

CSIA Occasional Paper Series

***A Primer for
the Nuclear Age***

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University Press of America Inc.
4720 Boston Way
Lanham, Maryland 20706

3 Henrietta Street
London WC2E 8LU England

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Printed in the United States of America
British Cataloging in Publication Information Available

Co-published by arrangement with the
Center for Science and International Affairs,
Harvard University

Library of Congress Cataloging-in-Publication Data

A Primer for the nuclear age /
Graham T. Allison, Jr.... [et-al.], editors.
p. cm. , (CSIA occasional paper ; no. 6)
1. United States-Military policy. 2. Nuclear weapons--
United States. 3. Nuclear warfare. 4. Nuclear
disarmament-United States.
I. Allison, Graham T. II. Series.
UA23.P69 1990 355'.033573--dc20 89-70587 CIP

ISBN 0-8191-7700-8 (alk. paper)
ISBN 0-8191-7701-6 (pbk.: alk. paper)

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences-
Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

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PREFACE

Several years ago, we in Harvard's Avoiding Nuclear War Project became concerned about the lack of institutional memory on nuclear issues in the American government. In conversations with former senior officials, it was obvious that many of them shared this concern. The majority had found themselves unprepared for the tasks confronting them once they assumed office, and they felt overwhelmed by the large amount of information they needed to master in a very short time.

During the course of our interviews, many of those former officials expressed a need for short background papers on various aspects of the nuclear age, believing that such a collection would have enabled them to obtain information quickly on a variety of important topics. We designed and distributed a briefing book to help meet this need for newly appointed officials' in the Bush administration. Later, a number of readers suggested that the material would be of interest to a broader audience who wanted to gain a better understanding of nuclear issues.

This resulting Occasional Paper contains fourteen chapters covering a number of these issues, designed to provide a broad overview in a short period of time. The chapters are largely descriptive in nature, although a few contain specific policy recommendations. Their general format is intended to provide a brief survey of a given topic and to summarize its most important features. These essays need not be read sequentially. Each contains a section, "For Further Reading," for those who wish to explore that topic in greater detail.

The first two chapters, under the heading "Assessing the Danger," seek to give the reader a realistic assessment of the risks and dangers of nuclear war. The first essay discusses paths that might lead to nuclear war. It emphasizes that the most dangerous path would result from a combination of accident and inadvertence along with the high stakes and limited time for decision making that would exist during a political crisis. The second essay describes instances in which the use of nuclear weapons was contemplated by the United States. It concludes with some observations made by Robert Kennedy after the Cuban missile crisis and a discussion of the applicability of these lessons for today.

The next set of essays focuses upon nuclear weapons themselves-their effects, the systems and procedures for their use, and their historical development. Chapter 3 assesses the potential results of three scenarios: the detonation of a single nuclear weapon over Washington, D.C., a "limited" nuclear exchange, and an all-out nuclear war. It concludes that under a worst-case scenario, prompt American fatalities could range from 100 to 160 million. Chapter 4 discusses the command, control, and communications network governing American nuclear operations. It emphasizes that this system is generally robust and survivable, although new technologies in the hands of an adversary could complicate its ability to function effectively in the future. Further attention should also be devoted to developing plans and procedures for controlling escalation and terminating nuclear operations quickly with a minimum of damage after a limited nuclear exchange. Chapter 5 traces the technical evolution of nuclear weapons and their delivery systems. It maintains that, barring unanticipated advances in strategic defense, future developments in weapons and delivery are likely to follow a slower and more predictable course.

The next set of essays focuses upon broader questions of strategy and force structure. Chapters 6 and 7 provide an overview of American and Soviet doctrine, respectively. Chapter 6 argues that American doctrine displays an evolution towards a more flexible targeting strategy; a similar evolution has occurred away from attacking Soviet urban-industrial centers and towards striking military targets. Chapter 7 maintains that Soviet nuclear doctrine is driven by a set of geographic constraints, technical capabilities, historical experiences, bureaucratic institutions, and political and cultural values that are very different

from those that shape American nuclear doctrine. It also shows that there can be important and unpredictable differences between Soviet declaratory policy and actual operations. Chapter 8 addresses how force levels and planning requirements are calculated in the United States; it argues that decisions about the number and mix of weapons in the American arsenal have often been based upon political and historical considerations in addition to strategic requirements. Chapter 9 catalogs the historical evolution of the nuclear balance and the factors that have influenced its development.

The next three chapters focus on domestic political influences upon nuclear weapons policy. Chapter 10 addresses the role Congress has played in shaping American nuclear doctrine and forces. It argues that executive inattentiveness to Congress's constitutionally mandated role in foreign and defense policy has often led to internecine warfare among the branches of the U.S. government. Chapter 11 looks at public attitudes towards a number of questions relating to nuclear weapons, nuclear policy, defense spending, the Soviet Union, and the NATO alliance. Chapter 12 focuses upon Soviet national security decision-making. It maintains that the Soviet leadership is an integrated political-military body, where political authority is dominant but where the professional military retains an important influence. The role of institutions and individuals varies within and between leaderships according to the issue under consideration.

The final two essays go beyond the immediate context of superpower relations to address the role of nuclear weapons on the broader stage of world politics. Chapter 13 discusses the central issues shaping the future of the NATO alliance, such as the role of nuclear weapons in preserving the peace in Europe, the nature of the American nuclear guarantee, NATO's strategy of flexible response, what the allies need from the United States, the inherent contradictions within the alliance, and the threats and opportunities posed by General Secretary Gorbachev. The final chapter addresses the problem of nuclear proliferation. It argues that the United States has learned a great deal about the type of non-proliferation strategies that can be successful, and that recent trends in this area have worked to limit the spread of nuclear weapons.

-Graham T Allison, Jr. Robert D. Blackwill Albert Carnesale Joseph S. Nye, Jr. Robert E Beschel, Jr.

Assessing the Danger

Chapter 1

PATHS TO SUPERPOWER

Nuclear War

by Robert P. Beschel, Jr.

In the late 1980s, the existence of a lengthy tradition of nuclear non-use, robust American deterrent forces, and a more moderate Soviet foreign policy made it difficult to envision how a nuclear war between the United States and the Soviet Union could ever occur. Although the odds of such a conflict taking place are small, it is important to guard against complacency. On the eve of World War I, senior British officials noted that Anglo-German relations had not been better in recent memory; Churchill later reminisced about the "exceptional" tranquility that existed throughout Europe during the spring and summer of 1914. In our own time, one of the more dangerous incidents in Soviet-American relations-the Soviet mobilization to assist the surrounded Egyptian Third Army in the 1973 Yom Kippur War and the subsequent American nuclear alert-occurred during a period of good relations between Washington and Moscow.

Most experts believe that there are four principal ways in which a nuclear war might occur between the United States and the Soviet Union. It could arise by accident, in which one state mistakenly believes that it is under attack and launches what it thinks is a retaliatory strike against the other. It could arise by a deliberate, surprise attack aimed at preempting the other side's nuclear forces. Nuclear war could also occur as the result of a catalytic attack, in which a third party attempts to trick or dupe the superpowers into attacking each other. Finally, it could escalate out of a conventional conflict. These four paths are not mutually exclusive. Indeed, the most likely way that a nuclear war would occur is out of some combination of these separate paths.

Nuclear War by Accident

Nuclear war by accident is perhaps the most familiar path, having been portrayed in books and movies such as "Dr. Strangelove," "Fail-safe," and "War Games." In these scenarios, a crazy general, a computer malfunction, or an unidentified blip on the radar screen triggers a chain of events that ultimately results in the launching of a mistaken retaliatory strike at the other superpower.

There have been a number of nuclear false alarms. On rare occasions, natural phenomena- such as the moon's reflection or a flock of Canada geese- have triggered American early warning radar systems. Both computer and human errors at NORAD have resulted in mistaken indications that a Soviet nuclear attack was in progress.

Because we live in a world in which complex systems have been known to fail, the dangers of war by accident cannot be dismissed even though no accidental launch has yet occurred. Nevertheless, most experts agree that, under normal (non-crisis) conditions, this scenario is one of the least likely ways in which a major nuclear war would start. To avoid the problem of sensor error, today's warning systems have a great deal of

redundancy built into them. Many modern nuclear weapons have elaborate electronic locks to prohibit their unauthorized use. More importantly, states do not go to war by accident, and history contains no example of a purely accidental war. In times of relative peace and tranquility, it is unthinkable that a sane president or general secretary would risk the destruction of their nations by ordering full-scale retaliation because of an isolated nuclear detonation, let alone isolated sensor reports.

Inadvertent war-the danger of war as the unintended result of a series of essentially defensive measures-is a more serious concern. There is a tendency for alert levels to "ratchet up" in a crisis, as the heightened military activity of one side is observed and the other side takes precautions to ensure the readiness of its own forces. This problem is compounded by the fact that, in a serious crisis, the military's focus changes from prohibiting the unauthorized use of nuclear weapons to ensuring that these weapons will be utilized in a timely fashion when the decision to release them is given. Thus, the risks of unanticipated or unauthorized use are likely to increase just when it is most important to avoid unintended provocation. A third danger lies in the fact that little is known about the functioning of American and Soviet global C³I (command, control, communications, and intelligence) systems at high levels of alert for an extended period of time. It is possible that the capability of these systems to provide accurate, reliable information in a timely fashion would be significantly degraded under an extended alert.

Nuclear War by Surprise Attack on the American Homeland

Another scenario that has driven American nuclear planning has been the fear of surprise attack. Fortunately, the number of nuclear weapons, coupled with their dispersal and the redundancy in their delivery systems, has made a "bolt out of the blue" strike extremely improbable under normal conditions. Neither side could realistically expect to execute such an attack without suffering a devastating retaliatory response.

A more realistic danger is the threat that, in a time of acute international crisis, the Soviets would launch a preemptive attack against American nuclear forces and C3I facilities. Soviet military doctrine has hitherto placed a great deal of emphasis upon damage limitation through the combination of preemptive strikes and active and passive defense measures. If the Soviets feared that an American attack were imminent, it is possible that they would attempt to prevent it by striking first. For that matter, an American president who became convinced that a Soviet attack were imminent and unavoidable also might elect to launch a preemptive strike.

Nuclear War by Catalytic Attack

Another way in which nuclear war might arise would be if a third party deliberately attempted to initiate a nuclear exchange between the superpowers. A Strategic Air Command (SAC) study in the early 1980s examined this danger, and concluded that neither the United States nor the Soviet Union could always determine the country of origin of a third party attack.

Fortunately, a number of factors make catalytic war unlikely. Any third party that attempted such an attack would have to have access to both nuclear weapons and delivery systems that could be utilized to simulate a Soviet or American attack-formidable obstacles for all but a very small number of countries. Another precondition would be the existence of an acute state of tension between the U.S. and the USSR. American and Soviet

nuclear forces would need to be at a high state of alert, and the deficiencies noted above would have to continue to plague Soviet and American alert systems. Finally, the national leaders in the superpower victimized by the attack must be predisposed towards making a hair-trigger response without clarifying what undoubtedly would be a very ambiguous situation.

There is also a danger that nuclear war between the Soviet Union and the United States would arise inadvertently out of a third party attack. For this to occur, the same criteria outlined above would need to apply. In times of relatively good superpower relations, the chances of nuclear war breaking out along this path are low, but they would increase if relations worsened.

Nuclear War by Escalation from a Conventional Conflict

A more likely path to nuclear war is by escalation from a conventional conflict in Europe, Northeast Asia, or the Middle East. Throughout the postwar period, both the U.S. and the USSR have viewed these areas as essential to their security, and the United States helps to deter attacks on its allies in these regions by either the explicit or implicit threat of escalation to nuclear weapons, if necessary.

The outbreak of a major conventional war in Europe or Northeast Asia would clearly pose the most dangerous risks of escalation. There are several ways in which such a conflict could cross the nuclear threshold. NATO could elect to initiate the use of nuclear weapons, as its military doctrine stipulates, if it thought it were losing on the conventional battlefield. The Soviets could intercept a NATO decision to disperse its nuclear weapons and elect to preempt with a series of limited nuclear strikes. A third party, such as France, could launch its tactical nuclear weapons at Soviet forces crossing its border. Or finally, nuclear war could begin at sea, as the USSR sought to neutralize the United States' advantage in carrier battle groups, or as the U.S. Navy sought to destroy Soviet ballistic missile submarines.

Fortunately, with the exception of the Korean peninsula, both Europe and Northeast Asia are currently stable; but it is possible that this stability will erode with time. On the near to mid-term horizon, the most significant danger is that a widespread challenge to the legitimacy of Soviet rule in Eastern Europe could reduce the USSR's ability to enforce order and could allow smoldering Eastern European animosities to erupt into open conflict. There is also a danger that a conflict that originates elsewhere would spread to Europe or East Asia.

The Middle East presents another concern. It is a relatively unstable region, in which both superpowers have important clients and commitments. The presence of advanced missiles and chemical weapons adds a danger of escalation. Israel's possession of nuclear weapons and a missile capable of reaching Moscow makes the potential risks of escalation serious.

The threat that nuclear war would arise out of a crisis that unintentionally spins out of control elsewhere in the Third World is a much lower concern. The chances of this happening during a period of relatively good relations between the United States and the Soviet Union are small; however, the risks increase if superpower relations decline.

Nuclear War by a Combination of These Paths

The most probable way in which a superpower nuclear war might occur is that two or

more of these paths might interact to create a dangerous synergism. For example, during the midst of the Hungarian revolt and the British and French Suez intervention, the headquarters of the U.S. military command in Europe received a flash message that unidentified jet aircraft were flying over Turkey and that the Turkish air force had gone on alert. There were additional reports that 100 Soviet MiG-15s were flying over Syria and that a British Canberra bomber had been shot down over that country. (In the mid-1950s, only the Soviet MiGs had the ability to shoot down the high-flying Canberras.) Finally, there were reports that a Soviet fleet was moving through the Dardanelles. These events were so serious that General Andrew Goodpaster, Eisenhower's White House Staff Secretary, feared they would trigger the NATO operations plan that called for all-out strikes on the Soviet Union.

Actually, the "jets" over Turkey were a flock of swans that had been picked up on radar and incorrectly identified. The 100 Soviet MiGs were really a much smaller routine escort returning the president of Syria from a state visit to Moscow. The British Canberra bomber was downed by mechanical difficulty, and the Soviet fleet was engaging in a long-scheduled exercise. Fortunately, these incidents did not lead to a superpower confrontation. They illustrate, however, the danger that, in a crisis, unintended and unforeseen events can seriously complicate superpower decision-making and raise the risks and dangers of nuclear war.

Conclusions

Under normal circumstances, the dangers of nuclear war by accident, by a "bolt out of the blue" strike, or by a catalytic attack are quite small. The danger that a nuclear war will arise out of the escalation of a conventional conflict is more pronounced, yet it remains low. In times of acute East-West tension, the risks associated with each of these paths become markedly greater.

The most probable way in which a superpower nuclear war might occur is that two or more of these paths will interact synergistically. The combination of a conscious decision to escalate with inadvertent escalatory steps is a particularly dangerous one. It is quite possible that measures that one side viewed as purely defensive (such as dispersing nuclear weapons and their delivery systems during the outset of a conventional conflict) would be interpreted by the other side as preparations for a first strike. Under these circumstances, there would be strong incentives for the other power to launch a preemptive response.

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Chapter 2

NUCLEAR CRISES

by David A. Welch

Only rarely have American decision-makers confronted the possibility of using nuclear weapons, or of using nuclear alerts for purposes of signaling, coercion, or deterrence. They have done so on twelve occasions, briefly sketched here:

1. *Berlin Blockade, 1948*. The Soviet Union's closure of access and supply routes to West Berlin for a period of 11 months prompted a muted display of American nuclear might (B-29 redeployments). The successful Berlin airlift supplied the city until the blockade was lifted. Opinion is divided on whether American nuclear muscle prevented stronger Soviet pressure.

2. *Korean War, 1950-53*. Three times during the Korean War, American military and political leaders contemplated the use of nuclear weapons: to prevent collapse of the Pusan perimeter in the summer of 1950; to turn the tide in the face of Chinese intervention in November that same year; and to force a resolution in 1953. In the first two cases, American nuclear forces were placed on standby alert; but most observers believe that this had little effect on the war itself.

3. *Dienbienphu, 1954*. The French government requested American nuclear assistance to prevent the collapse of the garrison at Dienbienphu. The United States considered but rejected the request, and the garrison fell on May 8.

4. *Quemoy and Matsu (I), 1954-55*. The use of American nuclear weapons was considered as an option for preventing the Communist Chinese conquest of a series of islands off the mainland coast occupied by Nationalist forces. Several small islands were taken, but not the larger islands of Quemoy and Matsu. Opinion is divided on the role of American nuclear forces in preventing further Chinese action.

5. *Suez, 1956*. Veiled Soviet nuclear threats against Britain and France in response to the Anglo-French invasion of the Suez Canal prompted Eisenhower to issue deterrent threats of his own. To bolster them, the U.S. Strategic Air Command (SAC) redeployed a portion of its bomber force, cancelled leaves, and improved its readiness. The Soviets muted their rhetoric, but their initial threats were probably bluffs anyway, since the USSR at the time had virtually negligible nuclear capability.

