouple a 20-kiloton explosion are present in the United States. They are of the type used by oil companies for the storage of natural gas. Other caves could be formed in salt domes by the process of washing away the salt. The Soviet Union has several salt-dome areas with good access to water, where the washing-away process could be accomplished. The Soviets attacked the "big hole" on technical grounds and called the conclusions "premature."

While one group of technical experts has been worrying about shots underground, another group has been studying shots in outer space. An elaborate system of satellites with complex instruments, circling the earth at various distances, has been devised. This system is to be expanded if it becomes necessary to monitor areas behind the moon and the sun. The obvious answer, to look at all rockets to be fired out of the earth's atmosphere before firing to see if they have a nuclear device inside, was rejected by the Soviet Union.

With lack of agreement not only between the United States

and the Soviet but within the United States itself on what constitutes adequate detection, it is not surprising that the conference has run into difficulties. Areas of United States-Soviet disagreement include the number of on-site inspections to be allowed each year to check on suspicious happenings that show up on the seismographs. As of December 1960, the United States was holding out for twenty veto-free inspections a year inside the Soviet Union. The Soviets were willing to allow three. Also in dispute are the composition of the teams and that old bugaboo veto power, though here the Soviets appear to have agreed to drop the veto over most matters of substance.

Should the negotiations on the test ban continue and should the present unpoliced moratorium on testing be extended?

Those in favor of continuing the ban and the negotiations argue that if the Soviets and the United States could agree on testing, the two sides would move closer together and a general arms control agreement would become more possible. A great deal of work has been done to bring the two sides together, and to break off the talks now would have disastrous international repercussions. They add that anything that opens up the Soviets is a great step forward, that no plan can be absolutely fool-proof, and that the chances of the Soviets' getting caught on this inspection system are high enough to deter them (that psychological question again) from trying to cheat.

Those who believe this usually also hold that there is not much to be gained from future testing. The maximum theoretical amount of explosive power that can be produced by fusion from a pound of lithium deuteride is roughly 30 kilotons. The practical limit is relatively lower. The amount of explosive power the United States is actually producing per pound of lithium deuteride (the basic H-bomb explosive) at the present moment is highly classified but there are definite indications that the amount verges on 3.5 kilotons per pound. This would place an upper theoretical limit on weapon improvement of roughly nine times. The practical limit is, naturally, lower.

When there are roughly 35 kilomegatons in the United

States stockpile, is such an increase in weapons efficiency worth more than a test ban? In part this is a technical question involving such items as, How important is improvement of missile guidance systems in comparison to improvement in warhead yield? or, How many anti-anti-missile devices can be built into the warhead for the weight saved? For example, the complex formula by which nuclear destructiveness is determined indicates that a threefold increase in explosive power per pound is the same as doubling the number of United States weapons. However, in part whether there should be a test ban or not is also a subjective value judgment in which every informed citizen is entitled to his opinion.

Those who favor a test ban also feel that the United States is better off planning to fight limited high-explosive wars rather than limited nuclear wars and that therefore there are plenty of smaller atomic weapons in our stockpile already without further testing. While there is growing agreement that the United States would be better off planning to fight limited high-explosive rather than limited nuclear wars, those opposed to the present situation are fearful that through clandestine testing the Soviets can advance so far in the ability to wage tactical nuclear war that the balance of power would tip toward them dangerously.

To the argument that unless the United States continues testing the Soviets may be the first to develop some deadly super-weapon such as the much publicized "neutron" bomb, those who favor a test ban reply as follows: that there is enough kilomegatonnage in the United States stockpile now to destroy effectively the Soviet Union several times over. Even if the Soviets could develop some new and more powerful weapon, which they doubt, the United States still possesses more than enough strength to deter the Soviets from using such a weapon.

The neutron bomb, if developed, according to some experts, would be a slow-exploding fusion weapon. It would hang over a city, taking maybe half an hour to go off fully. People would be killed by neutron bombardment rather than by heat and shock

as in current atomic and thermonuclear weapons. There is no shock, and the heat is generated so slowly that it dissipates rather than forming a fireball. The neutron bomb would thus kill people but not damage structures. (Is this a more humane weapon?) If it were possible to make a neutron bomb, the laws of physics are such that its over-all energy release should be roughly similar to that of present thermonuclear weapons.

Two other possibilities are the development of the anti-matter bomb and the high-explosive-to-fusion reaction, where the fission trigger of the hydrogen or fusion bomb is bypassed. In the anti-matter bomb the atoms, instead of being changed as in present atomic and thermonuclear weapons, are completely annihilated by the recently discovered anti-matter particles. This reaction, which would release all the energy of the atom instead of just a portion, as happens now, has occurred in minute quantities in laboratories. Development of an anti-matter weapon would be a major breakthrough, but is presently placed in the realm of science fiction as far as weapons are concerned.

The high-explosive-to-fusion reaction, on the other hand, is genuinely feared by some scientists. It would probably make thermonuclear weapons much cheaper and easier to manufacture, since the expensive fission (atomic) trigger would be done away with. At present the high explosive sets off the fissionable material, which sets off the lithium deuteride. High-explosive-to-fusion eliminates the fissionable material, plutonium and uranium, which are expensive and hard to make. This would greatly benefit nations trying to get nuclear weapons in a hurry. The consequences for arms control would be grave, as it would (as will be seen later) make inspecting for hidden weapons practically impossible and greatly increase the difficulties in inspecting current nuclear production. However, even if this reaction were developed, it would appear the United States would still have, with 35 kilomegaton, ample supplies of nuclear weapons for its strategic needs.

Finally, there is the problem of Red China. Those who favor the test ban feel that the ban will prevent the Red Chinese, pro-

vided they comply with the agreement, from ever possessing the nuclear weapon. They feel Russia does not wish to give nuclear weapons to the Red Chinese and that a test ban agreement will strengthen Russia's hand in not doing so. It is interesting that this argument was not used as a reason to start negotiations and appears to have crept up as the force of other arguments faded.

Those who favor dropping the negotiations and renewing testing argue that in the complex art of missile development and limited war weapons the United States cannot afford to fall behind the Soviets. They point to the possibility of developing multiple warheads for each intercontinental missile to confuse Soviet anti-missile defense. They also argue that with continued testing the United States might be able to develop "clean" weapons (the old dum dum bullet argument) and nothing should be done to jeopardize this development. They point out that continued testing will make weapons cheaper, more powerful, and lighter, which increases the "bang" per missile and therefore United States deterrent power. They further state that each test explosion is a true experiment, in which there is always the possibility of a scientific breakthrough.

The arguments that a test ban would hinder Red China's getting atomic weapons and that there are advantages to an even limited opening up of the Soviet Union are rejected by those who favor continued testing. The Soviet Union, they feel, follows courses which are to its own advantage. This is what will determine the giving or the non-giving of nuclear weapons to Red China, and a treaty on testing will not affect that decision. And in any event, Red China cannot be expected to comply with a treaty from which she gains nothing and as a major power will undoubtedly insist on developing her own nuclear weapons. As for opening up the Soviet Union, Germany was a lot more open all during the rise to power of Hitler and his preparations for war. Cultural exchange does not necessarily produce *Freundschaft*.

The basic problem of the test ban negotiations appears to be that both the United States and the USSR gain so little from

them that there is not much pressure on either nation to negotiate seriously. The United States began negotiations under pressure to stop further pollution of the atmosphere. The possibilities of underground and space tests, neither of which pollute the atmosphere, have now removed that issue. There is some question whether the United States, which at certain times has made concession after concession to the Soviets and at others has sat on its hands for months, actually knows what it wants from a test ban now that that issue has been removed. On the Russian side the Soviets have achieved a cessation of tests at their own initiative without having to give up anything. There is no pressure on them to admit inspectors.

Both sides are aware that a test ban does nothing to stop the manufacture of nuclear weapons, much less decrease stockpiles. Indeed a poorly policed test ban would probably increase world tensions, since the United States would continually worry in a leaky agreement about significant cheating. So why reach agreement?

Nevertheless, progress has been made on the test ban issue. Even though there were major outstanding differences, when the talks recessed, the United States and the Soviets had agreed to seventeen out of twenty-four of the treaty's articles and two out of the three annexes. The test ban is one of the few arms control areas where even belatedly the problems have been thoroughly explored. The emotions of the world are involved in the test ban treaty. To break off talks and resume tests would have a serious effect on world morale. The United States would probably suffer most from this, as America has been maneuvered into the position where it is the nation that appears to want to stop the talks and restart the tests.

Probably another effort to reach an agreement where chances of cheating are held to a reasonable minimum—anything more is impossible—would be in order. Unfortunately, the test ban agreement is another example of where an easy first step toward arms control turned out to be just the opposite. And where the

number of inspectors necessary to insure that one small step is correctly taken is practically the same as the number required to police many more significant strides forward.

Surprise Attack

Another clear indication of the lack of United States preparation in the field of disarmament came in the surprise-attack conference in November of 1958 in Geneva. Here the United States found herself negotiating with the Soviets for radar warning against missile attack, something America could more safely give herself unilaterally at less cost. So completely unprepared was the United States for this conference that the government never provided funds to pay the way of several key United States scientists to Geneva. Their bill was picked up by an American private foundation.

The surprise-attack conference resulted from an exchange of correspondence between Eisenhower and the Soviets. The initiative came from the President, who feared an unheralded fall of rockets on the United States. The working group that assembled under the United States Chairman, William C. Foster, a former Deputy Secretary of Defense under President Truman, had less than one month to prepare the whole subject.

The difficult problem of working out a fool-proof surprise-attack system, plus the lack of government policy, made the whole subject so complex that the group left for Geneva in doubt about what they actually wanted. Such basic questions were unanswered as: Was the United States more interested in knowing that there was a strong possibility of attack within five minutes or within five weeks? How reliable did the information have to be? What was the United States going to do with the information when it was received? Couldn't the whole problem be solved better by powerful radars, airborne and stationed on friendly soil, than by inspectors inside the Soviet Union? And to what extent

could surprise-attack inspectors increase the likelihood of such an attack by acting as spies?

At the conference it was soon obvious that "surprise attack" meant something quite different to the Russians, who were thinking of the German attack upon themselves in 1941, from what it meant to the Americans, thinking of Pearl Harbor. The Soviets wanted "practical steps" toward reducing United States forces in Europe, ground inspection of roads and railroads, and other disarmament measures. The United States was talking about technical problems in connection with radar inspection and aerial photography. As a result, the Soviet experts were political scientists, generals, and politicians who wanted to negotiate politico-military agreements. The United States experts were scientists and military experts interested in solving the problem by communications and electronics.

After six weeks the conference broke up in the usual recriminations. In commenting to the Senate on the conference failure, Chairman Foster underscored the major problem of United States arms control history since World War II:

"I think that by hard work and deep thought and putting together competent people to work on this, not on a part-time basis but on a full-time basis, something very valuable could be accomplished. This is something we had not really done prior to the intensive preparations which we engaged in this fall. . . ."

CHAPTER FIVE

First Steps and Present Proposals

THIS BOOK TILL NOW HAS THREADED THROUGH THE ARMED WORLD as it exists today, with a brief backward glance at some past efforts toward disarmament and arms control. Now the emphasis shifts to what arms control can do to increase the safety of nations. This chapter outlines two major first steps toward a more secure world. The steps are both in themselves a form of arms control and lead to a more stable situation in which negotiation on mutual arms limitation becomes more promising. The chapter also examines some current arms control proposals to see if they actually do lessen the risk or force of nuclear war.

It is a truism so overworked that it is embarrassing to write on a sheet of paper, but it is probably wise to repeat it once for the record, that the basic risk of war today stems from the hostility of the Communist camp toward the rest of the world. Arms control is not going to cure that. But besides that basic cause, there are the two important military causes of tension examined in Chapters Two and Three. The first is the extreme vulnerability of the United States' strategic nuclear deterrent, mainly the Strategic Air Command, to surprise Soviet missile and bomber attack. The second is the present necessity for the

United States to meet other than major aggressions by the threat of nuclear retaliation. This second necessity stems from past policies to concentrate on the strategic nuclear strike forces at the expense of other forces.

The first priority of arms control is to reduce these two deficiencies, at least for the United States and hopefully for the Soviet Union. For until this is done the world is so unstable and the chances of war so frighteningly large that both the United States and the Soviet Union are unwilling to put many limitations on their military power. The methods of remedying these deficiencies may seem more like purely military policy than arms control. They will come as a shock to those who hold traditional views that equate arms control with disarmament. But, as pointed out in Chapter One, the approach of arms control to reducing the risk of nuclear war is to work toward stability in the world at all stages, from the present situation through any eventual reduction in armaments.

Even as the distinctions between political and military decisions blur in the nuclear world, so do the distinctions between military policies and arms control. Arms control looks toward the reduction of the threat of war. When military policies go in that direction they may often be legitimately regarded as parts of arms control. And certainly when arms control deals with the actual reduction of weapons, it is in part also a military policy.

Securing the Deterrent

To reduce the risk of war that springs from the vulnerability of the Strategic Air Command, the obvious requirement is to increase the security of the strategic retaliatory forces. This means reducing as rapidly as possible the number of soft planes and missiles and replacing them with hidden or hardened weapons. As long as the soft weapons are there, the danger that the Soviets will risk a surprise attack is there. It was the obvious vulnerability of the United States fleet berthed at Pearl Harbor that led the

Japanese to take the risk of a surprise attack. A start has been taken toward hidden and hardened weapons, but unfortunately it is not so far wholehearted. More unfortunately, the trend toward soft, vulnerable, first-strike forces continues at the same time.

The chief weapons now in production that provide secure, second-strike forces are the Polaris submarine and the Minuteman missile. Both of these weapons had hard fights to get off the drawing board and into the American arsenal. At every stage of the way they were battled by the majority, both inside the armed services and out, who believed they provided too little explosive power for the cost of the weapon. The battles of Vice-Admiral Hyman G. Rickover to build the atomic submarine have become legendary. Less well known but equally severe were the battles of Vice-Admiral William F. Raborn to get the Polaris missile itself built and into the submarine. And the Minuteman would still be a blueprint missile without the unending pressure put on the Air Force in its favor by Lieutenant General Bernard A. Schriever.

The Polaris weapons system is a submarine, atom powered, with sixteen nuclear missiles on board. The missiles, which can be fired from beneath the water, have a range of 1200 miles and at present a warhead of 0.6 megaton. Improvements are in sight that will boost the warhead to 1 megaton and increase the missile's range.

The missile is guided by an inertial guidance system, which is a system of delicate gyroscopes plus a memory device into which the proper course has been fed. The gyroscopes register any deviation of the missile from the proper course and make the proper shifts of thrust to bring the missile back on target. The problem is to have the submarine located accurately when the missile is fired; if the missile does not know where it is when it starts, it cannot know where it is going—a remarkably human predicament.

The essence of the success of the Polaris as a weapons system lies in the hiding ability of submarines. The United States is too

open a society to hide anything in effectively. The best hiding place open to the Free World is the depths of the ocean. There radar cannot penetrate, and, in the present state of the art, under-sea detection at the depths to which the Polaris can submerge is minimal. This means that no matter how violent an attack Russia may be able to launch against the United States, if the United States has enough Polaris submarines properly deployed the Russians must expect a high level of damage to themselves.

Just how many submarines are necessary to deter the Soviets is too complex a military question to go into in a book on arms control. Some of the more important determining factors are: the psychological requirements of deterrence, the degree of Russian civil defense preparation, Russian anti-submarine defense, future advances in anti-submarine warfare, other weapons in the United States arsenal, improvements in Polaris warhead yield, missile and anti-missile developments, the level of Soviet strength, Soviet desires and expectations, and, hopefully, any arms control agreements that may be in force.

