INADVERTENT ESCALATION

CONVENTIONAL WAR AND NUCLEAR RISKS

BARRY R. POSEN

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Preface

The purpose of this book is to show how the interplay between conventional military operations and nuclear forces can inadvertently produce pressures for nuclear escalation in conflicts among states armed with both conventional and nuclear weaponry. It is premised on the assumption that knowledge of these hidden pressures may aid some future decision maker to avoid a catastrophe. Thus, this book continues in the tradition of the limited-war literature of the late 1950s and early 1960s. In Bernard Brodie's words, "Today . . . we speak of limited war in a sense that connotes a deliberate hobbling of a tremendous power that is already mobilized (nuclear forces) and that must in any case be maintained at a very high pitch of effectiveness for the sake only of inducing the enemy to hobble himself to like degree. No conduct like this has ever been known before."[1]

I base the analysis on the peculiarities of the East-West military competition in Europe, and its surrounding oceans and seas, in the 1980s. I believe, however, that it is relevant to all military competitions between states armed with both conventional and nuclear weaponry. Thus, this book speaks to some of the problems that will attend the proliferation of nuclear weaponry—especially to ongoing regional conflicts.

A great many suggestions for ways to limit a superpower war grew out of the early limited-war literature. Only two have had any long-term impact. The first was to have an assured nuclear retaliatory capability; the second was to have limited-war forces, which is to say conventional forces. Almost no new analysis of the requirements of limited war has been undertaken since.[2] The most outstanding exception, Richard

[1]Bernard Brodie, *Strategy in the Missile Age* (Princeton, 1959; reprint, 1965), p. 311.

[2]Many studies and analyses have been written in the government and by government consultants on "limited" nuclear war, especially its force structure requirements. This

Smoke's *War: Controlling Escalation* (1977), received less attention than it should have.[3]

The early limited-war theorists were influenced by three important problems: the record of costly, unintended escalation in the Korean War; the overdependence on nuclear forces of the Eisenhower massive-retaliation strategy; and the apparent instability of the strategic nuclear balance. The memory of Korea was washed away by Vietnam, an altogether different kind of catastrophe; the United States and its allies have purchased conventional forces in abundance since 1960; and the strategic balance came to seem so stable by the early 1970s that attention turned from fear that nuclear escalation might be too rapid to fear that the Soviets would not be deterred from anything by U.S. threats to escalate. Indeed, U.S. strategic nuclear weapons policy since the early 1970s has tried to generate more "usable" strategic nuclear forces, which has had the effect of rendering the strategic nuclear balance less stable rather than more.

My interest in the problem of limited war was kindled by two alarming developments in the public debate on U.S. national security policy in the late 1970s: the tendency to talk about a NATO–Warsaw Pact conventional war as a replay of World War II, as if nuclear weapons did not exist; and the tendency to talk about nuclear war as if it were a conventional artillery duel. Since these images of East-West conflict seemed implausible to me, an examination of the special qualities of conventional warfare among nuclear powers struck me as essential.

Since the 1960s the United States has pursued a two-pronged, internally inconsistent approach to its military forces. Secure second-strike capabilities and large conventional forces were bought to try to reduce the necessity and the temptation for rapid escalation to nuclear war. On the other hand, strategic nuclear counterforce capabilities have been acquired in an attempt to increase the adversary's perception that nuclear escalation might indeed occur. The United States acquired offensively postured conventional forces to add extra uncertainty to the task of any Soviet military planner and extra risks in the event of war. What U.S. policy makers did not do was examine the possibility that in actual practice these objectives could have proved inconsistent. In

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literature actually discusses controlled nuclear escalation, which is not the subject of this book. Although some limited-war theorists have considered inadvertent nuclear escalation, it was not the primary focus of the limited-war literature.

[3] I believe this book suffered in the defense policy community from its focus on pre-World War II historical cases at a time when history was out of favor and, more important, from its lack of a few clear-cut, policy-relevant conclusions. It presented a rich menu of informed hypotheses more suitable to an academic audience.

the event of war, NATO's offensive conventional operations would have damaged Soviet nuclear forces in ways that encourage nuclear escalation. Similar tensions existed in Soviet military strategy throughout the 1980s.

With the lessening of great-power political hostility at the end of the decade, both parties to the competition seem disposed to reduce some of the offensive potential of both their nuclear and non-nuclear forces. But military doctrines and force postures tend to change slowly, and many of the problems outlined in this book will likely remain in some form for years to come. Even if these issues diminish in importance in the U.S.-Soviet military relationship, the spread of weapons of mass destruction to regional conflicts suggests that they will emerge in a slightly different, but arguably even more frightening guise.

From my perspective, the most important purpose of the book is to develop a sense of the hidden fundamental dynamics that would likely govern a large-scale conventional war between nuclear-armed adversaries. With three credible theories as our lenses, we are attempting to peer into a murky, horrible, possible future, the better to avoid it.