6. *Lebanon, 1958*. A radical coup in Iraq prompted an American deployment in Lebanon, designed in part to stabilize the Lebanese regime, and in part to deter Soviet intervention in the Middle East. To bolster the deterrent value of the deployment, Eisenhower authorized an apparently effective heightened SAC alert; Khrushchev blunted Arab criticism of his inaction by pointing to the unacceptable risk of nuclear war.

7. *Quemoy and Matsu (II), 1958*. Renewed Chinese pressure on Quemoy and Matsu, including the announcement of Beijing's intention to "liberate" Taiwan, led American planners to consider the use of nuclear weapons to defend the Nationalists' position. SAC forces on alert on Guam were reinforced in August and September, but these forces were reduced as the Chinese threat abated. Again, the effect of the American display of nuclear muscle is a matter of debate.

8. *Berlin, 1958-59*. Khrushchev's attempt to force an agreement on the status of Berlin prompted Eisenhower to bring conventional units in Europe up to strength and to issue a number of subtle nuclear deterrent threats. There is evidence to suggest that Khrushchev

did not seriously believe that the United States would risk nuclear war over Berlin; but he was apparently, unwilling to press the matter further in any case.

9. *Berlin, 1961*. Khrushchev's renewed attempt to squeeze an agreement on Berlin out of President Kennedy led to a reinforcement of Berlin, an expansion in American conventional forces, delay in the retirement of B-47 strategic bombers, and heightened SAC alerts including an astounding 50 percent ground alert and a round-the-clock airborne alert (12 bombers). Again, Khrushchev may have doubted the American nuclear guarantee of Berlin, but hesitated to test it.

10. *Cuban missile crisis, 1962*. Khrushchev's secret attempt to deploy Soviet nuclear missiles to Cuba led Kennedy explicitly to threaten nuclear war. SAC's alert was raised for the first and only time to DefCon 2 (Defense Condition 2 on a scale of 5, just one short of the highest alert level, which the U.S. has never reached). The contribution to the settlement made by American strategic nuclear superiority in general, and by American alerts in particular, is a matter of debate both among analysts and among former participants.

11. *Yom Kippur War, 1973*. When Brezhnev's proposal for joint U.S.-Soviet intervention to prevent the collapse of Egyptian forces and enforce the status quo ante was rebuffed by President Nixon, Soviet forces began to prepare for unilateral intervention. The Sixth Fleet was reinforced in response, and SAC's alert level was raised to DefCon 3. The Soviets did not intervene; but it seems they neither understood nor took seriously the American nuclear threat.

12. *Iran, 1980*. In August, following the Soviet invasion of Afghanistan the previous year, signs of Soviet mobilization in the Transcaucasus led the Pentagon to conclude that an invasion of Iran was also possible, and nuclear options to defend the Persian Gulf were discussed. No attempt was made to coercively signal the Soviets, however.

Of these twelve cases, only one-the Cuban missile crisis of 1962-is generally considered to have been a serious nuclear crisis; President Kennedy estimated the risks of superpower conflict to be between "one out of three and even." Most analysts discount the likelihood of nuclear war in the other cases.

Robert Kennedy drew seven lessons in his memoir of the Cuban missile crisis, *Thirteen Days*, paraphrased here:

1. Take time to plan; don't go with your first impulse. A hasty decision is unlikely to be the most effective because a full assessment of the costs and benefits of the alternatives requires considerable time.

2. The President should be exposed to a variety of opinions in order to make a proper assessment of the alternatives.

3. Rely heavily on those with solid knowledge of the Soviet Union. Those who make a careful study of the USSR are best suited to assess Soviet motives, the meaning of Soviet signals, and the Soviets' needs and interests.

4. Retain civilian control and beware of the limited outlook of the military. Many members of the military during the Cuban missile crisis advocated belligerent courses of action and failed to recognize the dangers of humiliating the opponent and courting unintended escalation.

5. Pay close attention to world opinion. A congenial diplomatic climate can facilitate resolution of a crisis on favorable terms.

6. Don't humiliate your opponent; leave him a way out.

7. Beware of inadvertence-the "Guns of August" scenario. Accidents, inadvertence, and breakdowns in command and control can lead to actions beyond the President's knowledge and control, and may result in unintended escalation.

Few analysts disagree with Robert Kennedy's reading of the lessons of the crisis, but many stress that they are limited in applicability to the modern world. Several circumstantial changes seem to mitigate the practical usefulness of Kennedy's recommendations.

First, the media are now far more intrusive and far less deferential than in the early 1960s. Whereas several major newspapers cooperated with the Kennedy administration in suppressing premature disclosure of the discovery of missiles in Cuba, three factors suggest that no administration in a future nuclear crisis is likely to enjoy a comparable period of time in which to deliberate privately: the post-Watergate adversarial relationship between the executive branch and the media; the paramount value journalists place on being first with the story; and the aggressiveness of modern investigative journalism.

Second, in 1962, the United States enjoyed undoubted strategic nuclear superiority over the Soviet Union, as well as undoubted local conventional superiority in the Caribbean. Since nuclear superiority has been lost, and since the United States enjoys conventional superiority in relatively few areas of potential crisis, many analysts reject the possibility of drawing valid lessons for the future from the Cuban missile crisis.

Third, not only has the United States lost its nuclear superiority, but the arsenals of both superpowers now emphasize fast, accurate missiles (rather than slow, recallable bombers) and tightly bound command and control systems. Several analysts, therefore, discount the possibility of coercively manipulating nuclear risk in a future crisis (by using either nuclear forces or nuclear alerts as signals), because modern force structures and doctrines allow for less flexibility.

Fourth, the United States has lost much of its 1962 diplomatic advantage over the USSR. Since Vietnam, world opinion in the United Nations and elsewhere has been less accommodating to the United States.

At the same time, several important features of the Cuban missile crisis *would* be present in a future nuclear crisis: the operation of the "nuclear crystal ball," which enables decision-makers on both sides to foresee the ultimately catastrophic result of unbridled escalation, and therefore bolsters their resolve to avoid it; the psychological components of decision-making in a crisis—stress, fatigue, fear, and the dynamics of small group deliberations; the complications of alliance politics and the difficulties of preventing horizontal escalation; and the wisdom of not humiliating one's opponent. Therefore, while Robert Kennedy's lessons may be more difficult to implement in a future nuclear crisis, they have not entirely lost their relevance. And though a nuclear crisis may be more difficult to manage in the future than was the case in 1962, the importance of avoiding one has become increasingly clear—so clear that both superpowers have repeatedly shown signs of giving it top priority.

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Nuclear Weapons:
Their Effects, Control,
and Historical Development

Chapter 3

THE EFFECTS OF NUCLEAR DETONATIONS AND NUCLEAR WAR

by Steve Fetter

Nuclear war conjures up images of mass destruction and mutilation that few are willing to contemplate in detail. This chapter reviews the effects of nuclear explosions and describes the damage that might result from various types of nuclear strikes.

The Effects of Nuclear Detonations

The magnitudes of nuclear weapons effects are determined primarily by the yield of the weapon, which is measured in kilotons (kt). (One kiloton is equivalent to one thousand tons of TNT.) The average yields of tactical and strategic warheads are roughly 10 and 500 kt, respectively. For comparison, the bomb that destroyed Hiroshima and killed 70,000 people had a yield of 13 kt.

The direct effects of nuclear explosions include blast, heat, radiation, fallout, and electromagnetic pulse.

Blast. Nuclear explosions in air produce blast effects similar in kind to those produced by conventional explosives. The strength of the blast wave is measured in pounds per square inch (psi) of overpressure. Ordinary residences are damaged by overpressures of 1-2 psi and are completely destroyed at 5 psi; reinforced concrete buildings are demolished by 15-20 psi; missile silos can withstand more than 2,000 psi. The blast wave can directly injure humans by rupturing eardrums-or lungs or by hurling people at high speed, but most casualties occur because of falling buildings and flying debris. Most of the immediate damage from a nuclear explosion is due to blast.

A 500 kt warhead detonated above the Washington Monument would destroy reinforced concrete buildings in a 1 1/2^{mi} radius, including the White House, the Pentagon, the Capitol, and virtually all downtown government buildings. Residences would be demolished up to 4 miles away, beyond the National Zoo to the north, RFK Stadium to the east, and National Airport to the south.

Heat. Unlike conventional explosions, nuclear explosions generate large amounts of thermal radiation that can start fires or cause burns. A 500 kt explosion above the Washington Monument would, for example, ignite fires and cause third-degree burns to unprotected people at distances of up to six miles, or as far away as Chevy Chase and Alexandria. People glancing at the fireball from Rockville, Fairfax, or Bowie would be blinded. In Baltimore, the brilliance of the explosion would be far greater than that of the sun at noon, even

after many seconds. The many fires ignited by the explosion could coalesce into one superfire, preventing the escape of survivors and turning shelters into crematories. Thermal effects are less important (compared with blast effects) for smaller explosions—a 10 kt explosion produces third-degree burns about 1 mile away.

Radiation. Nuclear detonations release large amounts of neutron and gamma radiation. An unshielded person would receive a lethal dose of radiation 1½ miles from a 500 kt nuclear explosion, but at this distance he would certainly be killed by blast and heat effects. Radiation effects are more important (compared with blast effects) for smaller explosions. A 10 kt explosion would produce a lethal dose $\frac{3}{4}$ mile away. Specially designed weapons called "neutron bombs" produce greater radiation effects for a given yield: a 1 kt neutron bomb produces about the same dose as a normal 10 kt weapon, but the blast damage extends less than half as far. Unless the dose is extremely high, victims of a lethal exposure do not die for several days or weeks.

Fallout. When attacking "soft" targets such as cities or airfields, weapons would be detonated well above the ground to maximize blast effects. The highly radioactive weapon debris would then rise into the stratosphere and gradually fall back to earth over a period of months to years (global fallout). The destruction of "hard" targets such as missile silos requires explosions on or near the surface of the earth. In this case, the weapon debris mixes with dirt from the crater and is carried aloft at low altitudes by the wind (local fallout). Local fallout is difficult to predict because it depends on the weather; for average conditions, a 500 kt surface burst would deposit lethal fallout up to one hundred miles downwind from the explosion, with hundreds of square miles contaminated. People receiving less than a lethal dose of radiation would have an increased chance of eventually developing cancer.

EMP Nuclear explosions of all kinds produce an electromagnetic pulse (EMP), but the intensity and duration of the pulse depends on the location of the burst. EMP is especially strong when weapons are detonated high in the atmosphere. Because this effect was discovered just before the end of atmospheric testing, relatively little is known about EMP. An explosion above Johnston Island in 1962 damaged electrical equipment in Hawaii, 800 miles away, and damaged satellites in orbit. It is possible that one or two explosions high above the earth could blanket most of the United States with EMP, causing widespread blackouts and permanent damage to modern electronics. Special precautions have been taken to protect military equipment from EMP effects. A nuclear explosion can also disrupt radio and radar (especially at low frequencies) over hundreds to thousands of miles for many hours.

The Effects of Small-Scale Attacks

As the bombing of Hiroshima showed, a single low yield nuclear explosion can demolish a city and kill as many as one hundred thousand people. A single modern strategic warhead detonated above a large city could kill over one million.

The use of nuclear weapons on a small scale would not necessarily result in such catastrophic losses, however. A "demonstration shot" to signal resolve or the use of a few nuclear weapons at sea to destroy enemy ships or submarines need not cause any civilian casualties.

The use of a few low-yield battlefield nuclear weapons could conceivably result in fewer than a thousand civilian deaths. In each of these cases, the primary danger would be escalation to larger scale attacks. In West Germany, for example, even a "limited" attack on airfields, missile sites, and nuclear weapon storage sites involving fewer than 100 warheads could result in more than ten million deaths.

The Effects of Strategic Counterforce Attacks

The "limited" war scenario receiving the most attention is a counterforce first strike against key military targets. If the Soviet Union launched such an attack against the United States with about 3,000 warheads (used mostly against missile silos, and avoiding cities), it has been estimated that 12-27 million Americans would die outright, another 11-18 million would be injured seriously, and 2-20 million more would develop fatal cancers from exposure to fallout, for a total of 25-65 million casualties. For comparison, 2 million Americans have been killed or injured in *all* previous wars. A counterforce strike using only 100 warheads would kill 3-11 million Americans. If 100 warheads were used to destroy key U.S. industries, 11-29 million would die. A 100-warhead attack designed to maximize deaths could kill 25-66 million Americans. Corresponding U.S. attacks would kill and injure comparable numbers of Soviet citizens.

The Effects of All-Out Nuclear War

It should be clear that even "limited" nuclear attacks have unprecedented consequences; indeed, one may wonder how a nation could determine that it had sustained a "limited" attack rather than an all-out attack. But a war using a large fraction of the 50,000 nuclear weapons in existence would be much more devastating; if the attack came with little warning, 100-160 million Americans would die in the first few days. Maximum use of available shelters could reduce this, by 15-35 percent, evacuation by 70-80 percent, but the problem of sheltering the evacuees would remain. A U.S. retaliatory strike could kill 50-100 million Soviet citizens. If, as is usually supposed, such attacks included Europe and China, then the total number of dead would be in the hundreds of millions; some studies estimate that the death toll from direct effects could approach one billion (one-fifth of humanity) in all-out global nuclear war.

Indirect Effects of Nuclear War

Large-scale nuclear war may cause sizable indirect effects, including:
Global fallout. In the months following a large-scale nuclear war, the northern hemisphere would be blanketed with fallout. This global fallout generally would not be lethal (as would local fallout near surface bursts), but it would sometimes lead to sterility and sickness, and would further weaken those already suffering from injuries or malnutrition. In addition, cancer deaths and birth defects would be increased in later years. Rough estimates show that global fallout from an all-out war would cause 5-13 million cancer deaths and 6-16 million birth defects.

Ozone depletion. Nuclear explosions in air produce copious quantities of nitrogen oxides. If these nitrogen oxides reach the upper atmosphere, the concentration of ozone will be reduced. Ozone absorbs harmful ultraviolet radiation from the sun; a reduction of 60 percent would lead to sunburn and snow blindness within minutes and incapacitating sunburn in 30 minutes. Ozone levels would recover in several years. It would take several thousand high-yield (greater than 1,000 kt) or high-altitude explosions to deplete the ozone by 60 percent. The United States no longer stockpiles large numbers of high-yield weapons, and, though the Soviets may, there is no readily apparent reason for thousands of high-altitude explosions.

Nuclear winter. The fires started by nuclear explosions would produce a thick layer of smoke and soot that would reduce the amount of sunlight reaching the earth's surface. Although initial calculations showed that an all-out attack could reduce temperatures by as much as 50-70° F more realistic analyses give average temperature drops of only 10-20° F- "nuclear autumn" instead of "nuclear winter." Even these temperature drops would, however, be devastating to agriculture. Small scale attacks on oil storage and refineries could produce such drops in temperature. Changes in precipitation could be greater-and more costly- than changes in temperature. A disruption in the monsoons, for example, could threaten the food supply of one billion people.

Trade disruptions. Some countries, such as Japan, depend on foreign trade for a large fraction of their food. Without imports, a large number of Japanese would starve. This is also true for other countries; in the United States, for example, the urban population in the industrial northeast is fed by midwestern and western states. Without modern agriculture, the earth could only support a human population less than one-tenth the current size. But modern agriculture depends on the availability of machines, fuel, fertilizer, and pesticides, all of which could become unavailable after a large-scale war, even in countries that did not suffer explosions.

Fortunately, we have no firsthand knowledge of nuclear war. Although what we know about nuclear war is horrible enough, one cannot rule out the possibility that unforeseen effects could make the situation even worse.

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Chapter 4

COMMAND AND CONTROL OF NUCLEAR FORCES

by Ashton B. Carter

The command, control, communications, and intelligence (C³I) system is the nervous system of our nuclear forces. The job of the C³I system is to assure that legitimate national leaders would survive a Soviet nuclear attack, that these leaders would have intelligence about what had happened, and that the orders they gave would be carried out reliably and precisely by the thousands of military personnel worldwide who have custody of nuclear weapons—all in the midst of unprecedented chaos and destruction. Some parts of the C³I system are tangible: communications links, warning and assessment sensors, command posts like the presidential "Doomsday" planes, and combination locks on nuclear weapons. Other parts of the C³I system are intangible: the war plans and operating procedures of the nuclear forces—and, most important, the guidance given by the President to the C³I system in peacetime to make sure it can fulfill his needs in crisis or war.

The tasks of the C³I system fall into two categories. First, the C³I system must buttress deterrence, mainly by being able to survive Soviet attack and coordinate U.S. retaliation with high confidence. Second, the C³I system must see to it that deterrence is accomplished safely, by ensuring that nuclear weapons always remain under firm presidential control and are not prone to accidents.

Great progress has been made in strengthening our nuclear C³I system in the past decade. The Reagan administration in particular gave strong and sustained support to C³I Within the Department of Defense. Many of the deficiencies in the survivability of the system have been addressed in programs that are completed or under way. Deterrence is strong. We need now to set an agenda for the next decade, and especially to begin to give equal attention to the second task of the C³I system: safety and control. Setting this new agenda will require presidential attention.

The First Task: Survivability for Deterrence

The C³I system should be as survivable as the missiles and bombers it controls. All the parts of the system must be survivable: communications links, warning sensors, command centers, and the presidency itself. The first three of these parts have been made highly survivable by the Department of Defense; the President himself must assist in making the presidency survivable. With adequate procedures in place for continuity of legitimate political authority, the U.S. C³I system cannot be destroyed by a Soviet first strike. America can "ride out" Soviet attack and still mount a strong retaliatory strike against the Soviet Union. Not everything would

work perfectly, to be sure. The U.S. could be confident, however, that it could destroy the most important Soviet military targets in retaliation to any kind of Soviet attack. The United States should make its confidence in its C³I system clear to the Soviets in its official statements.