The Minuteman system is less well known than the Polaris, nor is it yet operational, though it will be so shortly. However, the two missiles are very similar. The Minuteman too is a solid-fuel inertially guided rocket, a little bit bigger, 60 feet; it carries roughly a 0.6-megaton warhead with plans to increase the explosive power to 2 megatons. There are two types of Minuteman squadrons planned, fixed and mobile. In the fixed squadrons, the missiles are dispersed over many miles and sunk into concrete holes in the ground protected by reinforced concrete doors. Plans are for the first squadrons to be hardened to 100 psi, with future squadrons hardened to 300 psi. With 300 psi of hardening, a 5-megaton missile must burst within roughly seven-tenths of a mile to destroy the Minuteman.

Because the Minuteman is a solid-fuel rocket, the fuel is stored right in the missile all the time, just as a cartridge is attached to a bullet. The missile does not have to be laboriously fueled up before it can fire, like the present Atlas and forthcoming Titan. The Minuteman rests in its concrete burrow

continually ready to fire at its selected target at the push of a button. In addition to being ready to go, the missile can be more easily hardened, since solid fuels take up much less space than liquid fuels. They also produce at present around one-third less thrust per pound. If the country's interest is in launching the biggest bang possible, the answer is liquid fuels. If there are other considerations, such as second-strike ability, the answer appears to tend toward solid fuels.

Because the Minuteman is so instantly ready to go, elaborate precautions are taken to make sure that it is not fired accidentally. These precautions are possible because the missile, being secure enough to withstand enemy attack, does not have to be fired in the few minutes before an enemy attack arrives. In the single-engine jet fighters and some of the soft American missiles stationed around the Communist periphery, one man in the plane or beside the missile can fire the nuclear weapon. In the Minuteman, the firing doctrine being discussed calls for three separate men in three separate blockhouses to depress their firing levers to launch the missile.

Should only one man depress his switch, as might be necessary after an atomic attack had knocked out the other two blockhouses, a time period of over an hour automatically elapses before the missile is fired. And during that time a series of highly secret devices can be manipulated by higher commanders to countermand the electronic order to fire.

On the drawing board are plans for weapons that can be made fantastically secure. Some, placed inside mountains behind concrete doors that have to be opened by explosive, are designed to be secure to 1000 psi, which is practically the edge of the fireball. After an enemy attack the concrete at the least radioactive exit from the mountain is blown apart and the weapons fired. These weapons are also fantastically expensive. They are mentioned here because the possibility of their manufacture will be seen to have a bearing on arms reduction plans.

In addition to the Minutemen that have been given second-strike ability by hardening, others are to be placed on special

trains that will keep them moving around the country. Those weapons would be soft and therefore vulnerable to blast; but though their whereabouts will not be as secret as the Polaris', the Soviets will have difficulty in locating them accurately enough to destroy them by missile attack. (Those who commute by train will appreciate the Soviet difficulty.) This difficulty can be increased by the employment of many dummy missiles.

Another secure, second-strike weapon is the Dromedary aircraft. Dromedary, presently only in the planning stage as distinct from the Minutemen and Polaris, which are in production, is running into the same resistance to new ideas that once plagued the other two weapons. The Dromedary weapons system is basically a Minuteman inside an old-fashioned, easy to build, cheap, propeller-driven transport aircraft. These aircraft stay airborne for long periods of time, four or five days, through aerial refueling. Maintenance costs and fuel costs are low on these pre-jet aircraft. The weapon is secure because the Dromedaries circling over the oceans and the air space of North America are airborne at the time of any attack and so escape the blast effects. After the attack is over, the Dromedaries land at any surviving small airport or suitable field, locate themselves, set up their Minutemen, and fire.

A mixture of Dromedary aircraft, some air-alert bombers, Minutemen on trains, and hardened Minutemen, plus the Polaris submarines, appears to be the best type of second-strike force for the next few years. The mere fact that it is a mixture makes it harder for the Soviets to destroy all of it. Such a force would not guarantee that the United States survived. In the nuclear age nothing guarantees that. But it would provide a force that could largely remove the extreme value of surprise attack from the Russians. No matter how hard the Soviets struck the United States, America could strike back hard.

He who strikes first will probably always be able to strike harder, but in the world of over-kill the extra degree of strength matters less. If one bullet kills you, an extra four do not make much difference. With such a system of second-strike weapons

and a secure chain of command to control them, the United States would not have to maintain the present super-alert posture and constant nerve-grinding readiness for surprise attack. More precautions could be built into the weapons and the command structure. The advantages, some of the dangers, and therefore the chances of general nuclear war would be reduced. •

There is one big "if" about the propositions of the last paragraph. They assume that the Soviets are doing roughly the same thing: that they also are moving to make their deterrent more secure and concentrating on second-strike rather than first-strike ability. If instead of doing this the Soviets concentrate on anti-submarine warfare, build vast numbers of soft missiles with bigger warheads and more accurate guidance systems, start manufacturing long-range fighters, and begin a gigantic civil defense program, the Soviets would then show themselves to be more interested in attacking America than in removing incentive to attack Russia.

The course of Soviet missile development would be particularly significant. Missiles that are designed to attack weapons have to be extremely accurate to do their job. Also, because weapons are harder to hit than cities, there have to be more missiles. Missiles designed to deter war by attacking people and cities do not have to be so accurate, nor are so many of them necessary. But they have to be secure so they can withstand an enemy attack. If the Soviets build second-strike missiles, missiles that are built for security rather than accuracy, this will be good evidence that they are interested in defending themselves rather than attacking America. If on the other hand the Soviets build vast numbers of soft, highly accurate and powerful missiles, this would indicate they plan a surprise missile attack.

The same argument holds true for the United States' purchase of weapons. The B-70 bomber is a soft, highly vulnerable, first-strike weapon. It cannot be protected on the ground because of its bulk, and the expense of flying it is such it cannot be protected by being kept airborne for long. Its use as a weapon comes if the United States is planning to hit Russia first. The

same is also true of the Army's soft intermediate-range missiles and the Navy's supercarriers, both vulnerable, first-strike-only weapons. The smaller carriers, on the other hand, like smaller fighter bombers, have a definite limited war function.

If both the United States and the Soviet Union begin to concentrate on secure second-strike nuclear forces, they will be making very definite indications of peaceful intentions toward each other, at least in the strategic nuclear war areas. Further, these intentions can be shown unilaterally without the squabbling for propaganda advantage that comes at the negotiating table. In a world where both the United States and USSR had abandoned a large part of their nuclear first-strike ability, the serious discussion of controlled limitations on arms themselves would become possible.

Providing Non-Nuclear Answers

Along with building a secure deterrent, America must find some method of protecting the non-Communist world other than the threat of nuclear war. This is a subject about which there has been a great deal of misunderstood shouting over the past few years. Two Army Chiefs of Staff, Generals Maxwell D. Taylor and Matthew B. Ridgway, on their retirement wrote bitter books opposing the reliance on nuclear answers to all questions. And this issue was also partly responsible for bringing about the premature retirement of the Army's most famous younger general, the brilliant James M. Gavin.

The dangers in the less-than-major-war problem have been discussed in Chapter Three. The solution is neither politically nor militarily simple. To fight non-nuclear small wars over such areas as Berlin, the United States not only has to modernize drastically the obsolescent Army and build the necessary airlift to move Army reserves, it also must draft more men. Political willingness to draft men in peacetime has never been high. And the whole program will be expensive: not nearly as expensive as losing a

limited war and either taking the defeat or going to all-out nuclear war. But that cost is in the future, while the cost of avoiding it is part of the political present.

The problem is complicated by the argument whether the United States should plan to use small, tactical nuclear weapons in a limited war. Those who feel that the United States should, argue that only by using tactical nuclear weapons can the United States compensate for the military manpower advantage of the Communist bloc. The 60-odd Soviet divisions immediately available for use in Europe can only be blocked by NATO's 21 1/3 divisions if tactical nuclears are used.

Why NATO should be limited to 21 1/3 divisions or even 30, which is NATO's goal, for any reason but unwillingness to make sacrifices has never been made clear. By 1965 there will be 59 million males fit for military service in the Soviet bloc (excluding Red China). At the same time there will be 95.4 million fit males in the NATO alliance. This ratio, coupled with the Russian manpower crisis stemming from less efficient agriculture, would seem to leave the manpower balance decisively tipped in NATO's favor.

In addition there are various other factors that indicate it is to the United States' advantage to fight limited high-explosive rather than limited nuclear wars. The West places a higher value on human life than the East, and nuclear wars produce far more casualties than non-nuclear ones. The Free World is superior in industrial capacity to the Communist bloc, and it is in non-nuclear wars that industrial potential becomes a strategically decisive factor. Finally, there are complex battlefield considerations, particularly the applications of mobility and electronics, that indicate the West's advantage lies in high-explosive wars.

This is not to say that the United States should lack the ability to fight tactical nuclear war. As long as the Soviets have the capability to wage such a war, the United States must be prepared both to conduct and to withstand such a battle. However, United States priority should be placed on the better choice of waging a limited high-explosive war.

In addition to its being to the West's military advantage not to use tactical nuclear weapons, avoiding such weapons helps solve the problem of escalation: a large war growing out of a small one. The danger of escalation into strategic nuclear war appears to increase decisively as the amount of nuclear explosive available to both sides increases. When the tactical use of nuclear weapons, particularly of fractional kiloton weapons (weapons with the explosive power of around 100 tons of TNT), was first strongly advocated in the United States, the Soviets had little nuclear explosive. They would have been unable to answer in kind a tactical nuclear attack by the United States without seriously depleting their strategic stockpile. Nor did the Soviets have any reliable method of delivering their tactical weapons. From roughly 1950 to 1958 the United States had the capacity to wage tactical nuclear war decisively without having it waged right back at itself. During this period America could determine the limit that was to be placed on the use of atomic weapons in limited war.

Today America cannot set that limit. The Soviet Union too has the capability to wage tactical nuclear war. At any moment the United States or Russia can unlimit a limited nuclear war to any degree it wants. It is important for the United States to make sure that it is not the country that has to increase the likelihood of general war by breaking limits in order to gain the necessary advantage, unless the necessity is vital.

Wars are limited by the accidents of history, but history is gross. She needs clearly defined lines on which to base her boundaries: lines like the Yalu River in Korea or the Austro-Hungarian border during the Hungarian uprising. These lines may not make much military sense. Why fight Chinese Communist aircraft in the sky on one side of a river but not on the other? But they make sense in the historical context.

The line between nuclear and non-nuclear weapons is such a line: illogical perhaps to the soldier, airman, scientist, or academician, but completely understandable to every citizen of the world. On the other hand, in the gradual increase of nuclear explosive power from a 100-ton weapon to a 500-ton weapon, to a kiloton

weapon, to 10 kilotons, to 20 (the size of the Nagasaki bomb), to 50 kilotons, to 100 kilotons, to a megaton, how does the line get drawn? And remember, the line will be being drawn in the heat of battle. The division between nuclear and non-nuclear is great. The division between tactical and strategic nuclear weapons is not.

Western ability to meet local threats with a mobile force able to fight successfully with high explosive will offer another alternative to general nuclear war. And the presence of this alternative will reduce the likelihood of general nuclear war. Threats will still arise. And meeting them will still be full of anguish and cost. The possibility that general nuclear war will be the ultimate result of a peripheral challenge will still hold. But the constant fear and preoccupation that every little challenge may signal the beginning of a major nuclear exchange will have greatly lessened. The development of a non-nuclear answer to aggressions short of all-out attack provides the second vital prerequisite for controlled limitations of arms.

Judging Arms Control Plans: Open Skies

Since the critical function of arms control is first to stabilize the balance of terror and then to reduce the elements in the balance itself, current arms control and disarmament proposals can be examined to see whether they contribute to this goal. The question is not, Does an arms control plan effectively "disarm" a nation? but, Does it make all-out war less likely, or reduce the destructiveness of any war that might occur? If it does not, or if it leaves the situation basically unchanged, the plan is neither in the national nor in the world interest. Arms control is too dangerous and vital an area for America to be able to afford the luxury of backing poor or marginally useful plans.

In testing the validity of a plan, attention must be paid to the world situation at the time the plan is proposed. For example, as long as the Soviet Union relies on soft missiles protected

only by secrecy, any inspection system that breaks down that secrecy will look exceedingly dangerous to the Soviets. Spy-in-the-sky satellites and U-2 overflights do not particularly concern a nation with secure weapons, nor do they bother a nation like America, where everything is known anyway. The United States has to find other ways of protecting its weapons. But for the USSR, with soft weapons protected only by hiding, overflight is a dangerous invasion made worse by the nation's long tradition of secrecy.

However, as long as America relies on soft weapons, as at present, United States vulnerability to surprise attack makes it essential to pierce the Soviet secrecy to guard against surprise. Yet this piercing of secrecy makes the Soviets more vulnerable, since it destroys their protection. They are placed in the position where their missiles are far more effective if they strike first. Until both the United States and Russia have a reasonably secure second-strike capability, an open skies plan for aerial reconnaissance and inspection so increases United States security at the expense of the Soviet's that it must be counted more a defense measure than an arms control plan.

General and Complete Disarmament

Most plans for arms control and disarmament currently being discussed in the legislatures of the world, including the current proposals by both America and the Soviet, have as their goal complete disarmament. Is this a valid end point in terms of international stability? What would a totally disarmed world be like?

In fact, what is totally disarmed? The national anthem of the Congo's province of Katanga ends with the rallying cry of:

Fight, fight, for Katanga

With your heart, your courage, your teeth.

Yet not even the most enthusiastic general disarmer has yet gone on record in favor of a UN force armed with pliers and mallets

and empowered by international law to de-denture the populations of the United States and the Soviet Union. And in this situation is the manufacture of false teeth a war crime?

In the first six years of the war in Algeria, French, rebel, and civilian official casualties ran to 238,000, mostly done with small arms. During the border dispute between Pakistan and India, countless people were killed with muzzle-loading rifles and clubs. Massacres in the Congo have been staged with fire, bows and arrows. Certainly the point in disarming is not to have bigger and better wars fought with clubs. Even if total disarmament could be achieved, there is no guarantee that it would be a self-perpetuating, halcyon millennium. In a totally disarmed world if one side has a decisive advantage in clubs, they will be tempted to use that. And surely the side that starts to lose that war will resort to guns. Then the side that starts to lose with guns will turn to cannon, and the side that loses with cannon then turn to nuclear weapons.

Even were all weapons destroyed, knowledge of how to make them would remain. The amoral genie of progress cannot be restoppered into the bottle of past history. A disarmament plan must have as an end point a more stable world as well as a temporary lack of certain weapons. Otherwise peace has not been secured; the chances of nuclear destruction not minimized. The major difference between disarmament and arms control is that the latter scientifically searches for a stable end point, one that will hold up at least briefly, even in this era of rapid technological change.

This difference between conventional total disarmament and arms control is one of the great hopes for the eventual adoption of arms control. Those who plan and negotiate the future of both America and the Soviet Union are men accustomed to the realities of power. As long as the end goal of disarmament is one they realize would not work, United States leaders rightly tend to be less than enthusiastic about any first steps toward such an end. But if the end is a hardheaded, more stable world and not a point where the arms race just starts up again more frantically,

and if America is protected from the opportunism of the next fly-by-night Castro, then arms control can be genuinely espoused by those whose oath and training obligate them first to defend the United States. For the first goal of arms control also is America's security. However, in the nuclear age American and Russian security have certain links.

UN and Other Police Forces

Some planners have tried to remedy the chaos of a totally disarmed world by creating a UN police force to keep order. Article 43 of the UN Charter establishes the legal basis for such a force. The United States and Russia are on record in favor of a UN police force in their current disarmament proposals, both of which have as a goal complete disarmament. However, the composition of the force proposed by the two countries is quite different. The United States wants the police force created quite early in the process of disarmament and favors a permanent force with its own organization. Russia wants the force created in the final stages and placed under the Security Council, where the veto would operate. The police force favored by the Russians would be formed only when necessary and would be made up of units from the police forces of UN members.

The general approach of the arms controller to the idea of a UN police force or a police force made up of smaller powers depends on what that force is seen as doing. For those who see the end goal of arms control as not complete disarmament but a more secure world, the problem of a UN police force to keep peace between the *major* powers does not arise. Arms control is designed to enable nations to keep peace among themselves and to limit the destruction if peace breaks down.

A major nuclear UN police force that could theoretically keep peace among the great powers, even if it could be formed, would actually destabilize the world by adding a new major

nuclear power to the balance. On the other hand, a small UN police force to contribute to the stability of the world by handling minor crises before they became *causes célèbres* among the major powers would make a definite contribution, as demonstrated on the borders of Israel and in the Congo.

The expansion of a carefully controlled UN police force to where it could keep the peace where major interests of the great powers were not involved, as UN forces have been doing, appears an advantage. A force that could separate, say, Castro's Cuba from Betancourt's Venezuela, would have a definite role to play. Efforts to construct a nuclear police force that can dictate to the United States or the USSR detract from efforts to build the present concept of a UN police force to where it becomes an effective policeman in minor disputes.

Besides the seemingly insurmountable practical problems against creating such a force, there are good theoretical grounds for not creating a nuclear armed UN police force as the supreme power in the world. Such a force would constitute a definite danger in itself, even if it were composed of those smaller nations which up until now have shown an even-tempered passion for justice. For would they continue to show the same passion for justice once they were the all-powerful police? Witness the behavior of India in Kashmir, once India had power.

It has taken a great deal of historical time for powerful nations to recognize even partially that justice is a benefit for the strong as well as a refuge for the weak, that a combination of strength and justice brings a nation more restful security than strength alone. In the nuclear age the Anglo-American alliance has bowed, sometimes reluctantly, to the dictates of international justice. Within these nations, with certain painful exceptions, individual justice has been enforced. To remove the power and responsibility of protecting the Free World and keeping the strategic peace from those nations whose political traditions and recent international actions show a developing respect for justice and to place this power instead in a new and traditionless force,

created by negotiation and bureaucratic fiat, would seem an action of incredible risk.

History holds at least one clear record of such an action's being taken. For some two hundred years the actual power in Rome, power to control the Emperor, was lodged with the Praetorian Guard. The guard made and broke emperors at its pleasure. Yet the age of this first supreme international police force, of Nero and Caligula, is not one looked back to with nostalgia by many. Military units, particularly those without a long tradition, historically have come to lodge primary loyalty with their commanders. The military commander of a UN force powerful enough to dictate to the major powers would thus tend to become the supreme arbiter of world destiny. It is doubtful if even theoretically this is a peaceful and reasonable solution.

Unilateral Nuclear Disarmament

The most popular extreme position on disarmament current in the West today is that of unilateral nuclear disarmament: that the West by itself give up its nuclear weapons and so avoid all-out war. Most of those who advocate this position do so so emotionally that it is difficult to meet their arguments. They feel that once weapons, generals, and barbed wire are done away with, the world will live in peace.

For example, one "argument" used is that nuclear weapons are so horrible their use is unthinkable. Since their use is unthinkable, they won't be used, so why not destroy them? Though unilateral disarmament could technically mean that the Soviet Union disarms while the United States retains nuclear weapons, for some reason the proponents of unilateral disarmament never advocate this. So the plan must be viewed as one where the West abandons nuclear weapons while the Soviets retain them.

The arguments usually advanced against unilateral disarmament are that it would lead to slavery of the West by the

Communists and the destruction of all humanistic Judaeo-Christian values. To which the unilateralist replies, Yes, but we would still be alive. Yet even on his own terms the unilateralist is wrong. (And to grant him his own terms is to grant him too much.) For unilateral disarmament increases rather than decreases the chances of nuclear war. The choice is not between "living on our knees or dying on our feet," as the unilateralists so loudly chant. The choice is swapping a fair risk of living on our feet for a good chance of dying on our knees.

The unilateralist argument is that with the West disarmed there would be only one major nuclear power in the world and that this would secure peace, peace at a price, but peace. But in the very close future, to disarm the West nuclearly will leave not one major nuclear power, but two: Red China and the Soviet Union. Neither of them shares the West's views about the value of human life. What could be more likely to set these two countries against each other in nuclear combat than the riches of the West lying naked for the taking? Perhaps, knowing what war is like, they would start the fight for America on American soil, the Chinese Communists starting from the West Coast and the Russians from the East. How long they could restrict the nuclear battleground to America is anyone's guess. In any event, in the near future nuclear disarmament of the West alone provides the two remaining nuclear Communist powers with a real prize to fight for.

Recent history contains two examples of unilateral disarmament comparable in degree to United States unilateral nuclear disarmament now. Such disarmament was enforced against the Germans after World War I and practiced by America in her frenzied demobilization following World War II. The unilateral disarmament of Germany did not prevent Hitler; and the unilateral conventional disarmament of America made possible the Soviet enslavement of the satellites and did nothing to prevent the Korean war.

In Britain there is a large movement that advocates the

unilateral nuclear disarmament of Great Britain alone. This is a separate and far different problem. It is complicated by the fact that there are three distinct types of unilateralists in Britain: those who want Great Britain to keep the present nuclear weapons that she has but stop the manufacture of fissile (nuclear explosive) material; those who want Britain both to stop manufacturing fissile material and to destroy her nuclear arms; and finally, those who want to stop the manufacture of fissile material, destroy British nuclear arms, and have Britain withdraw from NATO.

From the point of view of arms control, i.e., the effect on international stability, there is a great deal to be said for discontinuance of British fissile material production. British production is minor. The only condition in which the United States might need more nuclear explosive power than the roughly 35 kilomegaton in its stockpile would be in a tactical nuclear war. The need for it even then is doubtful, and British production is not enough to make an appreciable difference. As has been seen, the United States problem is building secure weapons, not manufacturing more nuclear explosive. At the same time, the movement toward diffusion, the continued spread of nuclear weapons to more nations, is both destabilizing and alarming. British abandonment of fissile material production would somewhat damp the pressure for diffusion.

On the other hand, the Soviets would certainly greet the stop in British production with joy, and if they interpreted it as a sign of weakness, they might attempt a little hay-making in Western Europe. The issue swings on the reasons why Britain would abandon further fissile material production. And these would be indicated by British actions at the time of the abandonment. If, at the same time the British abandoned production as destabilizing and not particularly useful, they increased their ability to make non-nuclear responses to Soviet provocations, the Soviets would be hard put to interpret the halt as a sign of weakness. Provided British abandonment of nuclear explosive

production leads to an increase in Britain's contribution to the conventional high-explosive forces in NATO, there is much to be said for such a step.

Those who take the middle position and wish to abandon both the production and the nuclear weapons are not on any such firm ground. To abandon weapons at a time when the dispersal of nuclear weapons is essential to the second-strike survival of the Western deterrent is a destabilizing action. It is hard to see how the Soviets could interpret it other than as a sign of weakness. And the Soviet belief in Western determination to resist is the psychological basis of deterrence. However, this policy would not be the complete disaster that would follow from the policies of the third group, those who want Britain to renounce nuclear production, nuclear weapons, the United States bases in Britain, and NATO.

To be reasonably safe against a Soviet first-strike over the next three years, SAC's bombers, soft missiles, and the Polaris submarines desperately need room in which to disperse. To deny SAC that room is greatly to lessen the risk to the Soviet Union of striking first. The perils of that course are obvious. To make it more difficult for the United States to build up a secure second-strike force by refusing to resupply Polaris submarines and SAC aircraft lengthens the present highly unstable period, increases the risk of nuclear war, and puts off the time at which progress toward controlled arms limitation can start.

Further, any move to break up NATO would greatly complicate the necessary United States programs to build up a force that can provide a non-nuclear answer to less than all-out aggression. Here Britain has a decided contribution to make. The abandonment of the NATO alliance by Britain would force the United States for some time to continue to defend the periphery by nuclear threat. Such an old-fashioned disarmament move that actually increases the danger of nuclear war is a pointed example of the difference between arms control and conventional disarmament.

Some Unique Proposals

Various other unique proposals have been seriously advanced as methods of ending the arms race. Many atomic scientists feel that secrecy is the root cause of much international tension. If secrecy could be abolished, the danger of war would largely pass. Others believe that what is necessary is for mankind to renounce the rule of force and substitute instead the world rule of law. Much time has been spent studying precedents to devise and codify the necessary laws. Other scientists believe that an international camp or some other area for intellectual exchange where scientists from East and West could talk over their problems would solve the problem of arms control by making it impossible for Russia or the United States to get the scientific jump on the other.

It is difficult to be violently against any of these proposals. It is also difficult to be for them. They are hoped-for end products of arms control. They are not the first order of business, which is producing a more stable world. Nor are they the second order of business, which is reducing the terror while maintaining the painfully acquired stability.

At another extreme are those who believe the way to start arms control is by controlling unimportant, easy-to-inspect items such as battleships and gradually building up to weapons that matter, like missiles. The answer to this is that the Soviets are loath to admit inspectors into their society for any reason. They will do so only where they can see the gain to themselves. There is no gain in controlling unimportant weapons. Indeed, would the United States be willing to admit the necessary number of Russian inspectors to control unimportant weapons? Further, to negotiate the control of such weapons is to tie up part of the national energy in trivial conferences at a time when there is far too little serious negotiation with the Soviets. And when

the time comes to inspect important weapons, both parties will insist on rewriting the treaties with additional safeguards.

Area Control Plans

To get around the problem of admitting inspectors into Russia and yet to make a first step toward arms control, various plans to limit arms in certain areas have been advanced. One of these has resulted in a treaty between ourselves, the Soviet Union, and other nations, banning military activities in the Antarctic. Communist area proposals have included the Soviet plan for a nuclear free zone in Asia of 1957, and the Rapacki plan to denuclearize Germany, Poland, and Czechoslovakia. In 1956 the Soviets proposed a zone for aerial inspection extending 800 kilometers to the east and west of the demarcation line of NATO and Soviet forces. The zone included most of the satellites and a small part of the Soviet Union.

A major proposal for area inspection came from the West in 1955. This was the Eden plan, which called for a demilitarized zone in Central Europe with East and West policing each other. In 1957 Harold Stassen, United States disarmament negotiator at that time, hinted at United States willingness to accept a limited inspection zone including Europe, Alaska, and part of Siberia, though this plan never received official endorsement. Denmark recently suggested that inspection could be tried out experimentally in Greenland.

Provided the area selected to be inspected and controlled does not seriously alter the balance of military power between the Soviets and the West, starting arms control in some small area makes a certain amount of sense. The basic difficulty is discussed more fully in Chapter Seven. In brief, the problem is that inspection of any one item or any one area, when looked at critically, usually requires almost as many inspectors as inspecting a wide area or many things. You can inspect for everything in

a wide area almost as easily as you can inspect for a few things or a small area.

A dramatic illustration of this problem is the nuclear test ban, where fifteen to twenty-one manned posts and two hundred to six hundred unmanned seismic stations are believed needed effectively to control testing inside the Soviet Union. This is enough stations to monitor a great many other items, from missile firings to troop movements. While the dangers, irritations, and limitations to national sovereignty for America and the Soviet are less in area inspection plans, so are the benefits. And the benefits decrease much faster than the effort needed for inspection. Since it is the benefits that pressure both sides to reach an agreement, area negotiations may not be easier to negotiate than other more sweeping forms of arms control.

Area arms control plans have been proposed as a method for getting into a more general arms control agreement. The controlled area keeps on expanding automatically unless one of the major powers involved calls halt. This is frankly a proposal on which so little research has been done that it is impossible to arrive at a conclusion as to whether such a plan is a valid first step. The problem is that the period when it is possible to negotiate a workable arms control treaty between East and West may be frighteningly brief. At that moment to waste the negotiating effort on an unimportant or bad treaty would be a tragically lost opportunity. Would an area agreement then be a first step or a peripheral detail getting in the way of more basic issues?

French Proposal to Inspect Delivery Systems

The proposal put forward by the French in 1959 calls for "prohibiting first the development, then the manufacture and possession of all vehicles for the delivery of nuclear devices: satellites, rockets, supersonic or long-range aircraft, ocean-going

submarines (etc.). . . ." Here again the problem is that to inspect one group of items such as delivery systems requires so many inspectors that you might just as well inspect for everything at the same time. Besides this, nuclear weapons can be delivered in trucks, ocean liners, suitcases, planes, missiles, and guns. To check all of these requires a fantastic number of inspectors. Checking any one item is not apt to be too useful. (Note that it is particularly unwise to check just missiles. At present it appears that missiles make the best secure second-strike deterrent. Other forms of delivery systems, like aircraft, achieve second-strike ability in less stable ways.) By itself a check on delivery systems appears unworkable.

Renouncing the First Use of Nuclear Weapons

Another popular form of self-imposed arms control is the suggestion that the United States unilaterally announce that it will not be the first nation to use nuclear weapons. The supposed next step in such a process is that a treaty would then be negotiated with the Soviets stating that neither side would be the first to use nuclear weapons. Obviously, the only binding force such a treaty would have would be moral.

Here the central problem is one of time. As has been pointed out, today the United States defends the Free World by threatening to launch a nuclear strike against the Soviets in response to any act of aggression by them. For example, the conventional high-explosive forces presently in Western Europe would have extreme difficulty in defending Western Europe against a Soviet invasion. The Soviets realize this. What holds them back is the ultimate threat of a strategic nuclear strike. This book has pointed out the irrationality of relying on such a threat; but until America builds up sufficient conventional forces to provide another alternative, the threat is all there is.

To renounce the first use of nuclear weapons before America has built up her conventional forces is to announce the abandon-

ment of Western Europe. Nobody can foresee what would happen next. Certainly the chances are excellent that the Soviets would interpret the announcement as a lack of Western determination to resist, and accept the invitation. This would probably start World War III. After America has a reasonably secure strategic deterrent and sufficient conventional forces, an announcement pledging America not to strike first with nuclear weapons might well be valuable in making the use of nuclear weapons less likely.

Controls and Mutual Cooperation

ONCE AMERICA AND THE SOVIET UNION HAVE GAINED A MORE SECURE deterrent and the United States capacity for non-nuclear answers is more nearly equal that of the Soviet's, the outlook for fruitful negotiations on arms control will be far brighter. The deterrent can never be totally secure. The nuclear threat will remain present in the nuclear world. But if both sides move toward secure deterrents and non-nuclear answers, rather than continuing to rely on anti-weapons strategy and local defense by nuclear threat, hopefully the world should become more stable after 1962. Studies of arms control plans and problems should start now, for the moment when negotiation is possible, if it comes, may well be fleeting. Also, some specific arms control measures, such as the Antarctica Treaty, may be negotiable with the Russians now. Conversations with the Russians may help both sides move in the direction of secure deterrents. But the real opportunity, if there is to be one, is yet to come.

The present problem is to recognize the important areas where world stability may be upset and damp these. The future problem is the controlled reduction of nuclear weapons. In be-

tween as a sub-issue looms the proper method of moving from the present to the future. This chapter deals with the actions the United States and the Soviet Union can undertake, with or without formal agreement, to keep the balance stable, and some of the long-term problems on which work should start now. The next chapter deals with the ultimate goal, the controlled reduction of arms.

Accidental War

Besides the two basic problems of securing the deterrent and providing a non-nuclear answer, discussed in the last chapter, three other major destabilizing factors must be faced. These are: the danger of accidental war, the so-called Nth country problem, which is the acquisition of nuclear weapons by an ever-increasing number of nations, and competition in outer space.

No nuclear weapon has yet exploded through mechanical or human failure, so no one knows what the international results of such an accident would be. But certainly the accidental explosion in time of crisis of a nuclear weapon of one hostile power upon the territory of another will bring general nuclear war frighteningly close.