The Soviet nuclear C³I system is also survivable. U.S. attempts to increase its ability to target Soviet C³I might only drive the Soviets to operate their nuclear forces in more

dangerous ways, and might even increase the probability that the Soviets would strike first in a crisis.

The U.S. C³I system maintains its survivability mostly by moving and hiding so that the Soviets cannot target it. The C³I system does not need active defense of the type an effective SDI defensive system would provide and, in fact, the current U.S. C³I system is not very well suited to active defense. Likewise, deep cuts in Soviet missiles due to arms control would not help the survivability of the C³I system very much. Our current approach to C³I survivability, through unilateral measures of survivability and deception, is working.

Though the C³I system is able to play its crucial role in deterrence today, some future problems loom:

- Future Soviet sea-launched cruise missiles could be launched from submarines near the United States coasts to attack its C³I system, and American leaders have no warning system for cruise missile attack as they do for ballistic missile attack. We must develop technologies capable of detecting cruise missile attack and deploy them, especially since sea-launched cruise missiles are unlikely to be verifiably banned in START

- The U.S. C³I system depends in part on warning and communications satellites in high orbits. Today Soviet anti-satellite (ASAT) weapons cannot reach high orbits, but in the future the Soviets might deploy more sophisticated ASATs. With a combination of unilateral measures to make U.S. satellites more resistant to attack, and agreed arms control restraints on ASATs, we can probably make our most important space-based C³I systems survivable in the future.

- Communications to the submarine force used to be the most unreliable element of C³I survivability, but improvements in technology and the great flexibility of undersea operations mean that today the submarine leg of the triad has the most survivable C³I. Communication to the ICBM silos is next best, although the silos themselves are not survivable. Communications to the bombers need improvement, especially if a decision to retaliate is not made until the bombers have flown far from their bases.

With these improvements, the C³I system will continue to be able to perform its role of deterrence in the future-provided the chain of command to the presidency itself cannot be interrupted by Soviet attack. The President and his closest personal and national security advisors need to devise continuity-of-government plans before the inauguration, since deterrence requires these plans to be in place on Inauguration Day. Past practice suggests three points to be borne in mind as the President devises these plans. First, while there are laws and constitutional provisions that place some constraints on his choice, the President's latitude to decide how he wants authority to flow from him in a nuclear war is very great. There is no pre-set plan: he must decide. Second, the bureaucracy will not (and should not) take it upon itself to make survival plans for the presidency without guidance from the President. Authority to command nuclear weapons is regarded as a solemn, purely presidential, matter. Again, the President himself must decide. Third, the plan the President devises must not only satisfy the terrible demands of survival in nuclear warfare, but must also maintain authority in the hands of civilians who have political legitimacy according to American traditions and values. Satisfying both of these requirements simultaneously is the difficult part of making plans for continuity of government.

The Second Task: Safety and Control in War and Peace

Safety and Control in Crisis and War. The President sits at the apex of both the civilian and military chains of command. The civilian officials of the Department of Defense, together with Congress, are involved in the procurement of weapons and the tangible parts of the C³I system. These weapons and C³I systems are then turned over to the military, and it is the

military who devise the plans and procedures for their use in war and who would actually conduct operations with nuclear forces. DoD civilians have very little to do with overseeing military operations. In matters of C³I the military chain is most important because, in crisis and war, plans and procedures matter most. Since the civilians in the Department of Defense do not control, and in many cases are not permitted to know about, plans and procedures for the wartime use of nuclear weapons, the President's personal leadership in the military chain is important.

Two areas of likely presidential concern about operational plans and procedures are the increasing time pressures built into operational plans and the absence of realistic plans for control of escalation from limited nuclear war.

The U.S. C³I system plans to operate with an increasing number of short timelines. The bomber force must take off from its runways within minutes of launch of a Soviet attack. Mobile MX and Midgetman missiles, if ever deployed, would probably need to get orders to leave their bases hours earlier. In recent years, the C³I system has increasingly come to regard launch-under attack of vulnerable silo-based missiles as an important planning assumption rather than just a secondary possibility. Even if the U.S. "rode out" the full Soviet attack, the President might be under pressure to retaliate quickly, since some (though not all) C³I systems would only work for a few hours after the attack. These time pressures constrain presidential freedom of action and could lead to tragic mistakes, even including accidental nuclear war. The President needs a C³I plan for confidently riding out Soviet attack, collecting intelligence about what has happened, and taking the time to make considered decisions, not an automatic plan that unwinds on a pre-set schedule. Automatic plans tend to be adopted by the C³I system because they are perceived to be more reliable, and thus better for deterrence. But safety and control are also important. And the survivability of the C³I system has already been strengthened. The balance between pursuit of ever more reliable plans and the pursuit of safety and control should be restored.

U.S. nuclear operations plans give much attention to retaliation to massive Soviet attack, but much less attention to what to do if nuclear war breaks out on a smaller scale. There is even a tendency to ridicule planning for "limited nuclear war" as unrealistic and dangerous. But the U.S. nuclear guarantee to NATO involves conducting limited nuclear strikes in the defense of Europe. And few would argue that if a limited nuclear war did, somehow, begin, the U.S. C³I system should not have plans and procedures for controlling escalation and terminating nuclear operations before destruction got completely out of control, or that the C³I system should only practice to do one thing—wage large-scale nuclear war. The President should have two kinds of operations plans, one type of plan for retaliation to massive Soviet attack, and another type of plan for conducting and terminating limited nuclear warfare.

Safety and Control in Peacetime.

No President in the forty-four years of the nuclear age has faced theft or accidental detonation of a nuclear weapon, whether by terrorists, foreign governments, deranged individuals, or authorized military personnel going about their duties. There have, however, been close calls, as when a B-52 bomber crashed in North Carolina in 1961 and five of the six safety devices failed on one of the 24 megaton bombs it was carrying. Many Americans believe that nuclear weapons are locked up with Permissive Action Links (PALs) or other locking devices that can only be opened by the President. But in fact many nuclear weapons, notably many operated by the U.S. Navy, do not have PALs. The security of these nuclear weapons, especially those on surface ships docked at foreign ports, would be improved by more widespread use of PALs and related control technology.

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Chapter 5

TECHNOLOGY AND THE EVOLUTION OF NUCLEAR WEAPONS AND FORCES

by Ivan Oelrich

Today's nuclear arsenal is a complex mix of sophisticated weapon systems whose evolution has been affected at several points by technical limits and opportunities. The nuclear arsenal grew slowly after the war; in 1947 there were just thirteen bombs, some riot fully assembled. In that year, two new plutonium production reactors were started, a process was developed to recycle uranium back into the reactors, a more efficient uranium explosive device was developed, and a fusion booster that markedly improved the efficiency of use of fissionable material was tested. These developments allowed a major increase in the rate of warhead production.

After the Soviets tested their first atomic explosive device in 1949, there were two schools of opinion in the United States as to how best to respond. One argued that the U.S. should trump the Soviet atomic bomb with development of the "Super" or thermonuclear bomb.

The other argued that the Soviets' ability to retaliate made attacks on cities pointless, and thus we needed to develop small tactical nuclear weapons for battlefield use. In the end, the United States pursued both paths, so nuclear weapons became both larger and smaller in yield. From the beginning, tactical nuclear bombs were designed to be delivered not only by small missiles but also by normal "conventional" weapons, for example, artillery and aircraft.

Intercontinental Bombers and Cruise Missiles

The Air Force has always had concerns about bomber penetration. One approach to overcoming air defenses was to make bombers faster by use of jet propulsion, made practical by new high-temperature materials. This trend led ultimately to supersonic cruise speeds, exemplified by the B-70, which was made possible by the ability to fabricate lightweight, high-temperature structural materials. Improved computational capability in supersonic aerodynamics was also instrumental. Another approach to survivability has been to make the bomber harder to detect by reducing its radar cross-section, which is the goal of Stealth technology.

A different kind of solution has been to find alternatives or supplements to the bomber. Immediately after the war, the technical feasibility of intercontinental ballistic missiles (ICBMs) was in question, so development work was begun on cruise missiles (i.e., powered by air breathing jet engines) of intercontinental range. The first strategic cruise missile was the Snark. This was followed by the Navaho, which required a liquid-propel-

lant booster rocket almost as large as the cruise missile itself.

Ballistic Missiles

The first postwar ballistic missiles, the Thor and Jupiter, had ranges of just a few hundred miles, which was all that the technology of the day allowed. By 1956, the Atomic Energy Commission (AEC) had within sight the first design for a lightweight thermonuclear warhead. This made the ballistic missile guidance systems of the time useful at intercontinental range because, with megaton warheads, one could miss the target by a considerable margin and still destroy it. About the same time, the Soviets demonstrated that the propulsion technology necessary for long-range ballistic missiles was feasible. The final technical hurdle for ICBM development was building a bomb package that could withstand reentry into the atmosphere.

The first U.S. ICBM was the Atlas. It used engines developed as boosters for the Navaho, and it was flight tested in 1958. The Atlas's use of liquid oxygen was unsatisfactory because it cannot be stored in the missile; preparations before launch are thus time-consuming. This problem was solved with the development of storable liquid propellants, which were first tested in the giant U.S. Titan missile in 1962.

Because of the danger of fire and explosion, the Navy has always been wary of liquid-propellant missiles. However, solid propellants must simultaneously meet several conflicting requirements. For example, they must have a very high-energy content, yet have high chemical stability. Only with the solution to these problems in 1959 were submarine-launched ballistic missiles (SLBMs) attractive to the Navy, leading to the introduction of the Polaris. Solid-propellant technology has since been applied to land-based missiles, enabling ICBMs routinely to hold a constant high alert, launch-ready state.

The survivable deployment of these missiles was possible because a non-air breathing propulsion system (in practice, this meant nuclear power) had already been developed for deployment on hunter-killer submarines.

The Cruise Missile Returns

When the Air Force abandoned the Navaho to pursue ICBM development, the intercontinental cruise missile program disappeared. However, the Air Force had continuing concerns about bomber penetration that eventually led it back through a circuitous course to the current generation of cruise missiles. Hound Dog was the first practical bomber-carried cruise missile, deployed in 1959. Its second model, though never deployed, introduced the terrain contour matching (TERCOM) guidance system. This was followed eventually by the SCAD, the subsonic cruise armed decoy, which evolved into today's air-launched cruise missile (ALCM). The ALCM was made possible by the lightweight TERCOM electronics and the availability of a small, reasonably efficient jet engine.

Bombers, ICBMs, SLBMs, and cruise missiles remain the delivery components of today's nuclear arsenal.

Qualitative improvements have been made, and continue to be made, in all of these weapons.

Observations on the Past

One of the recurrent images of the "arms race" is technical progress that occurs willy-nilly and only barely under control. Given the extreme technical challenges presented by nuclear weapon systems and the expense of development, this is, in fact, an inappropriate description. Some improvements occur because engineers see technical challenges as puzzles to be solved. But this tends to result in gradual qualitative improvements in existing systems, not in entirely new types of weapons.

The perceived mission requirements have, in general, been more important in driving the development of new nuclear weapon technology than the other way around. Indeed, the air-launched cruise missile offers an excellent example of available technology that languished for years because the Air Force saw cruise missiles as a potential replacement for the penetrating bomber. Because the Air Force is committed to manned, penetrating bombers, on the other hand, enormous research has gone into the development of technology, specifically Stealth, that allows this mission to remain viable.

Lessons for Today

What are the general lessons we can apply to decisions to be made today? First, the technology of nuclear weapons and their delivery systems have, in many ways, matured. Early systems could be cobbled together; for example, the Atlas used the Navaho engines and was "good enough" because it had no competitors. Now, since we already have sophisticated ICBMs, a proposed new missile must show enough of an improvement over existing weapons to justify the additional cost. Furthermore, in many areas of performance, further investments yield diminishing returns. Decreasing warhead weights from five tons to half a ton revolutionized the delivery possibilities. However, now that yields are measured in hundreds of kilotons while weights are measured in hundreds of pounds, the payoff from further miniaturization will be relatively less. Indeed, the direction in warhead development is now toward specialty warheads, like electromagnetic pulse (EMP)-enhanced warheads or earth-penetrating warheads.

The mission is also maturing in the sense that, early on, there were many more targets than weapons, so it was easy to justify additional weapons and systems. With thousands of warheads it is very difficult to justify new weapons except as replacements for other obsolete systems.

The second lesson is the need for balance in technical developments. For example, nose cone materials and guidance both affect warhead accuracy. It makes little sense to work on an additional order-of-magnitude improvement in one, if the other is still limiting overall accuracy. Also, we should not invest in improving those performance characteristics we can control if others we cannot control limit overall performance. For example, before the development of photo-reconnaissance satellites, we did not know the location of many military targets. Thus, by default, our targets were limited to large industrial centers and there was little need for pinpoint accuracy. Similarly, the utility of Stealth technology for manned penetrating bombers, rather than just cruise missiles, presupposes the ability of a pilot to search out and detect mobile or imprecisely located targets.

Finally, technological progress is surest when it has a firm scientific base on which to

build. The alternative is a slower experiment, test, and rework approach. Aside from development of the nuclear explosives themselves, the two areas that have been most important to technical progress in nuclear weapon technology have been electronics (for computers, guidance and control, etc.) and materials, developments in the second area are less dramatic than in the first, but no less important.

Conclusions

In general, further developments in nuclear weapons will follow a slower but steadier course in the future than they have in the past. Barring unanticipated developments in strategic defense, the offensive forces will continue to improve in quality and technical sophistication in an evolutionary way. If defenses enter the equation, then we may see a return to the intense rate of technical innovation of the past.

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Nuclear Doctrine and Force Structure

Chapter 6
**THE EVOLUTION OF
AMERICAN NUCLEAR
DOCTRINE**

by Peter D. Feaver

Since the 1950s, American nuclear doctrine has been based on two central objectives: 1) using the threat of nuclear retaliation to deter Soviet aggression against U.S. territory and against our allies; and 2) limiting damage to the American homeland, if possible, should war occur. The plans for achieving these objectives have changed over the years with the evolution of American and Soviet nuclear capabilities. In general, American nuclear doctrine has moved away from rigid plans for massive strikes against the Soviet Union and toward greater targeting flexibility. At the same time, doctrine has evolved from targeting cities to an emphasis on destroying Soviet military forces and political leadership.

A distinction must be made between declaratory and actual doctrine. Declaratory doctrine refers to the nuclear strategies and policies that are pronounced publicly by senior policymakers. Actual doctrine refers to specific classified plans for using American nuclear forces, including delineating specific enemy targets. Declaratory doctrine is a function of U.S. government perceptions of how best, through public statements, to deter the Soviet threat and to gain the support of the American public. Actual doctrine, on the other hand, is usually not made public until many years later since it consists of the secret Pentagon plans that make declaratory doctrine operational, e.g., the actual targeting blueprints which are a function of the real capabilities of the U.S. nuclear forces. Because these matters are secret, it is impossible to trace precisely the evolution of these strands. For the most part, the two elements have developed in the same general direction, although they have not always been entirely consistent with each other at any one time.

Inconsistencies between the two strands of doctrine exist in part because declaratory doctrine represents guidance for *future* war planning whereas actual doctrine consists of specific plans based on *previous* war planning. Actual doctrine during any period is constrained by the force structure existing at that time. This force structure, in turn, is determined by the declaratory doctrines of previous periods. Thus, the actual war plans are based on current nuclear capabilities which take ten to twenty years to develop and so reflect the declaratory doctrine guidance of an earlier era.

Doctrine can be distinguished further according to the types of targets that would be hit. A doctrine of targeting cities and industry is called counter value. In contrast, targeting enemy military forces and, in particular, nuclear forces is called counterforce doctrine. However, even when the target is a city, the primary aim point is war-making industry so that the civilian deaths that would result are considered "collateral damage." In this way, U.S. doctrine can claim that it does not expressly target civilians, although it is recognized that striking industrial centers would inevitably result in massive civilian casualties.

Early Plans: "Countervalue Targeting"

In the late 1940s, the U.S. did not have a declaratory nuclear doctrine. In the

event of war, military leaders assumed that the few bombs in the nuclear inventory would be used against a small number of enemy cities as they were at Hiroshima and Nagasaki. In 1948 the Joint Chiefs of Staff (JCS) expanded the Hiroshima concept into a war plan for a single strategic air strike against major Soviet cities. It was argued that this would deter Moscow from starting a war for fear of the terrible destruction that American reprisals would inflict on the USSR.

Post-1949: Towards "Massive Retaliation"

In 1949 the Soviet Union exploded its first nuclear weapon. The emerging nuclear arsenal of the USSR raised an overriding new requirement for U.S. doctrine. Although the JCS continued to plan for an attack against Soviet cities, destroying enemy nuclear weapons became the priority for American nuclear forces and remains so to this day. At the same time, U.S. leaders seriously debated whether to wage a preventive war in order to destroy Soviet nuclear forces before they could be used. In 1950, President Truman rejected preventive war as inconsistent with American values.