One answer to accidental war is to prevent the accident from happening. As has been pointed out, the more secure the weapon the less the need to have it and its crews on constant alert for instant response. The exposed Matadors in Europe, which are vulnerable to a Russian missile landing within 13 miles, are fired by one button. And in spite of official reassurances, the firing officer's private instructions in anything that looks like a nuclear attack are pretty much to push first and question later. The hardened Minuteman, protected in its concrete hole to pressures of 100 psi, will under present plans be fired by three men in three different blockhouses, all under definite instructions to wait for word from higher headquarters before the weapon is fired. What is more important, the Minuteman button-pushers realize they can afford to

wait word from higher headquarters, since they know their missile has a good chance of surviving a Russian sneak attack.

Accident-proof weapons and publicity about their accident-proofness are in the interest of both East and West. But this applies only to weapons that are secure. A weapon that has to be fired fast to avoid destruction cannot have too many safety features built into it. One argument advanced by bomber partisans is that the bomber is safer than the missile because it can "fail-safe," which means its crew will not go ahead and penetrate the Soviet Union, even after taking off on a mission to do so, without a second positive signal. Actually "fail-safe" is an attempt to counteract the accident-proneness of a weapon so vulnerable that it has to take off on its mission without adequate knowledge of whether war has begun. A missile that can survive a Soviet attack is not even fired until it is certain that there has been an attack. This might be called "start-safe," something far safer than "fail-safe."

Also, "fail-safe" presupposes that if communications with the bomber go out, the crew will elect to "fail-safe." What if they do not? From time to time SAC units lose contact with nuclear-armed jet bombers flying on alert. While there is no panic, it is not an experience they take lightly. On the other hand, when the Minuteman is in position, by 1962, should any one man in the Minuteman fire team lose mental control of himself and decide to fire the missile, a period of time of over an hour elapses before the missile is fired. During this time a system of alarms is triggered, and the whole base and higher headquarters have ample opportunity to stop the firing. On the Polaris submarine, both the executive and the commander must concur in the decision to fire.

In addition to making the weapons mechanically safe, there are certain tactical and doctrinal decisions both sides can make to reduce the chances of accident. To test the effectiveness of the Soviet radar is one thing. To test it, say, by having a large flight of bombers take off as if on a hostile mission is another. Again, to test-jam selected enemy communications is to keep up with developments in electronic warfare. To jam massively all his communications at once is to risk an accident that triggers off nuclear

war. The United States is planning to put 6247 nuclear infantry weapons, called Davy Crocketts, with its infantry battalions in Europe. One hopes that, like gas shells in World War II, the nuclear warheads for these are available but not immediately to hand. The Soviet Union, in an obvious effort to get America to do the same, has announced its nuclear-powered, missile-firing submarines will not cruise near American shores. The range of the Polaris is such that they could normally be restricted to areas where they could perform their mission but not appear overly provocative. If the United States should decide to do this, it would be an interesting form of unilateral arms control.

United States Air Force pilots are taught that the United States is presently so vulnerable to surprise, which it is, that they must be continually alert and ready to respond on the instant. To use the tactician's jargon: in a confused situation where the two possible decisions are go or no-go, the preferred response is go. Whether, in spite of the training, individuals would actually give the "go" response in a crisis is open to question. But with the secure weapons the preferred response can change to no-go. This would greatly reduce the danger of accidental war resulting from a nuclear accident.

But even when nuclear weapons have been made less accident-prone than the majority are today, something more will be needed. Time and chance can still act on even the securest of weapons. In the spring of 1960 a group of Air Force officers were sitting down to dinner at an Atlantic seaboard Bomarc missile base. Suddenly they saw in horror out the mess-hall window that one of the nuclear Bomarc missiles had set itself for firing. Its nose was pointing into the air ready for take-off, and fumes were coming out its tail pipe. Interestingly, the response of the officers was not that war had begun and a surprise attack was under way, but that there must have been an accident. Rushing from the mess hall, they yanked wires and threw switches and succeeded in calming down the missile.

Even after detailed investigation there is no real understanding what series of factors caused the electronic brain controlling

Bomarc firings in that particular area to issue the fire order to that nuclear weapon. The hypothesis is that a combination of the radio signals from passing police cars plus the tunes being played by a local disk jockey happened, in one of those improbable occurrences of statistical probability, to combine into a signal that fed itself into the electronic brain as a fire order.

Even with the future Minuteman, along with Polaris America's most accident-proof weapon, weaponeers are concerned about the possibility that a squirrel or other small rodent may chew through the cable that communicates between the Minuteman firing center and the Minuteman missile itself. The Minuteman is preset on course and, as it is a solid-fuel missile, when it gets the proper signal to go it fires instantaneously. If the Minuteman blasts off and deposits 2 megatons on Leningrad twenty-five minutes later, America is going to have to do more for the Soviets than some weeks after respectfully submit for their inspection an electrocuted squirrel with shreds of charred cable dangling from his incisors.

In the kilomegaton world the possibility of accident is always present. The time to plan methods for limiting the damage done by any accident is in the atmosphere of the world before the accident. In the confusion, suspicion, and hectic mobilization following an accident, adjustments, concessions, diplomacy, perhaps even communication may be impossible unless previously arranged.

The problem of preventing a nuclear accident from exploding into a nuclear war is not simple. This is particularly true of a major accident in which an American nuclear device destroys Russian property and life or a Communist accident destroys American property and life. To hold off retaliation and convince the other side the accident was genuine will be an exceptionally difficult problem.

The usual proposal for dealing with a nuclear accident is that some form of emergency communication link be established between the President of the United States and the Premier of the Soviet Union. Communications between the two capitals are undoubtedly a major key to the problem. Whether they should be

between President and Premier is open to question. Both will have other major responsibilities in the event of an accident. And such communication opens possibilities of either blackmail or deception in the event of a genuine surprise attack.

More than words will be necessary to prove the accident genuine. And time will be short. Particularly as more nations acquire nuclear weapons there would seem to be a need for joint United States-Russian teams stationed at several spots around the globe that could start almost immediate inspection of any alleged accident. What and how they would inspect and how they would report need to be agreed on beforehand. As a first step, the United States has to decide what it needs to know from the Soviets to assure itself the accident is genuine. And the Soviets should agree on what they need to learn from us to reassure themselves.

The need for such plans is as glaring as their absence. The plans need careful construction to assure that if Russia wants to attack America she cannot use some unfortunate or manufactured accident to increase her chances of success. And the Soviets will also undoubtedly have fears that must be met. None of the proposals so far advanced for dealing with nuclear accident appears adequately thought out. The problem is particularly difficult because it seems certain that the side that has the accident will have to run certain definite risks to convince the other side the accident was genuine. But then there are also risks in the uncontrolled repercussions from some nuclear Sarajevo.

Stopping the Nuclear Weapon Spread

Another rising source of tension is the possibility of a continued spread to more and more nations of the capability to launch a nuclear attack. The spread would already have been more rapid, but some nations presently able to develop their own nuclear capability have for the present forsworn this national blessing (Canada, Sweden). The balance of terror is difficult to maintain now with two major nuclear powers, one minor nuclear power, and

one diapered infant (France). How long for this earth, then, is a world in which Red China, Czechoslovakia, India, East Germany, Egypt, and Israel all have the ability to launch a nuclear strike?

Yet at the present time United States policy is at best ambivalent on this issue. A glaring example of this ambivalence is the hesitation waltz played by American policy makers on giving nuclear weapons to the North Atlantic Treaty Organization.

The argument advanced for giving nuclear weapons to NATO is that to feel secure the NATO nations need a second-strike nuclear force of their own so that they themselves can make the cost to Russia of attacking them prohibitive. This reasoning implies that if America were not attacked, the United States would not risk itself to defend NATO. With nuclear weapons not only would the NATO nations be able to hurt Russia themselves, but if the Russians attacked NATO without using nuclear weapons, the NATO nations would have the power to turn the war nuclear. This would increase the chances of the United States' being brought in. Thus nuclear weapons in NATO increase the nuclear threat and therefore the deterrent.

The argument has some merit at present, for a United States that talks of cutting down its troops in NATO must appear to the Europeans basically unwilling to defend Europe. Nor have the Europeans themselves made the necessary sacrifices to be able to meet and defeat with conventional forces Soviet non-nuclear aggression. Unwilling to supply the soldiers to fulfill their pledges (NATO's planned minimum force of 30 divisions is only 21 1/3 divisions), the NATO nations are planning to go nuclear and so unwittingly pledge their populations instead. But to increase the nuclear threat and the possibility of nuclear war by spreading nuclear weapons to more nations is not the answer. Rather Europe and America must build up a non-nuclear force that can meet a Soviet non-nuclear attack. At the same time the Soviets must be convinced, through diplomacy and such actions as building up United States non-nuclear power in Europe, that a nuclear attack on NATO will mean nuclear retaliation against Russia.

Restricting the number of nations with nuclear weapons increases the possibility of their eventual control. The problem of Red China is particularly acute. There is a widely held belief, though the evidence for it is inconclusive, that the Soviet Union is anxious to prevent any early acquisition by Red China of nuclear weapons. The Soviet Union is believed to want a nuclear test ban to give it another reason to refuse Red Chinese requests. If the Soviets decide it is to their advantage to arm Red China with nuclear weapons, little the West can do will influence this decision. But if the Soviets are hesitant, America should examine closely any moves that only marginally increase Western security yet accelerate Russian readiness to arm Red China. The arming of West Germany with nuclear weapons is cited by many as an example of such a move.

With the present remote possibility of serious, inspectable arms control, Red China should develop her own atomic weapons in a matter of several years at most. Even with an inspected test ban Red China should be able to build up a supply of primitive atomic (fission) weapons. To make thermonuclear (fusion) weapons is a more difficult engineering process. Plutonium-239 rather than the more easily manufactured Uranium-235 makes the best fission trigger at present, and an independent source of neutrons firing at the proper instant must also be provided.

Still, by herself Red China should have in addition to her atomic stockpile a few thermonuclear weapons in the period 1965-70. But here time is important. To have Khrushchev's Russia face the world with a multi-kilomeгатon capability is different from having the Stalinist Russia of the Berlin blockade period do so, in marked degree if not in kind. Similarly, to have Red China as a major nuclear power while still struggling with major economic crises is decisively different from having Red China a nuclear power after her leaders have created an industrial base of some value. This reed may be a slender one to lean on, but with Red China there aren't many reeds around.

It would seem that one of the mutual actions Russia and the United States could take to make the world more stable is to agree,

albeit tacitly, not to spread nuclear weapons. What to do about nations that elect to manufacture nuclear weapons on their own is another major problem. But as a starter neither Russia nor the United States should rush to hasten the destabilizing process of nuclear diffusion. Among the Western nations the demand for such diffusion is primarily generated by lack of any adequate force to provide non-nuclear answers. Hopefully this period of danger is coming to an end.

Space Control

Another urgent problem pressing the United States is the control of weapons in space. As has been demonstrated over and over again, the production of nuclear explosive material being the prime case in point, the time to control something is at its start. At present there are no weapons in space. Yet enthusiasts are advocating that the United States be the first to orbit a nuclear bomb, using the slogan: "Can we afford to be second in aerospace?" Obviously, the Soviets will also feel they cannot afford to be second. So the rush into space will be on, without Russia or America pausing to ask the question, Can either nation afford to be first with a nuclear weapon in space? Do the gains outweigh the extreme risks?

What will the world be like when on a clear night a watcher of the heavens in the United States or the Soviet Union can see circling over him at any moment in orbit ten or twenty 300-megaton weapons (the size usually discussed for orbital bombs)? One can see the continual alerts at the radar stations each time a satellite shifts course or appears to shift course slightly. And what happens each time a satellite begins to wander out of orbit and has to be destroyed by a nuclear explosion in space? Or in a moment of crisis, do the United States and the Soviet Union start their satellites just slightly downward to lean on each other a bit? These satellite weapons in space, vulnerable to counterattack, are a quantum jump toward insecurity.

In the near future huge multi-megaton weapons that can re-enter and hit targets on earth can be placed in orbit fairly easily. The problem is communicating with them. There must be communication with the satellite bombs to start them toward their target, to shift targets if necessary, and to check if they are still functioning. Both East and West will marshal all their electronic wizardry to prevent the other side from communicating with its nuclear satellites. Certainly one of the most closely guarded and eagerly sought secrets in both arsenals will be the nature of the radio command that starts a weapon satellite earthward. Also from time to time satellites do fail and start earthward of themselves. What occurs when a signal is sent out to an errant United States satellite to destroy itself forthwith and through communications failure nothing happens? The satellite continues wobbling along on course, getting a little closer with each pass to the point where it will fall on earth.

If weapons satellites were necessary for the defense of America, it might then be necessary to face such an explosive future. But the evidence is overwhelming that anything weapons satellites can do weapons from the ground can do better. The problem of American security, and for that matter of Russian security, is the creation of a secure second-strike system. Those who argue that the United States should rush to orbit multi-megaton nuclear weapons in space do so on the grounds of the weapons' security. Their thesis is that American radar will be able to spot the Soviet anti-satellite rockets that are taking off to destroy the satellites. Then the United States can start the satellites toward earth before the rockets arrive and also attack the Soviet with intercontinental missiles. The same argument is used for putting weapons on the moon. It holds that even if Russia could destroy America, the weapons behind the moon could still get the Soviet.

This argument is so specious that, regardless of the need to keep this book objective, it should be labeled "bunkum." The Polaris, the Minuteman, the Dromedary are as difficult to attack successfully as weapons on the moon or satellites in space. And the extreme complexity of the communications systems for testing and

firing satellite weapons makes them highly unstable and accident-prone. Space, like Antarctica, is an area where neither side needs weapons and where inspection is possible without dislocating either Soviet or American society.

The United States has stressed the distinction between placing actual nuclear weapons in orbit and sending up other information-gathering satellites. The Soviet Union, relying on hiding to protect its strike force and with its history of secrecy, has continually attempted to blur this distinction. The United States position appears valid. When a man attacks with a switchblade, the knife is the weapon, not the eye that guides the thrust. People are arrested for carrying switchblade knives, not for seeing. The Soviets themselves have spent years drawing the distinction between nuclear weapons and everything else, notably in their Stockholm peace petition. The same standards should apply on earth as in heaven.

Nevertheless, the Soviet problem should be understood. Russia relies on her secrecy to protect her second-strike capability, as America relies on the secrecy of the oceans to protect the Polaris deterrent. For the Soviets, overhead reconnaissance threatens the security of their second-strike force. While not particularly effective now, by 1965 at the latest the Samos satellite, photographing the earth while moving at 17,000 miles per hour from 100 to 300 miles up, will be able to distinguish objects on the ground 15 feet in size. This will force the Soviets to secure their deterrent in other ways, by hardening, camouflage, mobility. Or they may try to shoot down Samos, as they have announced they will.

This is not to say that Soviet objections should prevent the United States from launching reconnaissance satellites. Stability requires that America have certain vital information about Soviet weapons. Paramount is the United States need to know that the Soviets are not building up vast numbers of secret missiles in an effort to achieve a counter-weapon, first-strike capability. Note that though the Polaris submarines are hidden weapons capable of retaliating against the Soviet Union, the Russians know over-all how many Polaris submarines there are. The Soviets do not have

to fear that a sudden secret accumulation of Polaris will nullify their second-strike capability.

The problem for the United States is not just to gain the necessary information but to gain it in a way that decreases rather than increases world tensions. So far United States development of the reconnaissance satellite has pushed ahead in much the same fashion as United States development of the atomic bomb: a great deal of thought given to developing the weapon, not much thought to its use.

President Eisenhower, appearing before the United Nations in September 1960, proposed that "All launchings of space craft should be verified in advance by the United Nations," and that information gathered by satellites be exchanged to promote the peaceful use of outer space. This program, first proposed in modified form by the United States in 1957, which could be a significant step toward sharing the type of information necessary for arms control, did not attract much attention. It was received less as an arms control measure than as an extension of the "open skies" program, an effort to get around Soviet objections to reconnaissance satellites.

What to do with information from reconnaissance satellites is part of the larger program of controlling outer space. And to have any hope of controlling outer space America must not only refrain from placing nuclear weapons in outer space but also develop the capacity to enforce the controls. For in space control, as in other dealings with the Soviets, cooperation is best gained when it is to Soviet advantage to cooperate and disadvantage not to cooperate.

To place the West in a position to insure that space is controlled requires not just proposals to the United Nations but a major research, development, and production program. Physically controlling outer space is no simple matter. Take for example the problem of destroying a satellite that has been launched in defiance of a control system. Even with thick film absorption anti-radar coatings, satellites large enough to be of military use

can be tracked by present radar at distances up to 500 miles. After a satellite has passed overhead ten times, its orbit can be established with sufficient accuracy to launch an anti-satellite missile against it. But hitting it is still a major problem, particularly if the satellite has some built-in device to cause it to alter course at the approach of another body or is accompanied by decoys.

Even more difficult is being sure the illegal satellite is destroyed. Since there is no atmosphere in space, there is no medium through which blast pressure can be transmitted. This means the anti-satellite weapon must explode close enough to the satellite to destroy it through either heat or neutron radiation. But even if these destroy the satellite, they leave no mark on the satellite as destroyed that can be recognized from the ground, unless the anti-satellite missile bursts so close the fireball vaporizes the satellite. How many expensive thermonuclear weapons does America fire at each unauthorized satellite to satisfy itself the satellite is destroyed? And what about dummy satellites? At how many of these does America blaze away with its nuclear treasure? More importantly, if the major purpose of arms control is to prevent nuclear war, should America rely on a control system that is enforced by thermonuclear explosions, even though these explosions occur in outer space?

The answer to this problem is to design and produce a space vehicle that could intercept orbiting objects and identify them, even bringing them back to earth if necessary. The Air Force has a research project, "Saint," aiming toward this, but it is a low-priority project even among low-priority projects.

Meanwhile, there is another project already out of the research stage and into development. This is the Dyna-Soar orbital bomber, designed to travel at 17,000 miles per hour and to be part aircraft and part satellite operating at the edge of the earth's atmosphere and beyond. As presently designed to carry bombs, Dyna-Soar combines the previously outlined disadvantages of both weapons satellites and bombers. However, with additional expenditures of around 2 billion dollars, the Dyna-Soar could be modified to a manned space inspection vehicle by 1965. Thus by

1965 the Dyna-Soar and its pilot would have the ability to come alongside any satellite, inspect it, destroy it, or bring it back to earth for public inspection to show how any existing arms control agreement was being violated.

With the capacity to control outer space, the United States and its allies would be in a position to launch not a proposal but a program. While the need for such a program gets occasional lip service, only the most meager research has been done, and there is no general agreement on the best program. One fairly typical program envisages the prohibition of nuclear weapons in outer space and the inspection by UN inspectors of all satellites before they are launched. However, both East and West would be permitted to launch four uninspected satellites a year, of which only one could be in orbit at any time. All information from satellites, except from the four uninspected satellites allowed both East and West each year, would be turned over to the UN.

The reason for the exclusion of four vehicles a year from inspection is important and precisely illustrates the complexities of arms control. Paradoxically, a certain small amount of secrecy seems to be a stabilizing factor in international relations, as a little mystery is a good thing in a marriage. If the Soviets can scan at the UN space-control headquarters everything the reconnaissance satellites of the Free World are radioing back, they can devise methods of cheating and check to see if they are cheating successfully. If one satellite flies overhead about which the Russians have no knowledge, they can never be sure but that this satellite is catching them up. And they can check their suspicions about the United States in the same way. Four uninspected launchings a year permit both sides to develop space technology in secret, something of particular importance to the Soviet Union. Yet it is highly unlikely that the developments from so few launchings could change the balance of power.

The United States should be willing to accept modifications during negotiation of this or any similar program. But if it became obvious that the Soviets were not willing to put space controls into effect, the United States would start unilaterally ad-

mitting UN inspectors to its own launchings and policing outer space as the UN's agent. Thus the Soviets would be faced with the choice of joining or of having *all* their satellites investigated in outer space and politely returned to earth. Such an arms control program requires careful scientific, military, and diplomatic planning and development, planning that should have started some time ago.

The Perplexing Problem of Civil Defense

One of the oddest paradoxes of the nuclear age is that civil defense that at first glance appears the most passive of all military measures, a tortoise withdrawing into its shell, can become a blatantly offensive move. The nuclear balance of terror is based on the fact that Russia holds the population of the United States as hostages, while the United States holds as hostages the Russian people. An American or a Russian massive civil defense program is a method of unilaterally removing some of that country's own hostages from the grip of the other side. This leaves the country that has been able successfully to remove its hostages freer to wage war. As an extreme example, there have been estimates that with a massive civil defense program Russia could reduce Soviet casualties from a United States retaliatory attack from around 130 million of the population killed to between 5 million and 10 million dead. Most experts disagree with such an extreme estimate of the reduction.

Further increasing the hostile nature of civil defense are the time factors of the nuclear missile age. In the twenty-five minutes available between the firing of a Russian intercontinental missile and its arrival on its United States target, there is not going to be time to evacuate the major American cities, no matter how expensive the civil defense program. Nor will there be time to do much major city evacuation in the few hours remaining after the nuclear explosion before the heavy radiation starts to settle down.

On the other hand, it is possible, though exceptionally expensive, with estimates going as high as 25 billion dollars, to construct fallout and blast shelters into which even the population of America's major cities could be evacuated with twenty-four hours' warning. An example of the magnitude of the problem is that along the northeastern seaboard from Washington, D.C., up, shelters would have to be able to permit people to survive underground for around thirty days. To build such shelters in either the Soviet Union or America would give little protection against surprise attack, but would permit a surprise attacker to remove his hostages. And if both sides have massive civil defense programs, how many times does one side remove its population to the shelters to force concessions from the other before a kilomegaton exchange begins?

Opinions vary as to the size of the Soviet civil defense program. This is unfortunate, as knowledge of its extent is vital for United States security. On balance the weight of the evidence seems to be that their program is much like that of the United States but slightly more thorough. A lot of manuals have been written, plans made, and orders drawn up; but not much has been done in the way of evacuation rehearsal or deep shelter programs, though there are basement shelters in some buildings.

Just what America should do about civil defense under these circumstances is one of the most complex problems of arms control and national security. In any massive civil defense race, discipline, population distribution, geography, and wind patterns favor the Soviets. Perhaps the answer for America is a modest program to enable the smaller communities, particularly those in the Midwest that are far enough away from primary targets to escape destruction by heat and gamma radiation, to survive the effects of long-term fallout. Some of these communities are bound to be upwind or at least not directly downwind from targets, so that the radioactive contamination would be light. After an all-out nuclear exchange, some 40 million protected people in the Midwest might be the remnant on which the new nation would, if possible, be

built. Certainly fallout shelters for families in rural and semi-rural areas appear much more feasible and effective than a massive urban evacuation program.

At the same time the Russians must be watched closely. For should the Soviets start a massive shelter program, America must immediately respond. For the Soviets would then have the capability either to strike first or try nuclear blackmail.

Joint American-Russian Programs

There are some joint programs the United States and the Soviet Union could undertake where the skills, equipment, and problems of secrecy are so closely linked to military security that these programs can properly be considered important outskirts of arms control. Two such proposals are the joint disposal of nuclear wastes and joint space research. It is wise to caution that just because Russia and the United States undertake a joint program, friction is not automatically reduced. The joint program could lead to such bickerings and acrimony that both sides grow more estranged. The exchange of choral groups between Russia and America seems like a particularly "good" joint action. Yet the Soviet press has used visiting Russian-speaking United States choral groups to whip up anti-United States spy hysteria.

Disposing of radioactive wastes is an immense problem. These wastes are not only by-products of nuclear weapons programs but also the result of the peaceful uses of atomic energy for power. At present the United States buries its wastes underground or deposits them in special containers in the ocean. Of lengthy half-life, these highly radioactive wastes constitute a danger long after disposal. If the peaceful use of nuclear power grows at the rate predicted, estimates place the production of highly radioactive waste by the year 2000 at 50 million gallons per year. This is 4000 railroad tank cars full a year to dispose of permanently.

Reducing the dangers to mankind from so much toxic waste

cries for joint action. There is a possibility that certain wastes, those with the longest half-life, could be separated out, placed in the nose cones of missiles, and fired into space. This is a program of such size and difficulty that probably no nation would be willing to undertake it by itself. Even without so radical a step joint research on storage problems and joint storage programs could markedly lessen the danger of accidental radioactive contamination. Finally, by dealing constructively with one portion of the nuclear program, some of the difficulties that beset all United States-USSR attempts to agree on nuclear issues should be removed.

Research projects in outer space are another area where Soviet-American cooperation could begin. Among possible projects are: studies of the behavior and evolution of organisms in an environment markedly different from that of earth, geophysical research, long-range weather studies and eventual weather control, international navigation beacons independent of weather and radio interference, and vastly improved communications. Once again the benefits from such programs and the ease with which they can be initiated will increase with the security of the deterrent on both sides. For as long as either the Soviets or Americans, fearing to lose military advantage, hold back their best equipment or ablest scientists from the joint program, what cooperation there is will produce more friction than friendship.

Psychological Inspection

Psychological inspection involves basically the use of improved techniques of lie detection on selected American and Soviet personnel to find out whether there has been cheating on an arms control agreement. At first thought, such an idea seems to belong in the same category as men from Mars and flying saucers. A black box that could tell whether people in the Soviet Union and America were, say, cheating on the test ban seems a throwback to the witches' stones of the Middle Ages that were impossible for witches to step on without slipping. Quite possibly psychological

inspection is an idle fancy; no one knows enough about the infant science to know, though both the United States and the Soviet use it to guard their secrets. However, just possibly psychological inspection may answer the problem of adequately inspecting an arms control agreement without having to flood America, Russia, and Red China with hordes of inspectors.

Admittedly, speculation on psychological inspection is just that, but it is important to identify this area as one that needs rapid and thorough investigation. One of the reasons for the instinctive reaction against psychological inspection is that the whole idea of lie detection smacks of police-state techniques which are as repugnant to Americans as the idea of foreign inspectors snooping inside their country is to the Soviets.

The problem of lie detection today, readily admitted by most trained scientists who are in the field, is that the lie detector, or polygraph, as it is commonly called, is so unscientifically used, in many cases by non-scientific personnel, that its scientific potentialities are unknown. Trained United States scientists shy away from the field. The majority of polygraph investigators use the polygraph not as a scientific instrument but as a psychological weapon to help them in their instinctive questioning of suspects.

As a result, the unanswered questions about psychological inspection are legion. The newer findings of physiological psychology have not been utilized to aid polygraphs in measuring minute biochemical responses to truth and lies against the total pattern of human behavior. No improved polygraph has been coupled to an electronic calculator to explore the tools of statistical sampling and probability. Research funds for lie detection have been almost non-existent. Then there are the related problems of what is a lie to a Russian or Chinese Communist? And can people be culturally or psychologically conditioned to fool the machine?

Finally there is the problem of who will be inspected. Obviously, the Premier of Russia and the President of the United States are not going to place their hands on a black box and answer random questions. Is there any group whose inspection

makes sense and who would also know about arms control violations? The whole problem is complicated because the polygraph must be as sensitive in not producing false negatives as it is in not producing false positives. Namely: the machine must be as careful not to accuse the Soviets falsely as in preventing them from cheating. Immediate research in psychological inspection is necessary and should be thorough. Whatever else it is, psychological inspection is not a field in which to risk another test-ban fiasco.

Limiting Weapons

THE FINAL GOAL OF ARMS CONTROL IS IMPOSING INSPECTABLE LIMITS on weapons to maximize world stability and reduce destruction should war break out. Even in a world where such limits can be effective, a world far more stable than today's, the problem of achieving the limits and deciding what limits are wanted is infinitely complex. So little hard research has been done on reaching stability through the reduction and inspection of weapons that this chapter must be more speculative. Definite statements are not possible about the measures discussed in it the way they were about such policies as providing the non-nuclear answer or preparing to control space. Those proposals dealt with weapons systems and organizations that had been studied in some detail.

Indeed the problems of reducing weapons are so great and the danger of the United States' being maneuvered into an unfavorable military position is so ever-present that the temptation is to throw up one's hands and scream: "It's impossible!" The only antidote to this temptation is to recall the dangers in continuing the present situation. The problem remains one of balancing degrees of risk.

But when it comes to reducing weapons, even the risks are

not known. There are few experts, there is no doctrine, no history, next to no research, no precedents. So far the United States has spent only about 20 million dollars on the problem of detecting nuclear explosions, even less on the problem of hiding weapons themselves, yet both these subjects must be investigated as first steps in devising feasible agreements.

Even the basic problems of inspection systems are not known. How difficult is it to forge the records of plutonium production plants to lie about past production? Can a check on radioactive wastes disclose such forgeries? If so, to what degree? How many men would be needed to inspect for such forgeries? What sort of electronic calculators should be designed to help them? How do you set up a clandestine missile factory now? Ten years from now? Are there any parts of the missile, such as the delicate air bearings in the internal guidance system, that are easy to inspect for? When Minutemen will be pulled about America in freight cars, how can you keep track of this generation of missiles, let alone the next? Can any agreement work in which research and development are not controlled? How can you control these and still have a free society? And these are just examples of some of the questions people have thought about. And besides these questions there are a legion of unrecognized ones.

A Stable Deterrence System

In order for America to produce workable, long-term arms control proposals, expert investigation of this morass has to start now. The best way to move into this morass is to take a proposal that has been advanced by some of the few scientists, diplomats, and officers in the arms control field. This proposal takes the form of an arms control system in which America and Russia are limited to 1000 intercontinental ballistic missiles apiece of the type each nation wants. The proposal calls for the halting of nuclear explosive production, and inspection of nuclear stockpiles and delivery vehicles. Restrictions on conventional forces, if any,

would be few. Such proposals where both sides are held to a finite number of weapons rather than going down to zero weapons, as in conventional, complete disarmament proposals, are called "stable deterrence systems."

Several things need to be said about this 1000-missile proposal, the most important being that it is a working hypothesis, not a ready-to-go negotiable package. Nor does it represent the ultimate goal of international relations and mankind. Rather, such a stable deterrence system appears the best method of providing at least a few years in which to work out further solutions to future problems. Some stable deterrence systems set the number of nuclear missiles to which America and the Communist bloc would be limited as low as 50. A great many scientists believe 1000 is high and that the optimum number is between 200 and 500 missiles. On the other hand, others believe 1000 missiles for both East and West too few. One thousand may not be the optimum figure for security and stability; with present knowledge it is impossible to tell. But in working with national security in a relatively unexplored area, 1000 secure missiles appears a reliable number on which to construct a working model.

Before investigating the reasons for setting the missiles allowed both sides at 1000, it is important to go further into the critical arguments for having a stable deterrence system. Why is it better to have both sides retain a certain number of controlled nuclear weapons, rather than having Russia and America reduce their nuclear forces to zero? The answer to this question forms the theoretical crux of the arms control system. Arms control does not try to alter human nature and usher in perpetual peace. Its interest is in avoiding war by increasing stability between nations. The zero system, where both Russia and America destroy all their nuclear weapons and strip their conventional forces down to police force levels, is not only beyond the bounds of the possible; more importantly it is a system as dangerous and as unstable as the multi-kilomeгатon world of today. Even if a zero system were possible (which it is not), it still would be less desirable than a stable deterrent.