The Eisenhower administration inherited this actual doctrine of striking both enemy nuclear forces and industrial targets, and called it "massive retaliation." In the event of a Soviet invasion of Western Europe or attack on the American homeland, the U.S. would hit the USSR with one massive nuclear blow targeted against the Soviet nuclear arsenal and critical war-making industry. In addition, to bolster deterrence and defend against a conventional invasion of Western Europe, Eisenhower for the first time deployed U.S. nuclear weapons in Great Britain and West Germany, and equipped allied forces with nuclear-capable aircraft and artillery. During this time, NATO doctrine emphasized the early use of nuclear weapons both against the Soviet homeland and against enemy forces on the battlefield.

By the mid-1950s the rapid numerical growth of the American nuclear arsenal and, in particular, the deployment of long-range bombers and intercontinental ballistic missiles (ICBMs) permitted the U.S. to adopt a war plan that *comprehensively* targeted, with a few thousand nuclear weapons, both Soviet nuclear forces and industry. However, there was little integration among the war plans of the services, with the result that many of the same sites in the USSR appeared on several different target lists. This actual doctrine so inefficiently allocated the American nuclear arsenal that a major effort to integrate U.S. targeting policy became necessary. Late in Eisenhower's administration, the various nuclear war blueprints of the services were reorganized into one, called the Single Integrated Operational Plan 62 (SIOP- 62), referring to the year in which it was to go into effect.

SIOP-62 rationalized and codified the previously disorganized service designs into one extensive strike against a wide array of military and civilian targets, which would result in tremendous collateral damage (the JCS estimated that total Soviet bloc fatalities would range from 360 to 425 million people). Although this attempted knockout blow could not guarantee the U.S. against retaliation, and thus millions of American casualties, by the few surviving Soviet nuclear forces, it was the only war plan available to the President during a crisis.

The 1960s: "Assured Destruction" and "Flexible Response"

President Kennedy and Secretary of Defense McNamara found two critical problems with SIOP-62: 1) the war plan called for the U.S. to inflict as much damage on the Soviet Union as possible, which logically could lead to unlimited growth in the size of the American nuclear arsenal; and 2) the design was inflexible, leaving the President only two options: to launch all U.S. nuclear weapons, or none. Accordingly, two changes in declaratory doctrine were incorporated into subsequent SIOPs: the new concepts of assured destruction and flexible response.

McNamara developed the concept of assured destruction as a criterion for determining requirements for the American nuclear arsenal. He argued that, to deter Soviet aggression, U.S. forces needed to inflict only a finite level of damage on the USSR, corresponding to about 20 to 30 percent of the Soviet population and 50 to 66 percent of its industrial capacity. McNamara set this limit at the point where marginal increases above these levels of destruction could be achieved only with large and costly increases in the force size.

McNamara also built into the war plan options for limiting U.S. nuclear attacks to only one or two of the three traditional categories of targets: nuclear forces, other military, and urban-industrial. Under the revised declaratory doctrine, known as the "no-cities" or "city hostage" doctrine, U.S. forces would first, in the event of Soviet aggression, strike military targets (categories one and two) and simultaneously threaten *next* to hit cities (category three targets), in order to deter Moscow from retaliating against American population centers.

The "no-cities" doctrine represented a shift away from massive retaliation and towards a more calibrated response to Soviet aggression. Indeed, this increased targeting flexibility was adopted by NATO in 1967 when it formally approved the declaratory doctrine of flexible response. Under this declaratory doctrine, which remains in force today, NATO would respond to an invasion at a proportionate level. The allies could use nuclear weapons at any point but at the same time committed themselves to a strong conventional defense to meet a Soviet conventional attack. The doctrine is deliberately ambiguous in order to accommodate differences among the allies; in general, the U.S. has preferred to emphasize the conventional *defense* component of the doctrine while the Europeans have stressed the American nuclear *deterrent threat* aspect.

McNamara's changes were intended to give the President the ability to deter the Soviets while minimizing risk of damage to the American homeland. By the end of the 1960s, however, official U.S. government views on the prospects for limiting the damage of a Soviet retaliatory attack were pessimistic. A new concept therefore began to gain currency: mutual assured destruction (MAD), through which war would be deterred by the fear that *both* societies would be destroyed no matter who struck first with nuclear weapons. Although no administration ever explicitly adopted MAD as declaratory doctrine, the public at large began to accept it as the inevitable condition associated with the existence of thousands of nuclear weapons on the two sides.

Under the Johnson administration, the SIOP developed slightly more flexibility, but the smallest U.S. attacks still postulated the use of thousands of warheads against Soviet nuclear forces with civilian casualties continuing to be counted in the tens of millions. Thus, although the declaratory doctrine called for flexibility in the use of nuclear weapons in order to limit damage to the United States, the actual doctrine consisted of war plans that contained only a few options, and none of these options was smaller than a major strike against Soviet nuclear forces.

The 1970s: Limited Nuclear Options

The Nixon administration addressed this problem by developing a declaratory doctrine that included options involving tens rather than thousands of nuclear weapons. This new declaratory doctrine, called limited nuclear options and codified in National Security Decision Memorandum (NSDM) 242, exploited advances in accuracy and reductions in yield of the U.S. nuclear arsenal to create strike options that would cause minimal collateral damage to the Soviet Union.

NSDM 242 also expanded McNamara's assured destruction criterion and added a requirement to target Soviet industry that would be needed for economic recovery after a war. Significantly, this had the unexpected effect on actual doctrine of driving up dramatically the number of targets to be struck in the USSR. In this way, the number of Soviet targets in the war plan grew with the expansion in American nuclear capability occasioned by the deployment of multiple independently-targetable re-entry vehicles (MIRVs) on U.S. missiles. Thus, although the Nixon administration de-emphasized the rhetoric of assured destruction and countervalue targeting in its declaratory doctrine, its actual doctrine put greater emphasis on urban-industrial targets than had been the case with McNamara.

The 1980s: "Countervailing Doctrine" and the Strategic Defense Initiative

President Carter produced a new declaratory doctrine codified in Presidential Directive (PD) 59: the countervailing doctrine. PD-59 deleted most of the economic recovery targets and instead concentrated on Soviet leadership as well as nuclear and conventional military forces in the USSR. In addition, it called for major improvements in American command and control systems to enable the U.S. to fight a prolonged nuclear war if necessary.

These revisions remain part of the declaratory doctrine today, although the concept came to be called "escalation dominance" under President Reagan. The actual U.S. doctrine in the 1980s is not publicly known, since it is based on information that remains classified. It has been reported in the press that the actual doctrine may involve a launch-under-attack policy, although this is not part of declaratory doctrine. Under this policy, U.S. ICBMs would be launched immediately should Washington receive unequivocal warning that a Soviet attack against the American homeland was under way. By the early 1980s, Soviet capabilities had improved to the point where American land-based forces were vulnerable to a preemptive attack. The ability to launch American missiles before Soviet missiles can destroy them in a surprise attack may be the only way currently available to protect the land-based leg of the strategic triad.

President Reagan's Strategic Defense Initiative was a major effort to shift declaratory and actual doctrine away from strategic offenses to strategic defenses and to make nuclear missiles "impotent and obsolete." Since the capabilities of any future SDI system are uncertain, its eventual influence on American doctrine cannot be predicted with confidence. It is doubtful, however, whether any system can be so effective as to render the U.S. homeland inviolable; at best, SDI would probably reduce the vulnerability of only certain elements of the American nuclear arsenal.

Conclusions

Four shifts in emphasis are evident in the evolution of both declaratory and actual American nuclear doctrine since 1945. First, early plans relied on striking urban industrial centers in the USSR, but once the Soviets acquired nuclear weapons, American doctrine emphasized destroying enemy nuclear forces first. Second, as Soviet capabilities grew, U.S. doctrine moved away from the concept of a single spasmodic nuclear attack, and instead developed options for flexible responses to Soviet aggression. Third, as the American nuclear arsenal increased in size, U.S. doctrine was able to incorporate larger targeting lists of Soviet military *and* urban-industrial targets. Finally, as the arsenal improved with more accurate, lower-yield weapons, smaller strike options became possible. Today declaratory American 'nuclear doctrine includes the option for very limited strikes involving tens of weapons against enemy military or civilian targets.

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THE EVOLUTION OF SOVIET NUCLEAR DOCTRINE

by Andrew Bennett

There are three key points that American policymakers should understand about Soviet nuclear doctrine. First, it is essential to take Soviet nuclear doctrine into account in the formulation of U.S. defense and arms control policies. Second, Soviet nuclear doctrine is driven by a set of geographic constraints, technical capabilities, historical experiences, bureaucratic institutions, and political and cultural values that are very different from those that shape American nuclear doctrine. Third, there are important and sometimes unpredictable differences between Soviet declaratory doctrine and actual Soviet nuclear operations. The evolution of Soviet nuclear doctrine from Stalin to Gorbachev illustrates each of the fundamental principles.

Stalin and "Hostage Europe": 1945-1953

Soviet nuclear inferiority was the key determinant of Soviet military doctrine in the immediate postwar years. The U.S. had a monopoly on nuclear weapons until the first Soviet test of a nuclear bomb in 1949. By 1955, the Soviet Union had a total of only about 300 warheads, none of which could reach the U.S. because the Soviets lacked forward bases and intercontinental bombers. By contrast, the U.S. and its allies had some 3,000 nuclear warheads that could reach the Soviet Union in bombers based in the U.S. and Europe. Neither side had yet developed long-range missiles. Consequently, Soviet strategy was to hold Europe hostage under the threat of Soviet conventional forces and to build up air defenses against bombers.

A second important determinant of Soviet military doctrine in this period was the recent experience of World War II, as filtered through Stalin's iron-fisted control of Soviet policy. In particular, Soviet military thinkers could not discuss frankly the potential effects of surprise nuclear attacks, because to do so would have called attention to Stalin's failure to anticipate Hitler's devastating attack on the USSR in June of 1941. Thus, for reasons of both domestic politics and geopolitics, Soviet military doctrine in the immediate postwar years downplayed the importance of nuclear weapons and understated the potential effects of surprise. Still, Stalin pushed his country's nuclear program in private even as he publicly belittled the importance of nuclear weapons.

Khrushchev and the "Military-Technical Revolution": 1953-1964

Immediately after Stalin's death, Soviet military writers began to acknowledge the importance of nuclear weapons and the dangers of surprise nuclear attacks. These strategists, still strongly influenced by their experiences in World War II, suggested that the best means of addressing a surprise attack would be to look for warning signs of such

an attack and to strike preemptively, destroying the opponent's nuclear and conventional forces before they could be launched or mobilized. Soviet nuclear operations in this period, however, were very different from those that Soviet doctrinal writings seemed to dictate. The USSR's nuclear warheads were kept under the control of KGB units and stored separately from their respective missiles until the early 1960s, and bombers were not maintained at a high level of alert. Thus, although Soviet doctrine stressed the dangers of surprise and the virtues of preemption, Soviet nuclear operations left the USSR's nuclear forces vulnerable to a preemptive strike and incapable of carrying out such an attack on short notice. Soviet leaders may have allowed this gap between doctrine and operations because they wanted to take precautions against accidental or unauthorized use of nuclear weapons.

Soviet nuclear capabilities increased substantially from 1955 to 1960 with the deployment of about 200 Bison and Bear bombers, the USSR's first intercontinental bombers. This development contributed to further changes in Soviet doctrine under the rubric of the "military-technical revolution." Malenkov, a Politburo member who aspired to succeed Stalin, even suggested in 1954 that nuclear weapons were so destructive that war between capitalism and socialism was no longer inevitable. Malenkov's view did not win favor at the time, however, and Khrushchev used this issue to help oust Malenkov.

Khrushchev reversed himself only two years later at the 20th Party Congress, arguing that war was no longer inevitable because the Soviet Union could deal a "crushing rebuff" to any aggressor. Khrushchev used this doctrinal revision to spearhead a major shift in Soviet policy toward greater reliance on nuclear weapons, which he viewed as decisive in modern warfare, and less emphasis on conventional forces. The Soviet Union launched its Sputnik satellite in 1957, marking a key milestone in the development of intercontinental ballistic missiles. In 1959, the USSR created a new branch of its military, the "Strategic Rocket Forces" (SRF), to oversee Soviet nuclear missiles. The SRF quickly became the premier Soviet military service, ahead of the traditionally dominant Soviet ground forces. Meanwhile, the USSR cut as many as two million men from its conventional forces between 1955 and 1958. The shift from conventional to nuclear forces reached a high point when Khrushchev proposed in 1960 that Soviet conventional forces be reduced by an additional one million troops. Opposition to this plan, partly from within the military, forced Khrushchev by the summer of 1961 to drop the idea of further conventional reductions. Soviet Defense Minister Malinovskii affirmed soon thereafter that victory in war would depend on the "joint actions of all the services," including Soviet conventional forces.

Khrushchev's Bureaucratic Compromise: 1964-1971

Despite increases in Soviet nuclear forces in the late 1950s, Khrushchev's claims often outpaced actual Soviet capabilities. Khrushchev tried to deter the U.S. in part through boasts and outright deceptions regarding Soviet nuclear strength. It was almost a decade after Khrushchev warned of a "crushing rebuff" to any aggressor before the Soviet Union in fact had reliable intercontinental nuclear forces that could survive a first strike. Soviet missiles were based in "soft" launch sites above ground until about 1965, and they took many hours to prepare for launch, making them vulnerable to a preemptive attack. In addition, as the Cuban missile crisis revealed to the world, the "missile gap" favored the U.S. rather than the Soviet Union. The Soviets therefore gave high priority beginning in the mid-1960s to constructing hardened underground silos and building up their land-based missile forces, which grew from 224 missiles in 1965 to 1220 by 1969. Soviet missile submarine programs also expanded in this period, although submarines and bombers received less emphasis in the Soviet force mix than in the American triad.

Finally, Soviet doctrinal discussions indicated interest in a capability to launch Soviet

missiles quickly. In particular, military strategists addressed the importance of being able to: "launch on tactical warning" (LOTW), that is, once radar or other information indicated that an attack on the USSR was under way; or "launch under attack" (LUA), that is, after confirmation that the adversary's first bomb or warhead had detonated over the Soviet Union. These tactics received less attention as Soviet nuclear forces became capable of surviving a nuclear attack, but LOTW and LUA may still be options in Soviet nuclear plans, and Soviet capabilities to carry out quick launches have improved.

After Khrushchev's ouster, Brezhnev pursued a policy of bureaucratic compromise, continuing the doctrinal and budgetary focus on "all forces." Soviet strategists in this period acknowledged for the first time that a conventional phase of war might precede nuclear strikes, an idea that they had previously rejected out of concern that the U.S. would contemplate a war limited to the European theater. As the Soviets approached nuclear parity, they hoped their advantages in conventional forces would give them greater influence in Europe and the Third World.

Brezhnev and SALT: 1971-1983

The Soviets achieved nuclear parity in the early 1970s, and in this same time period, Brezhnev began to state publicly that, in the event of a nuclear war, both sides would suffer terrible damage regardless of which side attacked first. Brezhnev also publicly eschewed the goal of nuclear superiority in the 1970s, although some Soviet military writers still appeared to embrace this objective. The Soviet attainment of parity contributed to greater Soviet interest in arms control, because Soviet leaders could now negotiate without seeming to codify American nuclear superiority. The onset of nuclear parity coincided with the 1972 SALT I agreement, which placed limits on both sides' defenses against ballistic missiles. The Soviets had rejected any such limits only a few years earlier. U.S. and Soviet leaders also signed the SALT II agreement, which set limits on offensive nuclear arms, within several years of the establishment of nuclear parity.

Soviet agreement to SALT I, however, did not necessarily indicate that the Soviets dismissed the concept of ballistic missile defense. They may have feared American technological superiority, and they probably also realized that effective defenses against ballistic missiles, although highly desirable, were not within their current technical and economic means.

Similarly, despite Soviet agreement to SALT II and Brezhnev's statements on the reality of mutual assured destruction, the USSR continued to deploy large, accurate, multiple-warhead land-based missiles suitable for preemptive "counterforce" attacks—attacks on an adversary's nuclear and conventional forces. The Soviet view was that it would be far better to launch first rather than second, even if both sides were sure to suffer massive damage, and that the opening phase of a nuclear war would be decisive. Soviet doctrine also suggested that destroying U.S. forces before these forces were used against the USSR was not the same as a "first strike" if Soviet leaders were convinced that the U.S. intended to launch an attack. Moreover, Soviet strategists saw few contradictions between the requirements of nuclear "deterrence" and those of nuclear "war-fighting." In their view, the best way to deter a nuclear war was to be prepared to fight one with the least possible damage to the Soviet Union and maximum damage to the adversary. Soviet strategists were unsympathetic to Western views that pursuance of such a strategy by both sides would undermine crisis stability and encourage preemptive first strikes. Most of these ambiguities in Soviet nuclear doctrine and tensions between Soviet declaratory statements

and nuclear operations are, still evident today.

Gorbachev's "New Thinking": START and SDI, 1983-1988

The 1983 U.S. Strategic Defense Initiative (SDI) signaled a reversal of each side's earlier arms control policy regarding missile defenses. In contrast to the 1960s, the U.S. now sought to loosen limits on missile defenses and the Soviets sought to tighten them. This disagreement made it difficult for the two sides to agree on limits on offensive arms in the Strategic Arms Reduction Talks (START).