First, the zero system puts an incredible premium on cheating. Under a controlled 1000-secure-missile system, if the average missile payload is 5 megatons, that system can launch a 5-kilo-megaton attack (assuming for the purposes of illustration that all missiles fire perfectly and are totally secure). That, as may be recalled, kills roughly 80 per cent of the United States population in sixty days and about 60 per cent of Russia's. Say the Soviets cheat and succeed in hiding ten 5-megaton missiles. What is the difference? They put another 50 megatons on America and kill another 1 per cent of the United States population. America still can destroy 60 per cent of theirs. The cheating has been ineffective. And making cheating unproductive is a much better method of protection against it, and prevention of it, than any inspection system politically and physically possible. Of course, how much cheating is possible and what it can actually accomplish in enabling one side to destroy the other's weapons are crucial and highly technical questions bearing decisively on how many missiles America and Russia actually need.

But in a zero system, if Russia succeeds in hiding ten 5-megaton weapons when the United States has none, the Soviets have the world. Not only could they practically blackmail America into immediate submission, the Russians could announce they were resuming nuclear production, mobilize their army to defend their borders, and use their ten nuclear weapons to destroy the production facilities of America as fast as they were built. In this way Russia would soon have not ten nuclear weapons to America's zero, but one hundred. Then it would all be over.

Because the gain from even a small amount of cheating in a zero system is decisive, the inspection system has to be incredibly immense. The level of inspection has to exceed anything the United States would possibly agree to, let alone the Soviets. Find ten 60-foot-long missiles, the length of Minuteman, in the United States. And what about those sunk in containers in the ocean? Not all the technical problems of inspection are known, but inspecting a zero system would certainly require Soviet teams in every factory, bank, university, and laboratory in the United

States, with power to enter any citizen's home at any time. And because the results of cheating would be decisive, both America and Russia would continually press for more inspection and be instantly ready to spring into nuclear production at the slightest hint of a violation. The system would be as nerve-racking and unstable as that of today, if not more so. The duration of marriages where husband and wife have each other shadowed by relays of detectives is seldom long.

In addition to cheating, both sides, in a zero system, would be haunted by the possibility of some research breakthrough or even technological improvement that would upset the balance of power. In the kilomegaton world improvements in biological and chemical warfare make nice newspaper headlines, but they are not important. More people can be killed a great deal faster and more efficiently by fusion. In a zero nuclear world, chemical and biological warfare would become important threats to be rigorously inspected for. And the fear of a breakthrough in these areas would increase the tension between nations.

As long as America insists it is planning for the zero system of total disarmament, and acts as if it were, America's plans and actions will either be cynical or as insubstantial as the dreams they are based on. A stable deterrence system, whether of 1000 missiles or some other number, while difficult to attain, at least provides security for America and Russia and works with a permissible number of inspectors. And, if the system can be achieved, it is superior to the present uncontrolled world.

There should be no doubt about this superiority. Just because it appears impossible to abolish all nuclear weapons, there is no need to quit the struggle for arms control in despair. Not everyone can marry a Hollywood glamour queen. Indeed those who settle for reality often seem better off. A world with a secure, stable deterrent and a tolerable inspection system is a definite improvement over today's virtually uncontrolled multiplication of arms. The continuous accumulation of fissile material toward the DOE reaction would have stopped. Part of the grinding fear of surprise attack would have been eliminated. Though both sides could

still gravely damage each other, at least that damage would be more or less limited to portions of their own territories. And the limit on nuclear weapons, the setting of them to one side as a secure deterrent force, establishes a barrier around the use of these weapons which makes their use less likely.

Such are the arguments favoring stable deterrence over the traditional total disarmament. Once we have decided stable deterrence is the goal of arms control, a complex technical problem arises: How much force should both sides, the Communist bloc and the Free World, be permitted to keep under such a system?

Virtually no rigorous investigation has been done to determine the proper controlled force levels for stable deterrence at different periods of time. Besides theory, such work requires detailed and careful analysis of the capabilities of present and future United States and Soviet weapons. The quite proper "Top Secret" stamp on such knowledge means that such work can best be done under government auspices. To state it is unfortunate no adequate research has been done on this problem is to understate the obvious.

A stable deterrence system must (a) prevent the United States or the Soviet Union from being defeated in all-out war (the impossibility of truly "winning" in the nuclear age already having been examined); (b) reduce the danger of all-out war and the destruction war would cause; (c) be politically and economically feasible to install and inspect.

To prevent the United States from being defeated and reduce the danger of war, the secure force must be large enough to deter the Soviets. Thus even before questions on how vulnerable is the force and how effective is the inspection are met, the old problem arises of how much is enough to deter the Soviet Union and Red China. Here the only thing to do is to state there is no agreement among the "experts." Estimates start with those who feel the deterrent is sufficient if the Soviets know they would lose their ten major cities if they attacked the United States. Those who believe this tend to believe a very few secure missiles, between 50 and 100, are sufficient to constitute the secure force for both sides. Next come those who believe that the Russians

would be deterred if they knew their losses would be greater than those in World War II, when Russia lost about 10 per cent of its population. Those who believe this put the number of missiles needed for a secure stable deterrent at between 100 and 200. Several studies of the necessary level for deterrence by the Army and Navy place the deterrent in approximately this area. *

Then come those who believe that the deterrent in this irrational world has to be larger to be effective. They tend to believe that to be deterred the Russians must expect to lose at least 50 per cent of their population, and then there must be enough weapons left over to do the same thing to the Red Chinese. Depending again upon estimates of vulnerability and the possibilities of cheating, those who believe this tend to believe from 500 to 2000-plus missiles are necessary in such a system. Finally, there are those who believe that the only deterrent is for America to be able to do twice as much damage to the Soviets as the Soviets can do to America. At a time when both sides can inflict over 90 per cent casualties on each other, it is difficult to see just what this means. But those who hold this view see as unending the need for an ever-increasing number of missiles armed with ever bigger warheads.

Another argument advanced against the stable deterrent is the so-called "counter-force argument" that holds that America must have a war-winning capability, and this means the ability to destroy not just Russian cities and populations but primarily Russian weapons. To destroy Russian weapons, an increasing number of American weapons are required. The first basic answer to this argument is dealt with in Chapter Two. In the missile age it is close to impossible to destroy enough Russian weapons, even with the most elaborate sneak attack, to prevent the United States from being severely damaged in the counter blow.

Not only is an effective counter-force strategy close to a physical impossibility, but it presumes that America strikes first. For only by getting in the first blow is there a remote chance of success in severely damaging a secure force. As long as both sides continue to build vast numbers of weapons designed to destroy

the other side's weapons, the super-quick response posture of today will continue necessary with all its dangers, and of necessity the kilomegatonnage will climb.

Besides the question of how much force is necessary to deter, two other ingredients determine the size of the stable deterrent. These are the vulnerability of the force and the ability of the Russians and Americans to cheat. These two factors interweave. The more vulnerable the force, the less cheating the system can tolerate. Computing the vulnerability of a force is one of the most difficult military arts. It involves knowledge of the enemy's forces, of the state of military research, of weapons and counter-weapons strategy, of probability, and then some guesswork. The complex and dangerous interrelationship between vulnerability and cheating is another example of why America cannot undertake any serious weapons reduction until the secure deterrent, a force with some definite degree of second-strike ability, has arrived.

In a stable deterrent force each weapon does not have to be totally invulnerable. But the force as a whole has to be secure enough to remove the possibility that the Russians can reduce the force to a level where they avoid effective retaliation. For example, those who believe that all the United States has to do to deter the Soviets is to be able to destroy ten major Russian cities cite the following probability factors. If both the United States and Russia have a 200-missile force protected by hardening to 100 psi, and if the missiles of both sides have 8-megaton warheads and are accurate to within 1 mile (approximately the present situation), then the Russians would need 950 missiles to get a 90 per cent probability of leaving the United States with only 10 missiles at the end of a surprise attack. And the increase from the 200 permitted missiles to the 950 necessary represents a large amount of cheating.

If the Soviet missiles, on the other hand, were accurate to within 1/2 mile, they would need only slightly more than 600 missiles to obtain the same 90 per cent probability of reducing the United States force to 10 missiles. However, to turn the problem around, if the 200 United States missiles were hardened

to 1000 psi—this means they can survive practically at the edge of the fireball and is a difficult engineering problem but not impossible—then around 1450 Soviet 8-megaton missiles with an accuracy of $1/2$ mile would be needed to have a 90 per cent chance of reducing the United States force to 10 missiles.

The number of missiles necessary to destroy one enemy missile is called the exchange ratio. If it takes four Russian missiles to knock out one United States missile, the exchange ratio is 4:1. In actuality, exchange ratios are much more difficult to calculate than the theoretical examples given. Some of the Soviet and American missiles will misfire. Anti-missile missiles may be used. The problem with Polaris submarines is not missile accuracy but finding the submarine. A hit on a Polaris submarine takes out sixteen missiles. Some of the missiles left may fire at the same target. Someone may lose his nerve and press the wrong button. Further, the Russian missiles might be used against the vulnerable radars of the United States air defense, and then Soviet commercial jet aircraft, clandestinely converted to bombers, used against the United States missiles themselves.

Also, the exchange ratio fluctuates constantly. Improvements in guidance systems affect it markedly. Improvements in warhead size affect it somewhat. And the deterrent effect provided by the missiles remaining after an exchange can be altered drastically by large-scale civil defense programs.

Furthermore, with stable forces of 200 missiles or less, it may not be necessary for the Russians to use their missiles as a first-strike force against United States missiles. Sabotage may do instead. As long as the United States has a reasonable number of weapons, worries about sabotage are minimal. There are just too many weapons around for the Russians to be able to sabotage enough to make an appreciable difference. But as the numbers get very low, sabotage becomes a major problem, particularly in an open society such as America's. The possibility of the inspection force's being used for sabotage must always be considered. At the least, the inspectors are going to know the exact locations of all the fixed missiles and of some of the mobile ones. And at the

moment when a missile starts slowly off its pad, even the most hardened of missiles is vulnerable to something as primitive as a rifle bullet. Both the first nuclear submarine, the *Nautilus*, and the *Triton* have already been effectively sabotaged during their overhauls. With low numbers of missiles in a secure deterrent system, sabotage becomes a definite problem.

Related to the problem of sabotage is that of subversion and psychological warfare. Again, as long as the United States or the Soviet Union has a reasonably large number of weapons, the reliability of their crews is not a cause for concern. But as the numbers lower, the danger is increased that the effectiveness of the nation's defense may be reduced critically from subversion or clever psychological warfare. And certainly the purpose of arms control is not to create a world in which dissent is more difficult than today.

Finally, there is the problem of cheating. How much cheating is possible? The tautological answer that the amount of possible cheating varies with the amount of inspection permitted is no solution to the problem. So little is known about what constitutes adequate inspection that it seems wisest to look at some of the problems rather than the solutions. For all the solutions are based on so little evidence they may be misleading, as was the underground nuclear test detection solution, originally based on one nuclear shot.

One of the obvious places to check for cheating is the nuclear stockpile of the Soviets. Do they have only the amount of nuclear explosive they claim they have made, or have they made more and hidden it? If they have hidden some, or if they may have hidden some, can it be enough to make any difference under the agreement?

The extreme difficulty of checking on nuclear stockpiles is indicated by the fact that the United States government itself could not honestly say it was certain how many weapons exist in America. In the early days in the AEC, then the Manhattan District, those in the nuclear explosive plants at Oak Ridge, Tennessee, and Hanford, Washington, had more vital things to

worry about than accurate checks on the exact amount of material produced. And nuclear explosive, if it can be stolen, is as easy to carry away as cheese. Experts admit that with the controls then in being it is possible, though certainly completely unlikely, that someone could have stolen enough to make ten multi-megaton weapons and no one would know about it even now. In fact, even with the controls in being today, it is theoretically possible to steal enough nuclear material in the United States to make several weapons a year. Also, not all the nuclear explosive has been recovered from some of the accidents involving nuclear weapons. Since America cannot even be exactly sure about its own stockpile, what a problem it will be to be sure about the Soviet Union's.

Undoubtedly cheating on the stockpile will be possible. And where it is possible, the United States must assume that it has occurred. The question is then, How much will be possible? It seems a likely assumption, but no better than that, that the Soviet Union will shortly have manufactured around 350 tons of nuclear explosive. A 10 per cent ability to cheat on this amount would mean 35 tons of nuclear explosive could be hidden. It takes very roughly 100 pounds of nuclear explosive for the trigger of a thermonuclear weapon. This means that with a 10 per cent ability to cheat some 700 multi-megaton weapons could be hidden by the Soviets.

How possible is it for the Soviets to conceal 10 per cent of their past production? How possible to conceal 20 per cent? 1 per cent? Again, unfortunately, the answer is that no one knows. If the Soviet Union tomorrow, out of the blue, were to agree to start arms control and offer to let two thousand inspectors into Russia to browse amongst Russian records of nuclear production and wander at will through the plants themselves, the United States quite literally would not know whether to hail the offer as the greatest forward step toward peace ever made or denounce it as a cheap propaganda trick.

It is past production, not present or future production, that presents the major difficulty. First, all the plants producing nuclear

explosive (fissile) material inside the Soviet Union have to be located, and, not too long thereafter, those inside Red China as well. This does not appear too difficult a problem. Production of nuclear explosive requires either vast amounts of power—this is true even of the newly developed centrifuging techniques—or, if the material is produced in a reactor, vast amounts of water or bulky gas or air-cooling units are required. Then, since in creating a plutonium nucleus approximately two radioactive atoms are also created, there are always radioactive wastes to be disposed of. This disposal is a large, tricky operation and provides another opportunity to detect clandestine plants. After the plants have been located, and if the inspectors have access to plant, raw materials, and wastes, it does not appear too difficult to determine within certain limits the current capacity of the plant.

But has the plant always been operating at capacity? Or has its capacity been recently altered? That is where the difficult questions begin. Americans have only the haziest idea what sort of records the Soviets have kept in their nuclear plants. To forge plant records of nuclear production, if Soviet records are of comparable thoroughness to the United States', would require the altering of a great many simultaneous equations, and at the same time portions of the waste and nuclear explosive would have to be tampered with to conform to the forged equations. Much more likely would be the introduction of a certain vagueness into the records so that the American inspection teams could never be quite certain how accurate they were.

Another method of diverting past nuclear explosive production into a clandestine stockpile would be to claim that certain previous atomic tests had been unsuccessful. A nation could state, for example, that certain weapons, designed with enough material to produce a megaton explosion, when tested had proved duds and scattered their material over the landscape or seascape, so that most of it could not be recovered. Obviously, the claim by either the Soviet Union or the United States that it had run large numbers of "unsuccessful" tests would be regarded by the other side with extreme suspicion.

Inspecting Delivery Systems

The problem of inspecting delivery systems is that basically everything can be a nuclear delivery system, from suitcases to intercontinental missiles. While this is true, it is also true that some delivery systems are more effective than others. In a stable deterrent system strangers in cars, or even with suitcases, will not be welcome on the missile base or at the Polaris dock. Marginal weapons systems, from those hidden in suitcases to those hidden in ocean liners, can do grave damage, but to destroy enough of America's weapons so that Russia escapes retaliation, accurate complex delivery systems are necessary. These are primarily bombers and missiles.

In the 1000-missile stable deterrence system, the number of bombers is usually reduced to zero. Some weaponeers who do not like all their eggs in one basket prefer a mix of say 800 missiles and 200 bombers. But in spite of the defense advantages of having a mixed system, the basic vulnerability and instability of bombers already discussed limit their appeal and usefulness in a stable deterrence system. There is always the danger that commercial jet aircraft will be modified to serve as bombers. However, while it is simple to modify commercial jet transports, like the Boeing 707, to where they can do the bomber's job for area targets such as cities it is difficult to modify them to where they can bomb accurately enough, and avoid anti-aircraft missiles, to take out secure missiles or hunt submarines. Again the question is, How much cheating is necessary to be significant? And how possible is it to catch such cheating? Again, the answer is not known.

For example, for 14 billion dollars it is possible to set up a system which overflies the Soviet Union daily and photographs the entire Soviet Union from a height of 20,000 feet and processes all the data. From 20,000 feet modern photographic techniques can observe practically everything. Fourteen billion represents the initial cost. The continuing cost would be about 2 billion dollars

a year. With this, plus ground inspection, it would appear difficult to hide a clandestine factory producing something as large and complex as a bomber. But spotting clandestine production in some corner of a major factory producing commercial aircraft could be far more difficult.

Inspecting for clandestine missile production or hidden missiles is harder than inspecting for bombers. Missiles are easier to make, less complex, smaller, and therefore easier to hide. As missile development continues and missiles become smaller and simpler, the inspection problem increases. If it wanted to, America could soon begin hiding pre-targeted Polaris missiles in containers in the depths of the ocean that would rise to the surface and fire on some acoustic signal. How would the inspectorate find these? But then how sure could a nation be that such missiles would work after they had lain untested for, say, five years?

The world appears to be in the same state with missiles today that it was in with nuclear explosive in 1946. At present they are in limited supply and relatively easy to inspect. Soon missiles, like nuclear explosive, will start coming out of our ears, and the inspection problem will be of enormous magnitude. This is another reason why the period in which it is possible to establish effective arms control may be of brief duration.

The magnitude of the inspection problem indicates why a general arms control treaty may be the only kind it is possible or desirable to obtain. The level of inspection required to check safely any one item is so great that it is almost worthless to pursue it unless the gain involved is also very great. And the gain in solving any one section of the arms problem, from nuclear tests through missiles, often turns out to be marginal in comparison with the inspection effort involved.

The Research Breakthrough

Behind many objections to arms control systems is the fear that the Soviets will achieve a scientific breakthrough, which

would give them a decisive advantage over an America that had limited its weapons. To guard against this, some stable deterrent arms control schemes place elaborate restrictions on research and development. But the more controls over research and development are examined, the more unenforceable they appear; and the more antipathetic to democracy. How do you look for something when you do not know what you are looking for? How do you control men's minds where the breakthrough is going to come from? Also, if American or Russian inspectors start looking for some specific item of research, they indicate to the other side their most secret fears about their own weakness. Lobotomies for all scientists have been joked about as the ultimate research control. Unfortunately the "workable" controls advanced appear to have the same degree of reasonableness.

Then what makes a breakthrough destabilizing? The nuclear submarine with its ability to give America a second-strike deterrent through hiding has become a stabilizing factor. But at the time of its proposal who could have foreseen whether an undersea nuclear power reactor would decrease or increase world tensions? And how do the Russians feel about the stabilizing effect of the invisible Polaris submarines? Maybe they now look back with nostalgia to those old-fashioned air bases around their periphery against which they fulminated for so long, where their agents could at least count the bombers at the end of the runways?

In the developmental phase of new weapons, as distinct from pure research, some controls may be possible. Weapons testing often requires extensive facilities, and these may be inspectable. The nuclear test ban, if a workable test ban comes into being, will be basically a check on the development of new nuclear weapons by restricting their development phase. However, fundamentally the problem of preventing a research breakthrough is the problem of the "Woompher bomb." The Woompher bomb is a weapon that, even though you do not know what it is, if the enemy gets the Woompher you are through.

There are several things that need to be said about the

Woompher bomb. If it is genuine Grade-A Woompher, one that causes America to vanish instantaneously without hurting the Russians at all, and if the Russians get it first, then it makes no difference what level of armaments America has. America is through. Even at the time the United States and British armies were on the Rhine and the Russians were on the Oder, if Hitler had gotten ten 5-megaton thermonuclear weapons, the outcome of the war would have been different. America can spend every national resource piling up nuclear weapons, and, if the Russians get a genuine breakthrough on the Woompher weapon, it will not make any difference. On the other hand, it is important in a stable deterrence system not to set the numbers of weapons so low that a mere improvement in technology by one side severely changes the balance of power.

One area of continued scientific improvement today is missile accuracy. If some form of terminal guidance system, guidance when the missile is dropping down toward its target, could be developed for intercontinental missiles, say a ground-sensing apparatus that through interpolations from landmarks around the target made the missile accurate to within 100 yards, the whole problem of securing the deterrent would change. Here the whole complex of technological questions comes into play again. Against such pinpoint accuracy an anti-missile missile can be effective, since it has a limited area to protect. How effective will the United States anti-missile missile be in comparison with the number of Soviet missiles that can be given terminal guidance before the inspectors spot the change? And what about camouflage and artificial smoke? Or the mobile missiles, Polaris, Minutemen on trains, and Dromedaries? How would the Soviets get at them?

Once again the question is one of balancing risks. How great is the risk that the Russians will achieve a breakthrough that will be decisive over the stable system? And how does that risk compare with the present situation, where both sides rely on uncontrolled nuclear threat? This problem is probably more acute for Russia than for the United States. In spite of very definite

successes in some fields, such as space, Soviet society has not been as productive as the West in pure research from which genuine breakthroughs leap.

Some Problems with Stable Deterrence

War games indicate several major problems with stable deterrence. One of the most perplexing is the increased likelihood of limited, non-nuclear, "brush-fire" wars. As long as America and to some extent Russia rely on the threat of nuclear retaliation to deter minor provocations, some of them undoubtedly are deterred, though the risk in conducting policy in this fashion is, as already discussed, extreme. However, with nuclear weapons limited and set more or less to one side as a deterrent against only major nuclear attacks, much of the threat that a probing action may trigger a nuclear holocaust will have been removed from the Soviets. This obviously increases the United States' need for forces to handle decisively and quickly the threats arising from less than major provocations.

The increased possibility of limited wars would appear particularly prevalent at the start of an arms control agreement. Then the Soviets could be expected to probe the West to find out if American willingness to control arms indicated softening of United States intent to defend the Free World. Hopefully, after an arms control agreement has been in force for some time, with benefits to both the United States and the Soviets, the fear that a limited war might cause the agreement to break down would become a factor limiting the likelihood of limited war. However, such speculation is far in the future.

Another problem with stable deterrence, or with any adequately inspected arms control system, is the problem of cost. If there actually are those around who believe that arms control schemes are impossible to achieve because the American economy can function only under the stimulus of arms production, they can calm their fears. The problem is the opposite. A workable arms

control scheme with adequate inspection involves large expenditures both initially to build inspection machinery (around 14 billion dollars for aerial inspection alone) and later to provide for the inspection force and the processing of inspection data. On top of this are the creation and maintenance of the limited response force and the stable, secure deterrent. If one of the reasons the Soviets favor arms control is Russian desire to achieve immediate economic advantages from such controls, the quick advantages are not there, though more of them are there for the Soviets, who already have a large limited war force. Nor will there be much economic benefit from arms control in the long run if a moratorium on strategic arms production merely shifts, as seems likely, the struggle between the Communist and the Free World into some other area, such as economic aid.

The belief that arms control would lead to immediate tax relief, even while the basic divisions between East and West remained, is another indication of the major fallacies that result from the lack of serious study given this whole area. The monitoring and control of outer space alone is a problem that will keep the electronic and missile industries occupied. A major barrier to the achievement of arms control may turn out to be Russian lack of enthusiasm for the whole affair once they realize its cost. It should go without saying, but unfortunately some things that should go without saying are occasionally better said, that the expense of arms control is no reason for not adopting it. Arms control, like an adequate defense policy, is a lot less expensive than nuclear war.

Another major problem, singled out for inclusion here perhaps because it seems so inconceivable that it should be a major problem, is what happens to all the nuclear explosive in excess of that needed to make the number of secure weapons in the stable system? If either side is cheating in preparation to launch a surprise attack, that excess material is going to be a highest priority target. It also represents part of both United States and Soviet national wealth. The material could be destroyed by firing it into outer space or into the sun. But neither side will want to

do much of this until the workability of the arms control plan has been tested for some time. How does a country make its stockpile of excessive nuclear explosive inspectable but still secure?

This brief mention of a few problems involved in stable deterrence is not intended as an argument against the system. Nor is it a definitive listing of all the problems. It merely indicates that the arms-controlled world would have its complexities also, not all of which have yet been recognized, let alone understood.

Achieving a Stable Deterrent

The problem of the first move from an essentially non-controlled arms world to a controlled one remains crucial, even when the ability for second-strike and non-nuclear answers has arrived. Before discussing the generally agreed-upon first step, the problem of negotiating arms control agreements with the Soviets should at least be touched on, even though it lies mainly outside this book.

An assumption is sometimes made that those who favor arms control believe that the way to bring it about is to make a series of unilateral concessions to the Soviets. While there are some arms controllers who feel this way, they are in a distinct minority. The majority of arms controllers recognize the danger that the United States may become so anxious for arms control that it starts negotiating with itself. To make a genuine proposal, have the Soviets turn it down with a flat "no," and then go back and modify the original proposal in the hopes that the Soviets will accept the new version is to negotiate not with the Soviets but with ourselves. And if a program that has been continually modified to United States disadvantage without any Soviet concession is finally accepted by the Russians in its modified form for serious negotiation, the results could be disastrous.

The springboard most usually wheeled forward for plunging into the arms-controlled world is an inspected halt in the production of nuclear explosive by East and West. Both sides already

have ample nuclear explosive to damage each other heavily. It is true that there is more nuclear explosive in the United States stockpile than in the Soviets'. However, it is equally true that, even leaving aside secrecy, geography makes the Soviets a much less vulnerable target. Five kilomegatons delivered against the Soviet Union kills roughly 60 per cent of their population, while roughly 80 per cent of the United States population is destroyed by the same kilomegatonnage. And this difference in geography should be sufficient to offset Soviet fears over the superior size of the United States stockpile.

Checking to see that no more nuclear explosive is being produced is far easier than trying to figure out whether past production has been diverted into a clandestine stockpile. The problem is now reduced to first being sure that the Soviets, and not too much later the Red Chinese, have no hidden plants, and then adequately inspecting plant operations. As was pointed out earlier in the chapter, the large power requirements of mechanical separation (Oak Ridge, Tennessee, used more power than TVA could originally supply) plus the problem of cooling reactors and disposing of radioactive wastes, make concealment of these plants producing nuclear explosive exceptionally difficult. However, a small reactor for research purposes could be easily hidden.

Once again a word of caution is necessary. There has been a minimum of research on the problem of hiding nuclear production. No team of experts has been given the job of designing a nuclear explosive plant with the twin goal of producing weapons-grade material and outwitting a team of international inspectors. Many parts of some of the plants are highly radioactive and accurate checks on the materials going through them is difficult. Certain indicators, which at first glance appear to make almost certain the detection of clandestine nuclear production, on investigation turn out to be manipulatable. For example, the amount of krypton in the atmosphere should indicate the level of certain types of nuclear explosive production. But what if a plant producing krypton "accidentally" explodes, flooding the atmosphere with excess gas?

Unless further research proves otherwise, locating the plants and monitoring them after they have been located should not prove exceptionally difficult nor necessitate vast numbers of inspectors. Considerably fewer inspectors with less mobility would be necessary to inspect a cut-off of fissile materials than the twenty thousand now believed necessary to monitor the test ban. Inside the nuclear plants, if they were still in production to produce research-grade material, samples of materials in production, measurements of power, and radio-chemical analysis of wastes would seem adequate to assure that no significant amount of nuclear explosive was being diverted into some hidden stockpile.

Also, either hiding a plant producing nuclear explosive or diverting explosive into a hidden stockpile is a blatantly provocative action. If a plant were discovered, it would be hard for even the Soviets to insist convincingly that they really had told the boys in Siberia they could not build that underground reactor. The Soviets would risk a propaganda defeat comparable to their intervention in Hungary. While the Soviets are never overly concerned about propaganda defeats when there are physical victories to be gained, hiding a plant large enough to alter the balance of nuclear power appears on present evidence impossible enough to dismiss as a risk.

From the point of view of inspection, the advantage in starting with a halt in nuclear explosive production is that such inspection can be accomplished without disturbing other parts of a nation's society. Nuclear production plants in their extreme secrecy and because they are dangerous are already removed from the general population. Inspectors stationed there do not intrude on the general life of the nation, as would inspectors at missile plants which are more a part of the workaday world of both United States and Soviet societies. Estimates place the number of inspectors on the spot needed to monitor a nuclear explosive production halt at between one thousand and four thousand, depending on how much other nuclear activity is going on. The comparative ease with which it now appears such an inspection could

be instituted makes it appear an ideal starting point for testing the feasibility of arms control.

At the same time, in microcosm, such inspection tests the ability of the society as a whole to respond to controls. How complete are the records? How ready are people to submit to inspection? What physical restrictions confront the inspector? Can an inspection system safely be extended further in more general arms control agreements? A cut-off of nuclear explosive production seems to represent the hoped-for goal of a really important area that can be inspected with a minimum of dislocation to either Russia or America.

For the area is of critical importance. A cut-off of nuclear explosive production halts the steady if unwilling progress toward a Doomsday Machine. The production of lithium deuteride, a key material in the hydrogen bomb, might still secretly continue, since the production of this material from seawater and other common chemicals does not require complex installations and would be difficult to control. But there is a limit to the amount of lithium deuteride that can be wrapped around an atomic trigger to make an effective weapon, and a halt in nuclear explosive production stops the making of these triggers. Should, however, the high-explosive-to-fusion reaction be developed successfully, which at present seems unlikely, rigorous inspection of lithium deuteride production would be essential, as the atomic trigger would no longer be necessary.

In effect, a cut-off on nuclear explosive production halts present "progress" in the nuclear race. This is not perfection, not even close. Efforts should be made to start the controlled reduction of weapons toward a stable deterrent system. But to have ended the piling of kilomegaton Pelion upon Ossa is no small first step.

CHAPTER EIGHT

A Final Word

THIS BOOK HAS BEEN AN ARMS CONTROL TOUR OF THE KILOMEGATON age. It has explored the possibilities of an increase in national security for both the United States and the Soviet Union through building international stability. In an age when it is still easy to lose but increasingly difficult to win, the results of the two major destabilizing factors have been examined. These factors are: the vulnerability of present United States and Soviet strategic weapons to surprise attack; and the reliance on nuclear answers to check all forms of disturbances, from major thermonuclear war to minor harassments. Hopefully, the need for secure weapons and non-nuclear answers has been established both as imperative for American security and as a first step toward arms control. Hopefully, also, this discussion has established that in the kilomegaton age arms control is not something set apart from United States defense policy but an integral part of it.

Some of the past and present proposals that have borne the label arms control, arms limitation, or disarmament have been weighed and found wanting. These proposals were rejected not just because of their impossibility, though for many of them this alone should be enough, but more importantly because they lead

to a less stable rather than a more stable world. Therefore, the world produced by such proposals is one in which nuclear warfare is more likely in the long term, no matter what the short-term advantages may seem.

In addition to the two great needs of securing the deterrent and providing a non-nuclear answer, other necessary first steps of arms control have been surveyed, both their dangers as well as their possibilities: space control, methods to guard against surprise attack, the perplexing problem of civil defense, checking the spread of nuclear weapons, and some possible United States-USSR joint programs. Finally, there has been a more speculative glance down toward the end of the trail at what is entailed in a halt to the production of nuclear explosive and the establishment of an inspected, stable deterrence system.

At no time has arms control been presented as an easy way out. Controlling arms is at least as difficult as, if not more difficult than the defense programs both the United States and the Soviet now pursue. But it is a possible, workable solution, and possible, workable solutions in politics, international relations, and love have a tendency to be harder to accomplish but more rewarding in the end than feasting on a dream. Because this book has dealt exclusively with arms control, it is probably also wise to repeat once again that arms control is no panacea for the problems of the world. The victory of freedom would not be assured with the advent of arms control, the struggle would merely shift to other areas and go on. Nor would the defeat of freedom automatically result if arms control fails.