Renewed U.S. interest in missile defenses also opened up a potential gulf between Soviet and American doctrines and forces. The USSR has since World War II maintained a large research and development program in missile defense technologies, and it has devoted far more resources than the U.S. to deploying defenses against aircraft and missiles (the Soviet Union, unlike the U.S., exercised its right under SALT I to deploy a ground-based missile defense system around its capital, Moscow). More recently, however, Soviet strategists have argued that the best Soviet response to SDI would be not to create a Soviet SDI, but to invest in inexpensive and low technology offensive countermeasures (decoys, chaff, hardened missile shells, air- and sea-launched cruise missiles, anti-satellite weapons, depressed-trajectory missiles, penetrating bombers, and increases in the numbers of Soviet missiles and warheads). Still, this aspect of Soviet declaratory doctrine may not reflect actual Soviet force planning.

If the U.S. does not deploy comprehensive missile defenses in the near term, Soviet nuclear doctrine and forces may have greater similarity to their American counterparts than at any time since the early 1970s. The Soviets have begun to diversify their nuclear forces, placing greater reliance on bombers, missile submarines, and mobile missiles, and less emphasis on heavy missiles in fixed silos, which are becoming vulnerable to accurate American warheads. At the same time, Soviet strategists have renewed their attention to conventional forces. Marshal Ogarkov, chief of the General Staff until 1984, and, to a lesser extent, Marshal Akhromeyev, who succeeded Ogarkov, have suggested that the existence of numerous survivable nuclear weapons on both sides has decreased the likelihood of nuclear war. This development, in their view, has increased the importance of conventional arms, including emerging technologies such as precision-guided munitions.

With regard to arms control, Gorbachev's "new thinking" on defense, including the still vague concepts of "reasonable sufficiency," "defensive defense," and "mutual security," could ease negotiations on nuclear arms. Gorbachev has taken a small but important public step toward Western thinking on preemptive strategies and crisis stability in acknowledging that neither side can increase its own security by putting the other side at greater risk. These new concepts are not yet reflected in Soviet nuclear forces and operations, however, which remain oriented toward counterforce missions. In addition, there may be important differences between Soviet civilian and military views on "new thinking." In general, the more concrete the issue, and the closer it is to questions of policy implementation, the greater the apparent divergence between civilian and military views.

Conclusions

This brief review of the evolution of Soviet nuclear doctrine demonstrates that there have been important and sometimes unpredictable differences between Soviet declaratory doctrine and actual Soviet nuclear operations. Soviet nuclear doctrine led the development of

Soviet forces during some periods and lagged behind those forces in others. Stalin publicly downplayed the importance of nuclear weapons and the potential effects of surprise attacks, but he privately spurred the Soviet nuclear program. Stalin's successors openly discussed the danger of surprise attacks but quietly took the operational precaution of separating warheads from missiles. Khrushchev's bluffs made Soviet nuclear forces seem more capable and threatening than they actually were. Gorbachev's new thinking has changed Soviet declaratory doctrine in ways that understate the USSR's capabilities to carry out more aggressive strategies. It remains to be seen whether Gorbachev's new thinking will actually translate into important and enduring changes in Soviet nuclear doctrine, forces, and operations.

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Chapter 8

CALCULATING FORCE LEVELS AND PLANNING REQUIREMENTS

by Lynn Page Whittaker

Considering the cost and fearful potential consequences of possessing a hefty nuclear arsenal, it would be reassuring to believe that logical planning requirements have determined the forces we have. In fact, the reasons we have acquired our particular number and mix of nuclear weapons tend to be more historical and political than rational. Bureaucratic and alliance politics, interservice rivalry, technology, and public relations often play as large a role as does a convincing strategic rationale.

Underlying these political processes, however, has been a strategic rationale for nuclear weapons, which if nothing more at least stocks rhetorical arsenals for defense policy disputes. That rationale has remained essentially unchanged since Bernard Brodie articulated the goal of nuclear deterrence in 1946: "Thus far the chief purpose of our military establishment has been to win wars. From now on its chief purpose must be to avert them."

Why does the United States currently maintain 13,000 nuclear weapons? Officially, it is to deter aggression. Deterrence, however, is "in the eye of the beholder" and we are unable to know with certainty what will deter the Soviets; it is therefore possible to argue that this goal may be met in many ways, giving rise to many different *theories of* deterrence. Those who believe, say, in "minimum deterrence" argue for reductions to only a few or a few hundred nuclear weapons. At the opposite extreme, those who think that deterrence demands the ability to prevail in a nuclear war argue that the U.S. requires overwhelming nuclear superiority.

Forty years *of* politics and history have brought us to a force level between these two. We now have about 13,000 strategic nuclear warheads, based on land, on sea, and in the air. The strategic rationale that, along with political and historical factors, has formed the basis *of* force requirement calculations took shape when Robert McNamara introduced systems analysis to the Pentagon in the 1960s. His intention was better to align our strategy, forces, research and development (R&D), and military planning. He sought also to provide a way for the civilian office *of* the Secretary of Defense to curb requirements and set priorities among the services' "wish lists." This conceptual framework for determining "how much is enough" involves complicated mathematical calculations; but in essence, three major factors have guided the level and mix of U.S. strategic nuclear forces: 1) selection of targets in the Soviet Union; 2) the probability of destroying those targets; and 3) the level of confidence leaders want in their ability to destroy targets.

Targets in the Soviet Union

U.S. nuclear weapons planners do not target populations *per se*. Although substantial fatalities would result from any attack, the targets for our strategic nuclear weapons are Soviet military forces, nuclear and conventional, and their supporting command and control capabilities and industrial and economic base (most of which is in cities).

There is no objective method for determining the total number of Soviet targets. Such decisions are made by people using varying subjective, sometimes even arbitrary, criteria of selection, ranging from the most demanding to the least. A typical

moderate estimate is 5000. This list includes about 1500 fixed strategic targets-ICBM silos and their command and control centers. Another 1800 targets comprise shorter-range missile sites, tactical air and bomber bases, submarine ports, defensive systems, and ground force bases. The remaining targets are in the Soviet economic, energy, and industrial base. The type of target-especially whether it is "hard," like an ICBM silo, or "soft," like an air base-is crucial when assigning warheads since the difficulty of destroying the target affects the number and type of weapons needed.

Selecting targets, assigning priorities among them, and planning attack options have been, since 1962, the job of the joint Strategic Target Planning Staff (JSTPS) at Offutt Air Force Base, Nebraska. JSTPS prepares, in accordance with national guidelines, the Single Integrated Operational Plan (SIOP)-"single" and "integrated" because it includes all services. The SIOP presents national political leadership with a set of attack options available for execution in time of war.

The Probability of Destroying Targets in the Soviet Union

If each target could be destroyed with one weapon, force planners would need simply to determine a target set, and calculating requirements could be fairly straightforward. Such expectations, however, are unrealistic, and cannot be a practical basis for force planning. Instead, the likelihood of target destruction ("probability of kill") must be considered. This likelihood is a consequence of several factors: survivability; alert levels; penetration; and effectiveness/accuracy. These factors reflect the probability that the weapon system will work; that it will reach its target; and that it will destroy the target.

1. Survivability. The guiding assumption for planning is that the Soviets would launch a first strike against the United States, and ours would be a retaliatory second strike against them. In such a scenario, the Soviet attack would have destroyed some portion of U.S. forces preemptively, and the U.S. second strike would be launched with whatever weapons survived. While U.S. planners cannot be sure what type of attack to expect, logically they assume that it would be against all vulnerable forces-land-based ICBMs, bombers at air bases, and submarines in port. Although the exact proportion of destroyed forces is indeterminate, we can assume that the Soviets would try to destroy the largest possible proportion. Thus, we expect that our available alert, on station (in the case of the submarines) retaliatory force would be smaller than our total existing force.

2. Alert Level. If the Soviets were able to launch a "bolt from the blue" attack with only tactical warning, U.S. leaders could not raise the day-to-day alert level of their forces for protection. In such a scenario, non-alert U.S. bombers at their military bases and submarines in port would be just as vulnerable as ICBMs in silos. With warning, U.S. leaders would be able to put our forces on a much higher alert, e.g., disperse the bombers to a larger number of airfields, put some planes in the air, and get the submarines out of the ports into the oceans. If U.S. forces were alerted before Soviet weapons arrived, a smaller proportion of our force would be destroyed.

3. Penetration. For an example of this factor, consider the path of an ICBM. If the missile is not a dud and ejects properly from its silo, factors such as inertial sensing errors, uncertainties in gravitational forces, or lack of knowledge of atmospheric conditions at target may intervene to drive the missile or its reentry vehicles (warheads) off course. While extensive defenses against ICBMs are prohibited by the Anti-Ballistic Missile (ABM) Treaty, future deployment of space- or land-based ABM systems could prevent the

missile warhead from reaching its target. Even if it arrived successfully, there may be other problems. If the target is a silo for a land-based ICBM, it may be sufficiently hard to make it difficult to destroy. If the target is bombers at an air base, the planes may have taken off before the ICBM arrives. If several incoming warheads explode concurrently around a target, the dust cloud, atmospheric turbulence, nuclear radiation, and electromagnetic pulse from the first explosion may create enough disturbance to disable subsequent warheads or at least reduce their accuracy. (This phenomenon is called "fratricide.")

Additional questions arise concerning other weapons systems. Bombers are slower and easier to detect than ICBMs, and there are no legal constraints on employing air defenses to detect and shoot them down. Ballistic missiles launched from submarines (SLBMs) also face problems since they are fired from platforms that frequently change location. The latest generation of SLBMs (the D-5), however, will deliver a larger payload than current SLBMs with significantly improved accuracy.

4. *Effectiveness/Accuracy.* The likelihood that any one warhead will actually land close enough to its target to destroy it varies among types of weapon systems. After numerous flight tests, analysts are able to predict that each type of weapon will have a certain accuracy, called its "CEP," for Circular Error Probable. This number is calculated as the radius of a circle around a target within which 50 percent of weapons fired can be expected to fall.

The expected accuracy also varies depending on whether the target is in a fixed basing mode, is mobile, or is deployed deep underground. Whereas in the past, U.S. strategic nuclear weapons were technically limited in their accuracy and yield, current technology has reached the point at which we can hit any target that is fixed and on the ground.

Levels of Confidence

President Eisenhower was told once that a certain number of nuclear weapons was required because we needed a 90 percent probability of destroying each target. Eisenhower, an experienced military commander, disagreed, and indicated his willingness to accept lower levels of confidence; he was willing to settle for 70 percent. Although political leaders seldom have the military seasoning or the willingness to challenge military opinion to make that kind of judgment, they should be aware that force requirements are always driven by the level of confidence desired.

It should also be noted that the pressures to build more weapons are often countered by applying the economic principle known as the "law of diminishing returns." When force planners assign weapons to targets, they want to be confident that the target will be destroyed. But at some point, achieving high confidence in probability of destruction becomes too costly to be efficient in that the marginal increment of damage gained is not worth the expenditure needed to obtain it.

Finally, the total strategic nuclear requirement is never determined independently of the types of weapons or their basing modes. The primary rationale for the mix of forces is the need for redundancy in the force. The need to assure survivability has justified, in retrospect at least, the need for a triad of forces-based on land, on sea, and in the air. Redundancy protects against a Soviet technological breakthrough in means of detection or destruction of one "leg" of the triad; it also allows us to take advantage of the unique benefits of each leg while guarding against relying too heavily on any one. Submarine-based weapons, for example, are the least vulnerable part of the force. Though vulnerable, ICBMs are accurate and reliable, and can destroy even hardened targets.

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Chapter 9

THE HISTORICAL DEVELOPMENT OF THE U.S.-SOVIET NUCLEAR BALANCE

by David Blair

Both the United States and the Soviet Union have greatly increased their nuclear arsenals since 1960, when the United States had fewer than 2000 strategic offensive nuclear warheads and the Soviets had fewer than 1000. In 1988, the U.S. had a total of about 13,000 nuclear warheads on strategic (long-range) delivery vehicles-about 2,600 on intercontinental ballistic missiles (ICBMs), 5,600 on submarine-launched ballistic missiles (SLBMs), and 5,000 on bombers. The Soviets have a total of about 11,000 strategic nuclear warheads-about 6,400 on ICBMs, 3,400 on SLBMs, and more than 1,000 on bombers.

The major developments in strategic nuclear weapons can be highlighted by looking at a few programs on each side. In the 1960s, the United States and the Soviet Union built single-warhead ICBMs (Minuteman 1 and 2, and SS-7s, SS-9s, and SS-11s, respectively) and SLBMs (Polaris and SS-N-6s). In the early 1970s, the United States added a great many deliverable ICBM and, especially, SLBM warheads using new technology that allowed multiple independently-targetable reentry vehicles (MIRVs) on each missile. (MIRVs were first incorporated in the Minuteman 3 ICBM and the Poseidon C-3 SLBM.) Then, in the mid- to late 1970s, the Soviets deployed large numbers of highly MIRVed ICBMs (each had eight to ten RVs) and soon had many more ICBM RVs than the United States, although the United States still has many more SLBM RVs. Table 1 lists chronologically the major developments that affected the strategic balance. Graphs 1 and 2 show the growth in the number of strategic offensive nuclear warheads.

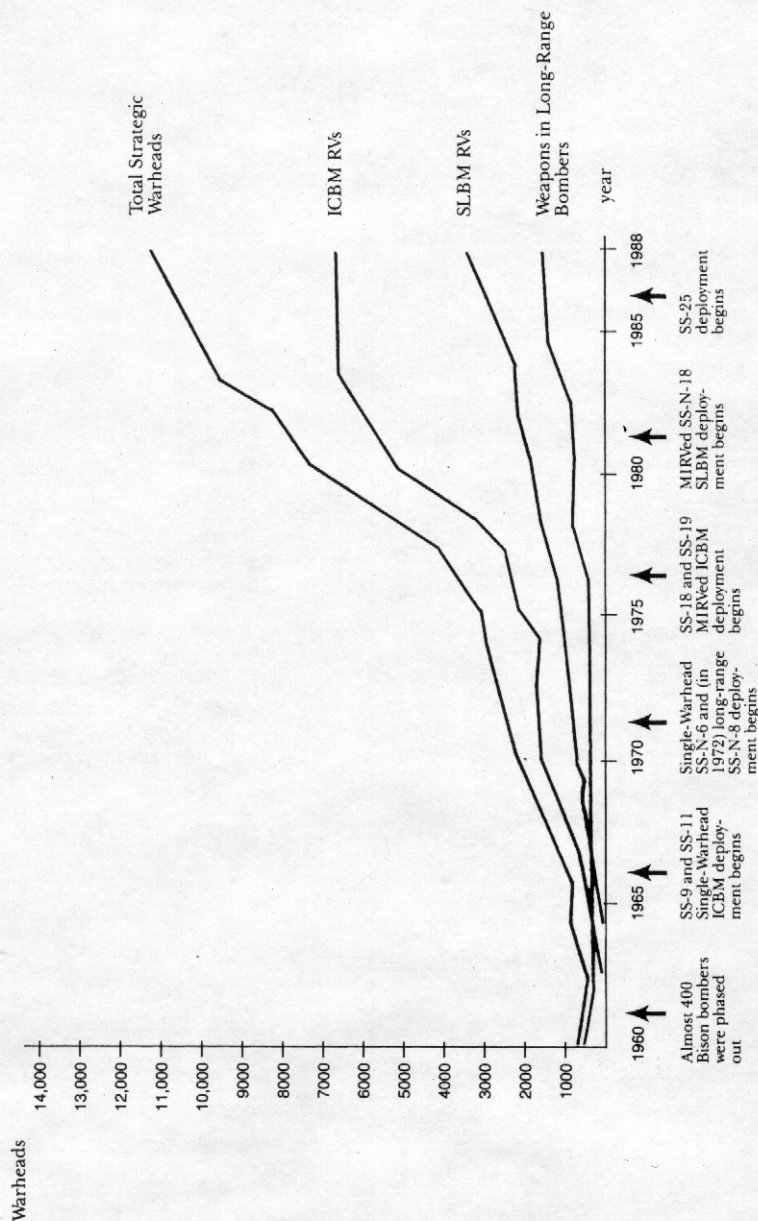
Since the late 1960s, the U.S. has had approximately 1,000 ICBMs, 650 SLBMs, and 350 to 400 bombers. Yet by deploying MIRVed ballistic missiles and by placing cruise missiles on bombers, the U.S. has more than tripled its number of warheads. Without increasing the total number of missiles, single-warhead Minuteman 1 and 2 ICBMs and Polaris SLBMs were replaced with multiple-warhead Minuteman 3 ICBMs and Poseidon and Trident SLBMs. The increase in U.S. warheads in the 1980s is due primarily to the deployment of air launched cruise missiles (ALCMs) on bombers. The Soviets have followed a similar pattern, although they have increased their number of missiles as well as warheads since 1970.

It is somewhat misleading to compare numbers of strategic weapons in 1960 with those in later periods since the definition of "strategic" has always been imprecise. In the 1950s and early 1960s, for example, the United States had many nuclear weapons on medium- range bombers and missiles that would have been used for the "strategic" purpose of hitting the Soviet Union but which are not normally counted as "strategic weapons." In 1960, the United States had 1,250 B-47s, which could have reached the USSR from U.S. bases on the Soviet periphery, and 105 intermediate-range ballistic missiles (IRBMs) in Europe. Once intercontinental delivery systems were perfected, however, these shorter range

systems were phased out. Throughout most of the 1960s, the Soviets had around 1,000 medium-range Badger bombers, which could hit targets in Europe or (in a one-way mission) in the United States. Strategic weapons have long constituted less than half the total number of nuclear weapons, which are deployed in the European theater, for air defense, on carriers, and so on.