United States Government Organization

If the United States government decides seriously to pursue arms control, as now appears probable, a number of the programs outlined in this book are vital. It is also vital that America and the rest of the world understand the reason for these programs: that, for example, in pressing for a secure deterrent and a non-nuclear

answer, America is not just adding to its defense budget but actually moving toward a more stable world in which arms limitations become possible. These two programs make sense no matter what the Soviets do. But more importantly, they are policies that should lead the Soviets toward a more stable posture.

Then there is the immediate problem of starting serious research on the actual form an arms control program should take. Some of the possibilities have been outlined. Also vital is the problem of organizing the government effectively to bring the program into being. While government organization is a subject apart from arms control, it is worth while to mention a few of the conflicting suggestions of the past, for they illustrate the difficulties ahead. There is general agreement that any organization to investigate and promote arms control needs status and presidential backing. After that the argument starts. It is a lot easier to argue about organization than devise workable programs for arms control.

Among the proposals advanced have been an entirely new agency whose head would have cabinet or sub-cabinet rank, an interdepartmental committee, an assistant secretary of state for arms control, an assistant secretary of defense for arms control, a presidential assistant, and a committee of scientists reporting to the White House. All of these proposals have their supporters. All to a greater or lesser degree have advantages and drawbacks. Which one is best probably depends as much on the operational methods of the president who decides to explore thoroughly arms control as on the intrinsic worth of this or that organizational plan. Certainly unless there is definite presidential backing no form of organization can function successfully.

The problem of an assistant secretary of state for arms control is that the tradition and operations of the State Department make it difficult for that department to handle an organization dealing so much with research and weapons and requiring such a vast budget. At the same time, the Defense Department is, through tradition, hostile to arms control, and it would seem dubious that any major program could get started there. However,

since arms control and armaments are both parts of national safety, it would seem wise to have at least a special assistant to the secretary of defense for arms control, no matter what other government organization was set up.

As for a committee of scientists, committees are fine for exploring problems but poor at arriving at decisions, particularly when they are composed of people who have no operational responsibilities. Harold Stassen as Special Assistant to the President for Disarmament appointed eight special committees to consider arms control inspection problems, and it is unlikely that reports were submitted by the majority of them. Presidential assistants have been appointed for a variety of special projects from foreign affairs coordination to disarmament, and this system has practically always proved unworkable. Such assistants lack the staff, money, and backing of more regularly constructed departments. Also, relying for their power on that often elusive organ, the presidential ear, they are subject to sudden changes of fortune and public impotence.

Many of the proposed bureaucratic solutions to the problem of achieving arms control appear to underestimate the problems in constructing and negotiating a genuinely workable agreement. Diplomacy, research, weapons analysis, political attitudes, and presidential decisions must all be blended successfully together. Arms control is a new concept, and to launch any new concept, from the atomic weapon through the Marshall Plan, requires drive plus organization. And the resistance toward developing the A-bomb or appropriating money for foreign aid was as nothing to the resistance and suspicions toward arms control.

In government the starting effort is the most difficult. Once started, programs develop a momentum of their own and are easier to keep going. When the magnitude of the problems facing those designing an arms control agreement is appreciated—from designing radar equipment to monitor outer space, through investigating the construction of hidden missile plants, to eventual recruitment and training of inspectors—it would appear that at least a sub-cabinet-rank agency is necessary. After the program has

been established for a few years, its logical home would seem the State Department, even as the Marshall Plan at the end of seven years ceased to be administered by a separate agency and moved into the Defense and State Departments.

It is probably too much to hope that the hand of hucksterism can be slapped down and the name "Peace Agency" kept off whatever structure is created. Imagine the poor people who must go through life forever tagged as men and women who work or once worked for peace. Every branch of government from the Defense Department, through the Atomic Energy Commission, to the Department of Health, Education and Welfare works for peace. An arms control agency would work for arms control. Whether this would produce an opportunity for peace, no one can be sure, but at least if the opportunity came, America would be ready.

Legislative and Diplomatic Proposals

There are some immediate actions the United States can take both to indicate the seriousness with which it views arms control and to place pressure on the Soviets to be serious also. These differ from the first steps toward arms control discussed in Chapter Six in that they are governmental and diplomatic actions rather than programs involving weapons and defense. Also, they are so-called "quick-fixes"; they can be placed in operation without too much delay—though here again the lack of serious research on arms control is a serious handicap. Do some of the quick-fixes actually stabilize the world? Are they merely transparent tricks to get around Russian objections to inspection? Worse, do they give away portions of United States power for no return?

One primary move is for America to begin serious discussion with its allies on the subject of arms control, as distinct from the jumbled *ad hoc* meetings of the past. In some areas of arms

control the interests of the United States and its allies are different. The French, for example, may want to continue their nuclear production program. The NATO powers should be kept informed and asked to contribute to United States arms control plans. This does not mean that they should exercise veto power—that way nothing would get done—but at least they should not be presented with bolts from the blue.

In addition to creating a government organization to deal with arms control, Congress needs to pass some form of legislation to assure the President freedom to negotiate broadly and decisively in the arms control area. What is necessary is some statement of policy similar to the "Vandenberg Resolution" that set the foundations of the Marshall Plan and NATO and put the world on notice that the Senate of the United States had moved into a new era of foreign relations.

Congressional action, for example, would enable the President to declassify the interior workings of the first type of United States atom bomb, the so-called gun-type weapon. This is the earliest type of A-bomb, in which one mass of uranium was fired into the other mass. It has been obsolete for a long time. Implosion weapons are now used, where high explosive compresses a mass of nuclear explosive so tightly that the critical density is reached and the fission explosion takes place. Declassifying the gun-type weapon would permit vigorously inspected atomic explosions for peaceful purposes to take place without any nation's being able to charge the United States was developing weapons. The uses of peaceful explosions, known as Project Plowshare, range from creating harbors and canals to producing steam economically. Such explosions could also be used to explore the efficiency of a nuclear test ban inspection system. And it would seem that removing the secrecy from one part of the atomic energy program would relieve part of the dark apprehensions hanging over other portions.

Another diplomatic quick-fix would be for the United States government to seal the plant records of past nuclear production

in a completely secure underground vault in the presence of international inspectors. Accurate records of past production are essential in determining nuclear stockpile size. And unless this can be determined, reduction of arms appears close to impossible. At the time the United States government sequesters its records as evidence of its sincerity on arms control, every diplomatic and international pressure should be brought on the Soviet Union to do the same. If the Soviet intends to proceed in good faith, there is no reason for it to delay; it is only the forging of the complex records of nuclear production that takes time.

In Conclusion

There can be no doubt that any move toward arms control will bring opposition. Cries of anguish will come both from those who think it is being pushed too vigorously and from those who think it is being pushed too haltingly. The problem is to walk the path between surrender or suicide, but there will be those who unwittingly want to rush toward one or the other. Then there will also be the danger that somewhere along the way the United States becomes so interested in arms control that America loses the national will to defend itself and its allies. But if this happens, there is something much more seriously wrong with America than an imperfect defense and arms control policy.

When the atomic and later thermonuclear weapons exploded, the importance of arms control took a quantum jump also. Arms control, a program that had worked before only in the most limited instances, suddenly became vital. But necessity has never been a particularly impressive argument to mankind. Nor is there any guarantee that the skills necessary to handle the nuclear world lie within human capability. For the religious there is the testimony of the prophet Isaiah: "Behold, the day of the Lord cometh, cruel both with wrath and fierce anger, to lay the land desolate." For the pragmatist there is the knowledge that species

before mankind have failed to meet the challenge of their environment and been fossilized.

In Scottish law there is a verdict of "not proven"—not innocent and set free, not guilty and condemned, simply not proven. This would seem the only verdict now renderable on America's and man's ability to survive in the nuclear age: "Not proven."

Glossary

“Big hole” theory—When an explosion is detonated in a large hole deep underground, i.e., when it is decoupled, the size of the seismic signals from the explosion is greatly reduced. The theory indicates that low-yield nuclear tests are more difficult to identify than had been assumed in 1958.

Blunting attack—See pre-emptive war.

Bomarc—A ground-to-air missile designed to intercept attacking aircraft. It has a 400-mile range and carries either a nuclear or high explosive warhead.

CBR warfare—Chemical, biological, and radiological warfare, sometimes called ABC warfare (atomic, bacteriological, chemical warfare).

CEP—Circular probable error. A measurement of the accuracy with which a missile hits a target 50 per cent of the time.

“Clean” bomb—A bomb with a low fission yield which therefore produces relatively little radioactive fallout.

Command guidance system—Guidance of a missile from a ground control base. Two ground radars feed into a computer which calculates instructions for transmission to the missile’s radar receiver.

Davy Crockett—A short-range, low-yield nuclear missile which can be fired by one man from a launcher carried by two infantrymen.

Decoupling—See “big hole” theory.

DOE reaction—The death of earth, sometimes referred to as a “beach.”

Doomsday Machine—A hypothetical device to destroy the earth which was invented by Rand Corporation physicist Herman Kahn. Connected to a computer, the imaginary machine would be triggered automatically by a sizable attack on a country. In theory such a machine could be built in ten years.

Dromedary—A large, non-jet transport aircraft which could maintain a long airborne alert and act as a missile-launching platform. The Dromedary is in the blueprint stage.

Dyna-Soar—A boost-glide space bomber. The manned vehicle is designed to orbit the globe at supersonic speed and make a controlled landing after re-entry.

Escalation—The growth of a small conflict into a broader and more violent one by successive but non-deliberate steps.

Exchange ratio—The number of attacking missiles necessary to destroy one target missile. Variables include yield, accuracy, and hardening of the target.

Fail-safe—An Air Force policy governing the firing of nuclear bombs; it prohibits an airborne nuclear bomber from striking a target without a positive order to do so. Without the order the plane automatically turns around at a given location and returns to its base.

First-strike capability—Ability to deliver the first blow against the enemy's forces and destroy his retaliatory capacity before he launches an attack.

Fission—The breaking up of a heavy nucleus into two or more fragments with a consequent release of a large amount of energy. The atomic bomb is a fission weapon.

Fusion—The combining of light nuclei into heavier ones with a consequent release of energy. The hydrogen, or more correctly thermonuclear, bomb is a fusion weapon with a fission trigger.

Half-life—The time interval over which the chance of survival of a radioactive atom is exactly one-half.

Hardening—Shielding an object against blast, heat, or radiation from a nuclear attack.

ICBM—An intercontinental ballistic missile with a range of about 5500 miles which travels at a rate of 3 to 4 miles per second at an

altitude of several hundred miles. A ballistic missile is guided along its early course by its rocket engines. After the engines are cut off, the missile follows a free-flight trajectory to its target.

Inertial guidance system—The most versatile guidance system for missiles. The missile's inertial autonavigator is self-contained, emits no radiation, and continuously computes motion and direction.

IRBM—An intermediate-range ballistic missile with a range of about 600 to 1500 miles.

Jupiter—An IRBM which can be launched from a fixed or mobile base. The Jupiter has a range of 1500 miles and carries a nuclear warhead.

Kilomegaton—Energy released by a nuclear explosion equal to 1 billion tons of the chemical high explosive TNT.

Kiloton—Energy released by a nuclear explosion equal to 1000 tons of TNT.

Krypton—A gaseous constituent of the atmosphere. It occurs in the air in a ratio of one part in a million.

Lithium deuteride—A metallic hydride used in thermonuclear weapons. When combined with lithium, deuterium can be placed in a weapon in solid form. Lithium-6 in turn contributes to a large energy release.

Matador—A low-yield, slow ground-to-ground missile with relative mobility, which is gradually being replaced by the more advanced Mace.

Megaton—A release of energy from a nuclear explosion equal to 1 million tons of TNT.

Minuteman—A solid-fuel ICBM missile which can be fired from a mobile base, such as a freight train, or a fixed base. The 60-foot-long missile, carrying a nuclear warhead, has a range of 5500 miles and can travel more than 15,000 miles per hour.

Nth country problem—The spread of nuclear weapons to countries not now possessing them. Until France joined the nuclear club and it became apparent other countries could do so shortly, it was called the "fourth country" problem.

Neutron bomb—A bomb which releases a burst of neutrons capable of destroying all life in the target area while producing negligible damage from heat and blast. Such a bomb has not been produced and is thought by many to be impossible.

Plutonium—One of the basic fissile materials of an atomic bomb, pro-

- duced by the irradiation of natural uranium in a thermal reactor.
- Polaris—An IRBM missile with a 1500-mile range, launched by a submarine or surface ship. The term also applies popularly to the Polaris-carrying submarine, which is equipped with sixteen of the 28-foot-long missiles, each of which bears a nuclear warhead.
- Pre-emptive war—Sometimes called a “blunting attack,” it is a war launched against a potential enemy because of the conviction that the enemy is about to attack and that survival depends on a first strike. In contrast to preventive war launched to take advantage of a temporary imbalance of strength favoring the aggressor, pre-emptive war is instigated by an immediate threat to the pre-emptor.
- Psi—Per square inch, a measurement of protection against blast pressure.
- Psychological inspection—Inspection of personnel, with physiological and psychological measures, including lie detectors.
- Resolution—In photography, the ability of a film-lens combination to render distinguishable a standard pattern of black and white lines.
- SAC—Strategic Air Command, U.S. Air Force.
- SAGE—Semi-automatic ground environment system, the coordinated system the United States relies on for spotting an enemy bomber attack.
- Samos—A reconnaissance satellite carrying photographic equipment which radios data back to ground stations.
- Second-strike capability—The ability to survive an attack and launch a retaliatory blow large enough to inflict intolerable damage on the opponent.
- Secure deterrent—Weapons systems which are shielded against an attack and therefore do not depend on a fast reaction time or striking first in order to be effective.
- Stable deterrent—A mix of weapons systems, which have been made relatively invulnerable to enemy attack through hardening and hiding, and have a punitive but not suicidal capacity. The size of the stable deterrent permitted a country is determined by an arms control treaty.
- Strategic nuclear weapon—A high-yield nuclear weapon. While there is no consensus on the precise meaning of “strategic,” the term is frequently applied to weapons with yields of 50 kilotons and more.

- Strontium unit—Formerly called a sunshine unit, it is one-thousandth of the maximum permissible body level of strontium-90.
- Tactical nuclear weapon—A low-yield nuclear weapon, loosely designating weapons with yields of approximately 20 kilotons and under.
- Thor—An Air Force IRBM with a 1500-mile range which is also used as a launching vehicle for space flight.
- Transit—A Navy navigation satellite operating on solar cells and storage batteries which enables surface ships and submarines to fix their positions by better than 1/4 mile.
- Vela—A program to improve detection of underground nuclear explosions in different kinds of geological formations.
- Woompher bomb—Symbolizes a technological breakthrough in weapons development which could give the country possessing it the decisive strategic advantage.

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The bibliography is divided into five sections, each devoted to one particular aspect of arms control and the nation's safety. The headings of the five sections are:

Strategic Theory

United States Security Policy

Western Alliance and Communist Strategy

Arms Control

Technical Aspects of Arms Control

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Not included in this bibliography is the large body of unpublished literature on arms control which evolved from the 1960 Arms Control Summer Study. The Summer Study group met for three months in Dedham, Massachusetts, under the auspices of the American Academy of Arts and Sciences, with financing from the Twentieth Century Fund. The participants included physicists, psychologists, lawyers, economists, mathematicians, political scientists, weaponeers, and arms controllers.

The working papers, group research projects, and records of the study group's discussions, as well as informal conversations with many of the participants, have greatly assisted the author in the preparation of this book. Among the problems examined during the summer were the goals of arms control, the definition and implications of stable deterrence, the role of inspection and intelligence, negotiation and the role of international agencies, the test

ban, the problem of China, and areas of potential East-West agreement.

Among the major contributors to the Summer Study were (affiliations are given, for identification purposes only, as of date of attendance at the Summer Study):

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