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GRAPH 2
Soviet Strategic Nuclear Warheads 1960–1988



Why Did the U.S. and USSR Choose to Deploy the Nuclear Weapons They Did?

Neither the United States nor the Soviet Union has specified nuclear strategy so precisely that it can determine its strategic nuclear forces by a formula. Rather, the strategic force decisions of both sides are driven by their desire to guarantee that their nuclear forces will not be vulnerable to a disarming first strike, the number and types of targets they may want to destroy in a war, worries about what the other side is and will be doing, and technological changes that make new weapons systems possible.

In deciding how many weapons to deploy, neither side is guided primarily by a desire to match the raw numbers of the other. Relative numbers of total warheads on long-range vehicles do not, in themselves, provide a very good measure of the balance. At least six other considerations bear on deployment decisions:

1. *Survivability Against a First Strike.* A major factor guiding the development of U.S. strategic forces has been the recognition that even a numerically superior force might be caught and destroyed by a surprise first strike. In the early 1950s, for example, U.S. bombers were located on a few bases, which might have been destroyed before the bombers could get off the ground.

Since the early 1960s, the U.S. has minimized vulnerability to a disarming first strike by maintaining a triad of delivery vehicles-ICBMs, SLBMs, and manned bombers. Even if one leg of the triad is wiped out, the other two legs will survive for retaliation against the Soviets.

By the late 1970s, there was widespread concern that the ICBM leg of the triad was endangered by the Soviet SS-18 and SS-19 ICBMs, which carried many more warheads and were more accurate than earlier Soviet ICBMs. Concern over this "window of vulnerability" has motivated much of the strategic weapons debate of the 1980s.

Until recently, the Soviets have seemed less concerned than the United States about surprise attack. They have placed a large portion of their warheads on SS-18s and SS-19s, which are becoming vulnerable (particularly given the planned U.S. deployment of D-5 SLBMs accurate enough to destroy silos). They have put many fewer warheads on submarines and keep fewer of those submarines at sea than does the United States. This emphasis is beginning to change, however, as the Soviets deploy the ten-warhead, rail-mobile SS-24 and single-warhead, road-mobile SS-25 ICBMs, and the ten-warhead SS-N-23 SLBMs.

2. *Alliance Commitments.* The two sides have different goals and international commitments. In particular, NATO relies on a U.S. policy of extended deterrence, in which U.S. nuclear weapons deter a conventional Soviet invasion of Western Europe. The credibility of this strategy has been undermined by the buildup of the Soviet nuclear arsenal.

3. *Hard-Target-Kill Capability.* SLBMs are much less accurate than ICBMs. Thus they are much less capable of destroying hardened targets; against the targets they can kill, they need larger warheads (which cause more collateral damage to civilians). The fact that about three-fourths of U.S. RVs are on SLBMs thus worries some Americans who believe that, in case of war, the United States would want to hit targets such as hardened command bunkers and ICBM silos. In 1988, the U.S. had fewer than 2,500 RVs capable of destroying silos while the Soviets had about 1,500 ICBM silos. So the United States did not have the two hard-target-kill RVs per silo that are needed to destroy the Soviet missile silos with high confidence. However, the United

States plans to change this by deploying the D-5 SLBM, which will be accurate enough to destroy silos.

4. *Low-Collateral-Damage Attacks on Military Targets.* Improvements in accuracy over the years have made it possible to discuss strategies that rely on attacks that are designed to destroy military targets (such as airfields or tank concentrations) while killing few civilians.

5. *Throwweight.* The Soviet ICBMs are substantially larger and thus can carry more warheads than U.S. ICBMs. The Soviet Union's 308 SS-18s have been tested for 10 warheads, but they might be able to carry as many as 30. By placing 30 on each SS-18, the Soviets could quickly acquire more than 6000 additional RVs with hard-target-kill capability—approximately doubling their current number of ICBM RVs.

6. *Penetration Capability.* At times, each side has been concerned that its warheads could be shot down by the other's defenses. For instance, the U.S. decision to deploy MIRVs in the late 1960s was said to be partly a response to a very rudimentary Soviet anti-ballistic missile (ABM) system. A more realistic concern about the capability of U.S. bombers to penetrate Soviet air defenses motivated the decisions to build the B-1 and Stealth bombers and to deploy cruise missiles on bombers in the 1980s.

The Debate Over MX and Midgetman

Fears about the vulnerability of Minuteman silos led the United States to explore ways to make ICBMs mobile and thus, it was hoped, untargetable. The Carter administration wanted to deploy the MX missile in a "racetrack" system that would have included 200 MXs shuttled among more than 4,300 sheltered launch points. Since the Soviets would not know where the missiles were, they would have to shoot at all the possible launch points in order to wipe out the U.S. ICBM retaliatory capability. This system probably would have made the ICBMs less vulnerable, but it was expensive and was unwelcome in the western states where it would have been deployed.

The Reagan administration dropped the racetrack MX deployment system and is deploying 50 MXs in Minuteman silos. This increases the U.S. hard-target-kill capability, but does nothing to make our own silos less vulnerable. The Air Force is also currently proposing to deploy 50 more MXs on railroad cars.

The Midgetman is a mobile single-warhead ICBM, favored by some members of Congress but generally opposed by the Department of Defense. This system might help solve the ICBM vulnerability problem, but it has run into opposition because of cost and because of uncertainty about whether it is mobile enough to survive a surprise attack.

Survivability and Penetration Capability of U.S. Bombers

Two main issues are important to decisions about bomber deployment: will the bomber be able to penetrate Soviet air defenses? and is the bomber force vulnerable to being attacked while on the ground?

The Reagan administration reversed President Carter's decision to cancel the B-1 bomber and decided to deploy 100. (Several have crashed, so we are left with a total below this number.) There is now some doubt that the B-1 will be able to penetrate Soviet air defenses, so it may have to be used as a platform to carry ALCMs. The Stealth bomber will

be much less visible to radar and, it is hoped, will therefore be able to penetrate Soviet defenses.

Another danger is that U.S. bomber forces might be vulnerable to an SLBM or cruise missile attack while still on the ground. The Air Force has reduced the SLBM threat by keeping some bombers ready to take off after the U.S. receives warning that the SLBMs are launched but before they hit the bomber bases. However, future Soviet stealthy sea-launched cruise missiles might be so undetectable that they could destroy the bombers without warning.

TABLE 1.
**Major Developments in U.S. and Soviet
 Long-Range (Strategic) Nuclear Delivery Vehicles**

1959-1960 ICBM programs were under way on both sides. The U.S. was building, but had not yet deployed, SLBMs. Both sides still relied primarily on manned bombers as nuclear delivery vehicles, but the foundations of the U.S. triad were laid in this period.

The Soviets may have produced ICBMs slightly sooner than the U.S. In 1960, when John Kennedy charged in his presidential campaign that the U.S. had allowed a missile gap to develop, the Soviets had 35 operational ICBMs, while the U.S. had not deployed any. However, the U.S. did have 105 Thor and Jupiter IRBMs based in Italy and Turkey and able to hit the Soviet Union.

1962-1968 The U.S. built approximately 1000 single-warhead, solid-fueled Minuteman 1 and 2 ICBMs and more than 650 SLBMs. (Today, it retains about the same number of missiles but has greatly increased the number of warheads.)

October 1962 At the time of the Cuban missile crisis, the U.S. had 450-500 ICBMs, many of which were protected in silos and were solid-fueled (thus capable of being launched on very short notice). The U.S. also had 630 B-52s. Many U.S. medium-range bombers and missiles, as well as fighter planes based in Europe, were capable of hitting the Soviet Union. The Soviets had about 75 ICBMs, all of which were liquid-fueled and many of which were not protected by silos. The Soviets also had about 200 long-range and more than 1,000 medium-range bombers.

1962-1974 The Soviet missile programs lagged in the early 1960s, but by 1969 they had more ICBMs than the U.S., and by 1974 they had more SLBMs. (These figures are for missiles, not warheads.)

1970-1974 The U.S. MIRVed its missiles by replacing more than half of the Minuteman force with 550 new Minuteman 3s, each of which has three warheads each capable of hitting separate targets. During this period, the U.S. also largely replaced the non-MIRVed Polaris missile with the ten-warhead Poseidon C-3. Thus, the number of U.S. strategic warheads greatly increased.

1975-1984 In this period, the Soviets deployed almost 700 large MIRVed missiles (the SS-18s and SS-19s), increasing their number of ICBM RVs by about 5,000. They also built a fleet of Backfire bombers, which may have the primary mission of attacking U.S. Navy platforms but which could hit targets almost anywhere in the U.S. if they were refueled in flight.

1982-present The Soviets have carried out a program to replace old non-MIRVed SS-N-6 SLBMs with MIRVed SS-NI8s and SS-N-20s.

1980s The U.S. is deploying 100 B-1s and 50 ten-warhead MX ICBMs in silos, and has equipped the B-52s with ALCMs. These programs increased the number of U.S. strategic nuclear weapons by about 3500 warheads. The Soviets have begun deploying the road-mobile, solid-fuel, single-warhead SS-25 ICBM and are near deployment of the ten-warhead, rail-mobile SS-24. They placed ALCMs on their bombers, so that in the mid-1980s the bomber fleet became a true leg to a Soviet triad. The new Blackjack intercontinental bomber, which is nearing deployment, will make the Soviet bomber fleet even more impressive.

The SALT I and SALT II Agreements

The SALT I agreement of 1972 placed five-year limits on the number of ICBM and SLBM launchers that each side could hold, but did not limit the number of warheads. The total number of Soviet missiles was limited to 2,400 while the United States was limited to 1,700. (The U.S. had a large lead in the number of bombers, which were not covered by the treaty, and, at the time of the signing, was thought to lead in the capability to build MIRVed missiles.) The treaty did not prevent either side from replacing single-warhead missiles with multiple-warhead MIRVed missiles.

The unratified SALT II Treaty of June 1979 limited each side to a total of 2,400

ICBMs, SLBMs, heavy bombers, and air-to-surface ballistic missiles. Unlike SALT I, SALT II limited the number of warheads; then existing ICBMs were not to be equipped with more than the maximum number they had been tested with as of May 1979. SALT II also limited each side to developing one new type of ICBM, with not more than 10 warheads, and prohibited the flight-testing of any SLBM with more than 14 warheads. Nevertheless, the terms of the treaty allowed the United States and the Soviet Union to deploy nearly 4000 new warheads each.

Did the Nuclear Balance Make Any Difference?

Henry Kissinger defended the 1972 SALT I treaty by asking: "What in the name of God is strategic superiority? What is the significance of it politically, militarily, operationally, at these levels of numbers? What do you do with it?" The heart of the question is whether the relative numbers of nuclear weapons will affect the outcome of a crisis. The United States had many more nuclear weapons than the Soviets during the Korean War and the Cuban missile crisis. But clearly the U.S. nuclear threat did not stop the Soviets from acting aggressively even then, and there is much debate over whether the strategic nuclear balance influenced the outcome of these crises.

Domestic Influences on Nuclear Weapons Policy

Chapter 10

NUCLEAR WEAPONS CONGRESS

by Graham T Allison, Jr.

We start with the three most important truths about this subject. First, over the past two decades, the ignorance of Presidents and cabinet officers about Congress has had at least as large an impact on the United States' development and deployment of nuclear weapons as has ignorance about our allies or the Soviet Union. Second, the Constitution gives Congress as legitimate and substantial a role in shaping American national security policy as it does to the executive. Third, the chairmen of the armed services committees (Senator Sam Nunn and Congressman Les Aspin) have seen six secretaries of defense come and go and expect to see six more; they are (and regard themselves as) at least as knowledgeable as the average secretary of defense, secretary of state, or national security advisor about issues of nuclear weapons, and they have long-standing relationships with many careerists in all of the relevant departments. In a corporate setting, they are functional equivalents of the Chairman of the Board of Directors to whom executive branch officials report.

This chapter summarizes key points about Congress and nuclear weapons under five headings: Congress's constitutional authority; Congress and decisions about the use of force; Congress and the development and deployment of nuclear weapons; Congress and arms control; and dealing with Congress.

Congress's Constitutional Authority

While it is a common belief that foreign policy is an executive prerogative, it is useful to recall the relevant provisions of the U.S. Constitution. The Constitution designates the President commander-in-chief of the armed forces, specifies that he shall receive ambassadors, and empowers him, with the advice and consent of the Senate, to make treaties and appoint ambassadors. It assigns the President no other powers specific to foreign relations. The Congress is empowered to provide for the common defense, to raise and support armies, to provide and maintain a navy, to declare war, to define and punish piracies and felonies committed on the high seas and offenses against the laws of nations, to lay duties and imposts, and to regulate commerce with foreign nations. In short, in the constitutional design, ultimate power over foreign commerce, war, and military preparedness is assigned to Congress. Operationally, the Constitution presents Congress and the President with an "invitation" to struggle over the control of American foreign policy.

Congress and Decisions About the Use of Force

Despite the Constitution and Congress's exclusive power to declare war, for 200 years Presidents have employed U.S. military forces abroad to protect our citizens' lives, properties, or other interests without declarations of war, and often without congressional

authorizations. By various counts, there have been 200 such incidents in which military force was used without congressional authorization. Of the conflicts known to us as "wars," three of the five most costly in both lives, and money-the Civil War, Korea, and Vietnam-have been undeclared and waged largely on presidential authority, with Congress at best an after-the-fact ratifier of presidential initiatives. Thus while the Constitution contemplated enforced collaboration between the President and his fellow politicians on Capitol Hill, in practice, such collaboration has been the exception rather than the rule. Consider the recent record: Cuba 1961, Cuba 1962, Vietnam, the 1973 nuclear alert, the *Mayaguez*, Iran, Grenada, and the strike on Libya-in none of these cases was Congress consulted. The President's role as commander-in-chief of the executive departments has provided all the constitutional authority and effective power required to send American military forces into danger or battle to protect U.S. interests.

The War Powers Resolution, passed in 1973 over the President's veto, requires the President to report to Congress within 48 hours of the initiation of hostilities on the cause for such action, and to terminate U.S. involvement unless Congress approves the action within 60 days. All subsequent Presidents have argued that the War Powers Resolution was "unconstitutional"; none have complied with it. Nor has Congress been willing to force a showdown. Congress clearly has the authority, through its exercise of the power of the purse, to bring to a halt American military involvement. Congress remains uncomfortable about the extent to which the executive branch has assumed its role in warmaking, and efforts are currently under way to revise the War Powers Resolution to better achieve the original constitutional intent.

Congress and the Development and Deployment of Nuclear Weapons

Whereas Congress's role in warmaking has been severely limited, the role of Congress in deciding about the weapons and people who provide for the common defense has grown steadily over the past several decades. Through the armed services committees and their subcommittees, and the appropriations committees and their subcommittees, Congress is deeply involved in every aspect of the research, development, and deployment of nuclear weapons.

For example, Congress has been a major actor in the saga of the search for a survivable land-based ICBM. This problem arose in the mid-1970s as improvements in the accuracy of Soviet ICBMs, particularly the heavy SS-18s, opened a theoretical "window of vulnerability" for U.S. land-based missiles. The crux of the problem is that improved accuracy renders vulnerable every fixed point on earth. This includes all 1000 U.S. ICBMs, which are based in fixed silos. U.S. weapons designers' search for a survivable basing mode for a new ICBM has explored several dozen alternatives, a number of which have been national policy for a period. None has retained the combined support of the joint Chiefs of Staff, the President, and the Congress for the decade required to develop and deploy a new missile. President Carter, for instance, won congressional support for a multiple protective shelter ("racetrack") program in 1979. President Reagan subsequently rejected that program, and in 1983, a blue-ribbon commission (the Scowcroft Commission) argued that the so-called "window of vulnerability" had not adequately taken into account the survivability of U.S. air- and sea-based strategic forces. It recommended deployment of 100 MX missiles in fixed silos and the development of a small ICBM suitable for mobile basing.

The moral of the story: without sustained support from members of the key committees, and ultimately a majority of Congress, it is not possible to develop and deploy nuclear weapons.

Congress and Arms Control

Over the past decade, Congress has imposed more severe restraints on U.S. weapons programs than have arms control agreements with the Soviet Union. Such congressionally imposed constraints include: observing the limits of the unratified SALT II Treaty for a period that extended beyond the date on which it would have expired; not conducting any tests in the SDI research program that would violate what Congress judged to be the "correct" (traditional) interpretation of the ABM Treaty; halting all tests of ASATs (anti-satellite weapons). Dozens of members of Congress have been actively involved or formal observers in the START negotiations between the U.S. and the Soviet Union. Since consent to ratification of a treaty requires a two-thirds vote by the Senate, small numbers of senators can pose major obstacles. Foreseeing such Senate opposition, President Carter withdrew the SALT II Treaty from Senate consideration rather than have it defeated.

Dealing with Congress

Congress functions primarily through its committees and subcommittees. Key members of the executive branch spend as much as one-fifth of their time testifying before such committees. But testimony alone will not create the relationship necessary to sustain a consensus for a coherent national security program. Key national security decision-makers should develop informal working relations with as many as 50 representatives in the Senate and House, particularly members of key committees and subcommittees, and engage them in policy deliberations *before* making decisions.

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Chapter 11

AMERICAN PUBLIC OPINION TOWARDS NUCLEAR WEAPONS AND NATIONAL SECURITY

by Thomas W. Graham

While public opinion polls should never provide the primary reason for making presidential decisions, effective policy implementation requires that senior administration officials understand in detail public attitudes toward national security issues. To prepare this chapter, over 800 public opinion polls were reviewed to compare contemporary public attitudes with those recorded since 1945. They show that most people are functionally knowledgeable about nuclear and national security issues but are not often aware of jargon or esoteric details of negotiations or weapons systems. Ten key conclusions emerge from this systematic review.

1. Deterrence. Even though the public is critical of building additional weapons systems, there is broad support for nuclear deterrence. There is little desire to remove nuclear weapons from Europe on a unilateral basis, and the public believes that the existence of nuclear weapons has helped prevent war from breaking out between the superpowers.

2. Use of Nuclear Weapons. When asked, a majority of the American public does not support using nuclear weapons first to defend important allies in Western Europe as is called for by NATO's current strategy, even if the Soviet Union were winning a conventional war. Majority support for using nuclear weapons occurs only under hypothetical scenarios in which the Soviet Union has used nuclear weapons first against the U.S. homeland or against American troops stationed overseas. While the exact level of public rejection of nuclear first use varies depending on question wording, 60 to 75 percent of the public hold this view. Thus, public attitudes against initiating the use of nuclear weapons may be characterized as "consensus."

3. Building Nuclear Weapons. In the 1980s, public support for the deployment of additional nuclear weapons has been about 30 to 40 percent. Support for spending additional money on nuclear weapons is lower than for spending on the military in general, and the level of public support for military spending is at an unusually low point historically (comparable to levels immediately post-Vietnam). In contrast with public attitudes in 1979 and 1980, today the public believes that the United States needs only to maintain a nuclear balance with the Soviet Union, not be superior in nuclear weapons.

4. Arms Control. The public is strongly in favor of all arms control negotiations (or summits) with the Soviet Union, and it supported the INF treaty at the level of 65 to 75 percent. There is also strong support for a START agreement, but the public will not demand a strategic arms reduction agreement right away. A majority of the public would be satisfied with a "pause" to

see if the Soviets live up to the INF agreement. Contemporary attitudes suggest that there is little "down-side" risk to pursuing strategic arms control with the Soviets. For example, the public does not believe that nuclear reductions will increase the chance of war. In terms of other nuclear arms control agreements, some polls show a moderate level of support for a comprehensive test ban treaty. However, historical data suggest that this support is relatively soft compared to attitudes concerning strategic nuclear reductions.

5. *Verification.* For the last 40 years, approximately 65 to 70 percent of the American public believed that one could neither trust the Soviet Union nor verify an arms control agreement with it. Recently, as a result of improved attitudes towards the Soviet Union, on-site inspection in the INF agreement, and the pullout of troops from Afghanistan, the public began to soften its heretofore solidly critical attitude toward the prospects of verifying an arms control agreement. From 40 to 65 percent of the public believe that the Soviet Union is more trustworthy under Gorbachev than under previous Soviet leaders.

6. *Soviet Union.* In the eyes of the American public, Gorbachev is the most popular Soviet leader ever. However, extremely positive attitudes toward Gorbachev have not translated into naive attitudes toward the Soviet Union. In the last two years, perceptions toward the Soviet Union have improved somewhat, becoming more positive by about 15 to 20 percent. The public has a quite sophisticated view of the Soviet Union at this point in time. They are very positive on Gorbachev, lukewarm on U.S.-Soviet relations, but still pessimistic regarding Soviet actions in the Third World. From a historical perspective, for detente to be successful between the United States and the Soviet Union, a minimum of 35 percent of the public must have a positive attitude towards the Soviet Union. Data from surveys conducted from 1985 through 1988 indicate that, until 1988, the public was slightly under this 35 percent threshold. However, in 1988, positive attitudes reached 45 percent, approximately the same level that occurred from 1973 to 1975. It is important to note that even during periods of relatively close U.S.-Soviet cooperation, positive attitudes toward the Soviet Union have never reached more than 50 percent.

7. *The Nuclear and Military Balance.* From 1978 through 1983, during the Carter administration and the first Reagan term, the public was quite concerned about American military weakness. During this period, pluralities and majorities (up to 55 percent) believed that the Soviets were militarily stronger. Since 1984, this attitude has changed, with a plurality now perceiving that the U.S. and Soviet Union are approximately equal in military strength. Pluralities also believe that the U.S. should build its military capability to equal, not be superior to, the Soviet Union. During the post-1983 period, however, a relatively stable 25 to 30 percent continues to believe that the Soviets are ahead in military strength.

Trends in public attitudes concerning the nuclear balance of power have followed a similar pattern. From 1979 through 1983, the public believed that the Soviet Union was stronger than the United States and that it was necessary for the U.S. to be superior to the Soviets in nuclear weapons. However, since 1984, the public has consistently characterized both the actual and the preferred nuclear balance as equality between the superpowers.

8. *The Strategic Defense Initiative.* The public has a complex set of attitudes concerning SDI. First, a majority believes it is possible to build an active defense against nuclear weapons, and most of the public thinks that the U.S. and the Soviets currently have a defense against nuclear weapons. Second, the public has shifted back and forth concerning whether the Soviets lead the U.S. in ABM and SDI. On balance, however, the public believes that the Soviets spend more on their SDI than do the Americans. Third, spending money has always been the most negative aspect of public attitudes toward both the ABM and SDI programs. Fourth, it is hard to gauge trend data accurately on support for SDI, but it has been relatively stable at around 55 to 60 percent or has declined very slightly. If question wording ~ is "pushed," one can get support up to the level of about 75 percent. When asked if development of such a system would make them feel safer, a plurality (rarely a majority) have answered in the affirmative. Few questions on SDI focus on the deployment issue. Fifth,

people are against sharing SDI technology with the Soviets. Sixth, as is true of arms control in general, people are not optimistic that any agreement covering defensive systems will be negotiated with the Soviets. Seventh, people do not want any SDI system itself to be nuclear. Eighth, people do not think Reagan's system would be 100 percent effective, but they want a system that would protect people.

9. *Emerging National Security Issues*. In the last several years, the issues of nuclear proliferation, drugs, terrorism, and economic security have become increasingly salient to voters, while strategic nuclear issues and U.S. -Soviet competition have declined in relative importance.

10. *Public Knowledge and Interest About National Security Issues*. Awareness of and interest in nuclear weapons are universal and much higher than awareness of and interest in arms control. In terms of detailed knowledge, people are twice as knowledgeable about nuclear weapons issues as they are about arms control issues. Only approximately 5 to 10 percent of the public have detailed knowledge of arms control and can be considered the "attentive public" for this issue area.

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Chapter 12
**SOVIET NATIONAL
SECURITY DECISION
MAKING**

by Kurt Campbell and Jeffrey W. Legro

Winston Churchill's characterization of the Soviet Union as a riddle wrapped in a mystery inside an enigma may overstate Western understanding of the USSR's national security decision-making. The evidence in this domain is sparse, and what we do have is incomplete. Indeed, the Soviets have taken extraordinary steps to maintain the black box that shields how and why their decisions are made. With these caveats in mind, knowledge of Soviet decision-making can be summed up in a few general statements. First, the Soviet leadership is an integrated political-military body, where political authority is dominant, but where the professional military retains an important influence. Second, the role of institutions and individuals varies within and between leaderships, according to the issue under consideration (e.g., doctrine, procurement, etc.), and between times of peace and war. The potential for evolution in the roles of institutions is particularly apparent in the current period of "perestroika." Gorbachev has initiated changes that appear to be aimed at transforming the security decision-making apparatus. Finally, the historical record of decision-making in superpower crises indicates that the Soviet Union has been very cautious in confrontations with the United States, a tendency that need not prove true in future clashes.

The Actors

The General Secretary, the Politburo, the Defense Council, and the General Staff represent the core of the national security apparatus. The Communist Party dominates life in the Soviet Union and the Politburo is its executive council. The Politburo, now composed of twelve full (voting) and eight candidate (non-voting) members, is headed by the General Secretary (Mikhail Gorbachev).

The Defense Council links politicians and the military at the highest level and is thought to act as a powerful subcommittee of the Politburo, dealing with national security issues on a day-to-day basis. This shadowy body, which has been reconfigured several times since World War II, is chaired by the General Secretary and is believed to include the minister of defense, the minister of foreign affairs, the KGB chief, and the chairman of the Council of Ministers (the head of the official government administrative body), among others. Its members have greater access to intelligence and military information than do other members of the Politburo and thus this council importantly shapes most national security issues.

The General Staff, the command organ of the military services, is organizationally under the direction of the Ministry of Defense but has direct ties to the Defense Council. In contrast with the joint Chiefs of Staff, it is headed by one man (Army General Moiseyev) and has more power over the five individual military services (ground forces, air forces, strategic rocket forces, air defense troops, and navy).

Leadership Change and Issue Areas

The role of these different actors in decision-making varies with the power of the leader and with the type of issue under consideration.

The power of the General Secretary vis-à-vis his colleagues has tended to fluctuate over time. Usually the leader builds increasing authority as his tenure in office lengthens (Khrushchev is an important exception here). As his power grows, the General Secretary is increasingly able to act independently of his colleagues on the Politburo, and his individual style and preferences will have a greater influence on decisions.

The decision-making style and substance of different leaderships has also varied considerably. For example, the military under Brezhnev had much greater autonomy and authority in its duties than was the case in the Stalin and Khrushchev periods. With Marshal Grechko's ascendance to full membership on the Politburo in 1973, the professional military had a direct say in the highest decision-making body of the Soviet Union. Today the military is again being dominated by the aggressive political leadership of Gorbachev. In light of the decision to withdraw from Afghanistan, the conclusion of the INF treaty, and the unceremonious firing of high-ranking generals in the wake of the young German Mathias Rust's feat of landing a small plane in Red Square, and the unilateral reduction of the armed forces, speculation about military unhappiness with the Gorbachev leadership may be justified.

Decision-making power is not only a product of institutional affiliations, but of personalities as well. As the case of Marshal Ogarkov illustrates, a forceful individual with clearly articulated views can have a significant impact on policy. Although Ogarkov was removed in 1988 from his position as Chief of the General Staff, his stress on the need for technological improvements in the Soviet conventional force posture has had a lasting influence.

Another key determinant of the decision-making process is the specific issue under consideration. The four most important issue areas are doctrine, force structure and procurement, arms control, and crisis management.

1. Doctrine. Military doctrine in the Soviet Union has two distinct levels: the "socio-political" and the "military technical." The dominant socio-political level considers the nature, objectives, and initiation of war and is dictated exclusively by the Party leadership. The subordinate military-technical level deals with assessing the threat, force structure, strategy, and troop preparation, and has traditionally been considered the realm of military professionals. There is an inherent tension between these two levels, as the socio-political level stresses war prevention, while the military-technical level emphasizes war preparation, particularly the principles of surprise, initiative, and preemption.

The Soviet military wields significant influence because of its traditional monopoly on military, expertise and information. There has been no civilian structure, such as the U.S. Office of the Secretary of Defense that parallels the military command. No institution, except in limited aspects the KGB, is able to challenge the military's interpretation of strategic requirements and planning needs or its estimates of the size and nature of military threats. Thus, despite having no formal vote in the major decision-making bodies, the military retains an important de facto authority. Gorbachev may be attempting to reduce this authority by, among other things, shifting oversight authority for defense budget matters to a standing Committee on Military Affairs, established in the new Soviet Parliament, and encouraging more open debate on national security issues.

Over the past two decades, the military's monopoly in the realm of strategic nuclear weapons has weakened somewhat as scientists and civilian analysts have begun to take part in policy matters, much the same way U.S. civilians did in the 1950s. In matters of conventional warfare, the monopoly remains largely intact. However, in this area, too, there have been indications under the Gorbachev leadership that the civilian role will be increased.

2. *Force Structure and Procurement.* The political leadership oversees all decisions and is probably directly involved with questions pertaining to major systems, especially weapons that require significant resources. Most requests for new weapons originate with the individual military services and are assessed and rationalized by the General Staff. As weapons have become technologically more sophisticated, the academy of sciences and top science advisors have assumed increasing importance in weapons acquisition and R&D investment decisions.

3. *Arms Control.* Decision-making in arms control is similar to deliberations on doctrine except that civilians outside the top leadership have a more prominent role. The chief Soviet negotiators have historically been senior foreign ministry officials. Despite the military's efforts to deny information to even these diplomats, their role has grown as a function of their experience and the necessarily political nature of the arms control process. Under Gorbachev, the now ex-Chief of the General Staff, Marshal Akhromeyev, has played a key part in arms control negotiations at summit meetings. In this role, it is unclear whether he is a personal emissary of Gorbachev, the official representative of military interests whose say is crucial, or both. Other civilian participants in the arms control process include analysts in academic research institutes that study the West, whose knowledge has been applicable to the ongoing negotiations with the U.S. and its allies. Finally, scientists have become influential because of the crucial link between rapidly changing technology and national security affairs.

4. *Crisis Management.* Decision-making in a crisis will depend on the severity of the situation and the time frame available for choice. For example, in the case of a surprise attack, the General Secretary would make the launch decision on his own authority; the Soviets have their own equivalent to the U.S. President's "nuclear football," a briefcase with nuclear release codes which accompanies their leader. And in the case of a plane intruding into Soviet airspace, the top political leadership might not be contacted at all—as is purported to have been the case with KAL 007—and the plane could be shot down according to standard operating procedures.

There is no question that political officials have the exclusive authority to release nuclear weapons for use.

Soviet leaders are extremely concerned about unauthorized or accidental use of nuclear weapons, and they have gone to extensive lengths to prevent it. In the early days of the nuclear era, warheads were kept separate from delivery systems and were under the control of the KGB. Today, missiles of the strategic rocket forces are equipped with multiple key systems (which the U.S. calls permissive action links, PALs), and it is likely that Soviet submarines also have some sort of external control device. In the case of tactical nuclear weapons held outside the Soviet Union, nuclear charges are still housed separately in special ammunition storage areas. It is probable that the KGB, with its own communications network, continues to play a role in the control of nuclear weapons.

As in the day-to-day formulation of national security policy, the locus of crisis decision-making is the Defense Council. This body appears to be a peacetime analogue of the State Defense Committee, a unified political economic-military leadership organ which assumed supreme command of the country in World War II (and would do so again if war breaks out). Despite the explicit dominance of civilian political officials in the Defense Council, the military can have a significant implicit influence. The nature of a conflict situation demands expertise in military affairs and, in this realm, the professional soldiers by and large have exclusive authority. Because the General Staff acts as a secretariat for the Defense Council, it is also able to shape the agenda and decisions. More directly, the military is tasked to make a timely determination of an outbreak of

hostilities and a potential enemy missile strike. Such a judgment would, of course, have an important impact in a crisis. This impact is of particular concern given the military's emphasis on offensive operations, especially the key role of preemption should a large-scale nuclear exchange appear imminent. Although Gorbachev's "new thinking" in national security affairs has denounced preemption and promised to upgrade the importance of defense in Soviet strategic thought, the results in this area remain unclear.

History of Soviet Decisions on Nuclear Weapons in Crises

The historical record-albeit a very limited and opaque one-is somewhat at odds with an image of the Soviet leadership as an integrated political-military command where an offensive-minded military has considerable influence. One might expect from such a leadership a skillful manipulation of the armed forces for political purposes and a military able to tilt the war prevention/war preparation dilemma in favor of seizing the initiative. In practice, however, the Soviet leadership, has been extremely cautious regarding the use of force in the few superpower crises that have occurred (the Cuban missile crisis and the 1973 Middle East War are the most notable). Readiness levels of the Strategic Rocket Forces have never been raised as a means of demonstrating resolve. Furthermore, from what little we know, the military has not been particularly eager to advocate use of force in crises with the U.S.

This record should not suggest that we can expect the USSR to roll over in future clashes. Most of our evidence on Soviet crisis behavior comes from a period when the U.S. enjoyed overwhelming nuclear superiority. This is no longer the case. Such a change, however, does not mean that future Soviet decisions in crises will err on the side of war preparation and initiation. The Soviets are still constrained by a desire to avoid nuclear war and a uniquely disadvantageous geo-political situation. In any conflict, especially those involving nuclear weapons, the USSR is surrounded by potential adversaries, not the least of which is China. As Brezhnev has asserted, "There are two camps of nuclear weapons: those in the USSR and those aimed at the USSR." Soviet decisions in crises will be driven by a number of factors, including the composition of the particular leadership, the international and regional balance of forces, and the specific interests at stake. As these factors vary, so too will policy choices.

Conclusion

Soviet national security decisions are made by an elite group of political and military Communist Party officials. The nature of the decision-making process can vary with the power of the General Secretary, the particular issue confronted, and the relative state of peace and war. Political authority is dominant, yet the military retains an important influence through its near-exclusive expertise in matters of armed conflict. The Gorbachev leadership has indicated a desire to weaken this monopoly by establishing alternative sources of military

planning and threat analysis, but the fate of such efforts remains uncertain. Finally, the history of Soviet decisions in superpower crises indicates that the USSR's leaders are hesitant to risk the possibility of a major conflict, especially a nuclear war, with the United States.

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**Beyond the Superpowers:
Nuclear Weapons in the
International Arena**

Chapter 13
**NUCLEAR WEAPONS
AND NATO**

by Graham T Allison, Jr.

Few issues (if any) are more important in U.S. relations with our key allies than nuclear weapons. There are three central, overriding truths about nuclear weapons and our European allies. First, nuclear weapons have been one essential factor in preserving four decades of peace in Europe after four centuries in which war was the more common condition. Most European leaders see the American nuclear guarantee as *the* essential factor in preserving this peace. Second, public support for nuclear deterrence is diminishing across Western Europe, especially in West Germany. This is the result of many factors: the passage of four decades without war, the success of nuclear deterrence, fear of the possibility of an inter-German nuclear war, a declining perception of the threat posed by the Soviet Union, and the failure of Western leadership to articulate a coherent case for nuclear deterrence in current circumstances. Third, sustaining a credible NATO nuclear deterrent in the face of Gorbachev's challenge is likely to be a more severe test in the next four years than it has been in any previous decade.

This chapter attempts to state succinctly important points about the alliance and nuclear weapons-points that "everyone knows" but that most of us tend to forget (or fail to appreciate adequately)-under five headings: America's nuclear guarantee; NATO's strategy of flexible response; what allies need from an American government; contradictions within the alliance; and Gorbachev's threat and opportunity.

America's Nuclear Guarantee

The American nuclear guarantee-the development, positioning, and plans to use nuclear weapons to deter attack upon Europe-affirms America's vital interest in the security of Europe. As expressed in the NATO treaty, an attack upon one is an attack upon all. To deter Soviet attack, the U.S. maintains 300,000 servicemen and thousands of nuclear weapons in Europe as part of a long-term commitment.

The alliance is the second biggest success story of American policy in the postwar era (second only to the avoidance of general nuclear war). Not only has NATO brought an unprecedented period of peace to an area previously plagued by war, but equally significant, the alliance is the United States' biggest asset in our long-term competition with the Soviet Union. Consider the alternatives: a neutral Europe, a hostile Europe allied with the Soviet Union, or even a Europe with a unified, nuclear-armed Germany.

NATO's Strategy of Flexible Response

NATO's strategy for preserving the peace is called "flexible response": an array of conventional and nuclear weapons, a commitment to forward defense in the event of war, a policy of deliberate escalation if aggression cannot be contained, and a refusal to inform our adversary when and under what circumstances nuclear weapons might be used. This combination of factors has worked successfully to undermine the confidence of any Warsaw Pact commander or Soviet leader contemplating an attack upon NATO. They face the possibility that the West would use U.S. battlefield, shorter-range, strategic, or British or French nuclear weapons in a way that could escalate to the destruction of Soviet society. Abstract calculations of academics, nuclear planners, or even Western leaders raise questions about the credibility of NATO's posture. The Soviet leadership has come to understand, however, that a Warsaw Pact attack on NATO would likely escalate to general war involving conventional and nuclear forces. While the consequences of such an attack are unforeseeable, it would carry a high risk of an ultimately self-defeating conclusion.

NATO's flexible response strategy provides a framework within which there have been significant changes in nuclear and conventional forces. Thus, Pershing II and cruise missiles were deployed in Europe as part of the strategy, and removed after the INF Treaty eliminating American and Soviet theater nuclear forces. In 1984, NATO unilaterally decided at Montebello to withdraw 1400 tactical nuclear weapons from Europe and is now contemplating further withdrawals of short-range nuclear weapons. Thus, while preserving the basic strategy of flexible response, one can-and must-make significant changes in the forces that implement the strategy because of the requirements of modernization, changes in Soviet capability, and European public opinion.

What Allies Need from an American Government

"The essential prerequisites to successful change can be summarized under four headings: commitment, continuity, consultation, and competence. In the initial meetings between members of a new American administration and our European allies, the main concerns Europeans will be assessing are: the *U.S. commitment* to countries within the NATO framework and to the policies that have brought four decades of peace; *continuity* of American interests and policies (and a lack of illusions about reinventing American interests with a new administration); *consultation* with NATO allies through NATO processes and bilaterally with the major partners; and *competence* of the new President and his administration. More on each point:

1. *Commitment.* Each of these states depends on the American President for its most fundamental interest: its own security and even existence. While European citizens cast no votes in American elections, the American voters' selection of a President, his selection of his administration, and that administration's potential choices could affect the lives of European citizens more than the actions of their own leaders.

2. *Continuity.* Europeans worry about a political system that brings novices to top positions. They fear new Presidents and members of new administrations who arrive with new ideas-or an insistence that U.S. policies and even American interests be *different* for the sake of differentiation from the last administration. Europeans see the policies of NATO as the decisive factor that has accounted for the current period of peace. The majority of Europeans are therefore deeply committed to this status quo.

3. *Consultation.* NATO is an alliance of sixteen independent nations bonded together in an international institution that really works. NATO has developed an elaborate consultative process with layers of cabinet-level committees and subcommittees that are inevitably cumbersome. But these processes assure extensive consultation and consensus-

building in sustaining a remarkable institution-the NATO alliance-that has proved remarkably successful. Thus, particularly in early encounters with members of the new administration, our NATO partners will look for evidence of a willingness to consult, listen, and compromise.

4. *Competence.* Within a broad range, how things are done is as important as what is done in NATO decision making. Most NATO governments remember vividly instances in which American performance failed to meet the test of competence. President Carter and the members of his administration provided examples: the American promotion of the neutron bomb, encouragement of European leaders to support it publicly, last minute changes of mind and cancellation of deployment. President Reagan's loose talk at Reykjavik about "getting rid of all nuclear weapons" was (and is) judged by most Europeans as incredible. *contradictions of the Alliance*

An alliance among nations in which sovereign leaders choose dependency upon the commitments and actions of an ally to assure the security and even survival of their countries is, in a sense, unnatural. Such dependency breeds many contradictory reactions on the part of our European partners, including appreciation, fear, and suspicion. However uncomfortable such a relationship may be for either the dependent or the guarantor, it is better than any alternative arrangement that anyone has been able to identify for securing the interests of each. Recognition of the extraordinary nature of the relationship, however, counsels sensitivity in managing an inherently uneasy relationship.

Contradictions-both public and private-strain the credibility of the American nuclear deterrent. NATO's flexible response strategy threatens to use nuclear weapons to deter or defeat a Soviet conventional attack upon Europe. The credibility of that pledge has been strained since the early 1960s by questions about whether the U.S. would deliberately trade Boston for Bonn; by assertions of former Secretary of Defense McNamara and others that the U.S. never intended to fulfill its commitment to use nuclear weapons to meet a conventional attack; and by statements such as former West German Chancellor Helmut Schmidt's assertion that "it is unrealistic to believe that West German soldiers would fight after the explosion of the first couple of nuclear weapons on West German soil." President Reagan's oft-repeated one-liner-"a nuclear war cannot be won and must therefore never be fought"-expresses an important truth. Is that truth, however, consistent with the NATO strategy's reliance upon the threat to initiate the use of nuclear weapons?

Such statements demonstrate that the leaders of the alliance have largely lost the capacity to talk coherently to their publics about nuclear weapons, or indeed to themselves. Assorted contradiction will not, and fortunately need not, be entirely resolved. Nevertheless, to preserve a credible nuclear deterrent in Europe when coping with the impending issue of modernization of short-range nuclear missiles (Lance), and when meeting Gorbachev's conventional arms control initiatives, the NATO leadership will have to give some more articulate affirmation of its nuclear posture.

The Threat and Opportunity of Gorbachev

Gorbachev's Soviet Union represents an opportunity and a threat quite different from that *faced* in the past decades. On the "up" side, Gorbachev's recognition of the failures of the Soviet system, his desire for a relaxation of the international competition with the U.S., and his initial attempts to subordinate foreign policy to domestic priorities move in directions the West has long sought to push the Soviet Union. Thus the possibilities for advancing Western interests through liquidation of Soviet external adventures (Afghanistan, Cambodia, Angola), arms control (INF, START, conventional arms control), and increasing freedom for people, *in*

the Soviet Union and Eastern Europe hold great promise. On the "down" side, paradoxically, Gorbachev's actions and words may allow him to follow through *on his* threat to "deny the West an enemy." More precisely, *as* Gorbachev denies the West the *perception* of the prospect of being hanged separately unless its members hang together, it will prove difficult to sustain the structures of NATO that push him in the directions we desire. Leading the alliance in the era of the Cold War has been somewhat akin to managing an iceberg in a long freeze. In a thaw, contradictions and conflicts long frozen over will appear as wide fissures. To meet Gorbachev's threat, NATO's strategy for seizing opportunities will have to communicate a vision of a more stable, secure peace and the role of nuclear weapons in that future.

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Chapter 14

THE SPREAD OF NUCLEAR WEAPONS AND NUCLEAR TERRORISM

*by Thomas W Graham, Joseph S. Nye, Jr.,
and Roger Smith*

The fundamental technical obstacle to acquiring a nuclear weapons capability is not knowledge, but rather the scientific, engineering, and industrial infrastructure to support and exploit that knowledge. The general scientific principles and technology necessary for building a fission weapon are well known; so well known, in fact, that American college students have developed plausible weapon designs from unclassified sources. The principal difficulty lies in obtaining the fissile material in sufficient quantities to manufacture a bomb. Whether a country decides to produce nuclear weapons from either highly enriched uranium or from plutonium, the process is extremely complex and requires a considerable investment in time and education, as well as plants and equipment.

Only one fissile material exists in nature, Uranium-235. However, this only makes up 0.7 percent of natural uranium; the remainder is Uranium-238. Consequently, the production of nuclear weapons requires either the enrichment of natural uranium to 90 percent U-235, or the transformation of U-238 into plutonium through reprocessing. This nuclear alchemy forces a potential proliferator to go through a number of steps: the mining and milling of uranium ore, the construction of conversion and fuel fabrication plants, building a nuclear reactor, and then, depending on the type of reactor, an enrichment or reprocessing plant. The plutonium path to nuclear weapons is generally seen as being easier due to the need for many additional installations and capabilities to complement the enrichment process. An important point for preventing proliferation is that each step is a daunting engineering challenge for a potential proliferator, and the attainment of each step can be made more difficult by international action.

Nuclear proliferation is a serious national security problem. The most likely nuclear war would occur among Third World countries. The most likely source of materials for nuclear terrorists is also among new proliferants. The issue cuts across the jurisdiction of the Secretaries of State, Defense, and Energy, the Director of Central Intelligence, and the Director of the Arms Control and Disarmament Agency (ACDA). It involves hard trade-offs among competing American foreign policy objectives. Effective policy requires a comprehensive evaluation of the current state of nuclear proliferation in approximately a dozen "sensitive" countries. Some, such as India, Pakistan, Taiwan, South Africa, and Israel, might be called "covert proliferators" since they have not openly declared nuclear weapons capabilities.

American Policy

On the surface, the international non-proliferation regime seems in good shape: in the last decade no country has used or threatened to use nuclear weapons; no nonnuclear weapons state has overtly tested a nuclear device or overtly operationalized and deployed nuclear weapons. No violations of the Non-Proliferation Treaty (NPT) have

taken place. The U.S. government has trained a dozen mid-level officials who have the knowledge and experience to both make and implement policy in this area. In sum, the dire predictions made in the 1960s and 1970s about the large number of countries that could possess nuclear weapons have not come true.

A comprehensive review of the state of nuclear proliferation, however, would show that a very serious international nuclear crisis could occur. India, Israel, Pakistan, and South Africa should be considered nuclear capable. Conflict involving any of these countries could involve the use or threatened use of nuclear weapons; it could provide the most likely path to nuclear war.

Given the expansion of nuclear weapons capabilities in several countries around the world, the proliferation of ballistic missile capability in Third World countries, and the possibility that new nuclear countries might use their weapons in a crisis, the direct national security threat from proliferation to the United States or to our deployed forces overseas will increase substantially before the year 2000. This will require the U.S. to develop military plans to deal with these problems.

The number of sensitive countries is finite and is not likely to grow in the near future. This is an important accomplishment of past U.S. efforts and has important policy implications. The countries of acute concern fall into three categories: those who should be considered *de facto* nuclear weapons states, those who are on the threshold, and those who are potential threshold states.

1. *De facto Nuclear Weapons States* (Israel, India, Pakistan, and South Africa). Israel has the technical ability to deliver a modest number of sophisticated nuclear weapons to a regional target. It has an advanced nuclear weapons infrastructure capable of building nuclear systems that will threaten the Soviet Union in the near term. While not as advanced as Israel is, India, Pakistan, and South Africa have the technical capability to build significant numbers of nuclear weapons in a short time. There is much uncertainty about the precise capabilities of their programs, the exact time it would take them to produce or deliver a militarily usable nuclear weapon to a regional target, or the precise political decisions made to move to nuclear weapons. However, all three countries have unsafeguarded nuclear weapons-grade material, have nuclear weapons design and development programs, and face serious national security threats.

2. *Advanced Threshold States* (Argentina, Brazil, Taiwan, and South Korea). All these countries have worried U.S. policymakers in recent years. None could produce nuclear weapons within one year, but all could produce nuclear weapons within a few years if a political decision to do so were taken. All have had serious interest in acquiring nuclear weapons capability. Some have moved away from becoming *de facto* nuclear weapons states, but this "progress" is not guaranteed.

3. *Potential Threshold States* (Cuba, Iran, Iraq, Libya, and North Korea). These countries represent potential threshold states at least 10 years down the road. These countries do not now have substantial nuclear research and development programs or many trained personnel. American policy could have an important impact on determining whether these countries become the nuclear problems of the 21st century or the successes of the 1990s.

One serious problem that affects all of these sensitive countries is that, over three administrations, the U.S. has developed a credibility problem. Many governments—including Pakistan and India, China and Israel, France and West Germany—have concluded that the United States talks a great non-proliferation line, but does very little to control the spread of nuclear weapons when that would require compromising competing U.S. interests. To change this, the U.S. must determine what price it is willing to pay for a strong non-proliferation policy and then implement such a policy even in the face of bureaucratic and diplomatic pressure to do nothing.

Lessons

Over the past thirty years, the United States has learned what type of non-proliferation policies do not work. First, as important as the NPT and the International Atomic Energy Agency (IAEA) are to constraining the contemporary proliferation problem, they are not sufficient to influence decisions by the dozen sensitive countries. Second, one cornerstone of past U.S. policy, the control of nuclear supply, provides less leverage against proliferators than in the past when there were fewer suppliers. Third, supply of conventional weapons to sensitive countries does not necessarily constrain their development of nuclear weapons capability.

At the same time, over the past thirty years, the United States has learned that several policies, implemented jointly and administered for more than a few months, can have a powerful and positive impact. First, nuclear export controls can significantly slow down technical progress by even the most advanced sensitive countries and can buy valuable time. Many exports useful for the development of a nuclear weapons program are not directly associated with nuclear power programs and, as a result, tight controls need not hinder the development of nuclear power. Second, genuine cooperation in strengthening export controls, sharing intelligence, and initiating diplomatic efforts to strengthen non-proliferation has ranged from good with a number of countries, such as Australia, Canada, Japan, and the U.K., to poor with a number of others. Third, the United States has had major non-proliferation successes. On a day-to-day basis, however, American nonproliferation and regional specialists often overestimate the problems they will face before a serious initiative is begun. Thus, an important role of the national security council is to continue to press the bureaucracy. Fourth, small but important successes have occurred when relatively small amounts of diplomatic pressure are used in a timely fashion to reinforce non-proliferation norms and to move potentially sensitive countries away from decisions that would have had the effect of placing them into the "threshold" category. Fifth, in the last decade, luck or internal political developments have made the proliferation problems in Argentina, Iran, and Iraq much less pressing than they otherwise might have *been* without a return to civilian rule in Argentina and without the Iran-Iraq war.

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ACKNOWLEDGMENTS

We are grateful for the assistance of numerous individuals in preparing this occasional paper. The Carnegie Corporation of New York provided funding for this project, and we are particularly indebted to David Hamburg, Frederic Mosher, and Deana Arsenian for their continued support and encouragement.

Jennifer Laurendau, Mark Ramee, and William Ury have all worked on various phases of this project. The idea for a briefing book arose out of a series of conversations with former decision-makers, including George Ball, Robert Bowie, McGeorge Bundy, Jimmy Carter, Warren Christopher, Lloyd Cutler, Leslie Gelb, Alexander Haig, William Hyland, Bobby Inman, U. Alexis Johnson, Carl Kaysen, Robert Kimmit, Melvin Laird, Jan Lodol, Jack Matlock, Robert McNamara, Roger Molander, Elliot Richardson, Henry Rowen, Dean Rusk, James Schlesinger, Brent Scowcroft, Walter Slocombe, Bromley Smith, Helmut Sonnenfeldt, James Thomson, James Timbie, and Caspar Weinberger. This idea received further impetus at a conference at Hawk's Cay, Florida, in March of 1988, whose participants included James Blight, Morton Halperin, David C. Jones, Robert MacFarlane, Richard Neustadt, Roger Porter, and Scott Sagan.

The Harvard Avoiding Nuclear War Project Working Group reviewed earlier drafts of these chapters and made numerous helpful comments. We would therefore like to thank Emanuel Adler, Benina Berger Gould, Marie Chevrier, Walter Clemens, Michael Doyle, Sean Lynn-Jones, Kerry McNamara, and Michimi Muranushi for their input. We would also like to express our gratitude to Marsi Beschel, Kathleen O'Reilly, and the editor of this series, Lynn Whittaker. Teresa Pelton Johnson provided invaluable editorial assistance in preparing both the earlier manuscripts and the final publication. We thank Ann Linden for her assistance in typing and compiling the final book. Any errors of commission or omission, of course, remain our own.