This effort has received generous support from the following institutions: the Carnegie Corporation of New York, the William and Flora Hewlett Foundation, and the Ford Foundation under the auspices of the Defense and Arms Control Studies Program at MIT; the Woodrow Wilson International Center for Scholars at the Smithsonian Institution; the Rockefeller Foundation; the Council on Foreign Relations; and the Center for International Affairs at Harvard University. John Mearsheimer, Jack Snyder, and Stephen Van Evera provided invaluable advice on the final rewrite of the manuscript. At various stages of the project, conversations with Bruce Blair, Joshua Epstein, Richard Kugler, and Steven Miller proved extremely useful. Robert Art, as usual, has far exceeded his responsibilities as an editor of this series. Laura H. Peters ably assisted in the editorial process. My wife, Cindy L. Williams, patiently supported my efforts to complete this project; although it often deprived me of my good humor, it never deprived her of hers.

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Inadvertent Escalation

[1]

Introduction: A Model of Inadvertent Escalation

Can nuclear powers fight conventional wars with each other and avoid the use of nuclear weapons? Although this question has usually been raised in the context of the superpower competition, it is also relevant to future disputes in a world where nuclear weaponry has proliferated, including disputes among nuclear powers of every class, from the very great to the very small.

The most common view of how a conventional war could become a nuclear war stresses the initial stakes of the dispute. For example, had NATO found itself losing a conventional ground battle for control of Western Europe, the United States' most vital overseas interest, the United States might have reached for nuclear weapons in the hopes of salvaging its position. Alternatively, the Soviets would have expected such an event and preempted it with either a theater-wide or even an intercontinental attack. Although the issue is seldom discussed, this scenario has an analogue in terms of any dispute that would directly threaten the territory of a nuclear power. The French promise to employ nuclear weapons rather than see their territory violated by aggressor ground forces. Presumably, the United States or the Soviet Union would do the same, if either was threatened with conquest of its territory. These are quite standard views of the escalation process. They stem from the assumption that states are unlikely to leave such effective weapons unutilized in a struggle for vital political interests. This is a valid hypothesis and represents one plausible way that nuclear powers could move from conventional to nuclear conflict. Because of its simplicity, it is also a way that has been anticipated by political actors.

I propose in this book a second mechanism by which nuclear powers locked in conventional conflict might move to the use of nuclear weapons. Unpredicted by the political and military leaders who permit or

order them, large-scale conventional operations may come into direct contact with the nuclear forces of an adversary and substantially affect the victim's confidence in his future ability to operate these forces in ways that he had counted upon. The most dangerous conventional attacks would be those that substantially degraded the basic nuclear retaliatory capability of the victim—his second-strike capability—for among nuclear powers this capability is the only insurance policy against nuclear coercion or annihilating attack. This fact suggests that the problems outlined herein will loom especially large for small and medium-sized nuclear powers, since they will have the most difficult time building nuclear forces that can survive. But lesser threats could also prove problematic, depending on peculiarities of each side's nuclear doctrine. For example, a series of non-nuclear attacks that degraded one side's ability to use its nuclear forces in discriminate ways for very limited attacks might be perceived as a major problem if that side had stressed this use of nuclear weapons in its prewar doctrine. Alternatively, if one side depended on a launch-on-warning or launch-under-attack posture, conventional damage to its early warning systems might be viewed as a major escalation.

I call this class of events "inadvertent nuclear escalation." It is a broad concept. I exclude from it occasional accidental conventional attacks on nuclear weapons—which are bound to happen in a conventional conflict. I also exclude from it deliberate and sustained conventional attacks on nuclear weapons that are explicitly developed and approved to alter a local or general nuclear-force relationship. In one short-lived incarnation the U.S. Navy's maritime strategy explicitly aimed to alter the nuclear "correlation of forces" through conventional attacks on Soviet ballistic missile submarines. During the 1980s the Soviet Union planned to attack NATO tactical nuclear forces with air-delivered conventional ordnance at the outset of any conflict in Europe for the purpose of reducing NATO's tactical nuclear capabilities. Neither of these scenarios ought to be viewed as inadvertent.

I would, however, include a rather broad range of events. For example, "incidental" conventional attacks on nuclear forces—conventional attacks that self-consciously threaten nuclear forces as a means to achieve a conventional mission—ought to be considered part of the problem of inadvertent escalation. The longer-lived incarnation of the U.S. Navy's maritime strategy, which deliberately threatened Soviet strategic missile submarines for the purpose of diverting to their defense Soviet attack submarines that might otherwise threaten the sea lines of communication (SLOC), would be an example of incidental attacks.

Since such operations were proposed and presumably approved on the basis of their contribution to a cherished conventional mission, I credit their advocates with lack of foresight, although some might argue they were simply disingenuous. Similarly, large-scale conventional operations conducted in a particularly sensitive area, which create the potential for multiple accidental encounters between conventional and nuclear forces, would also be included in the category of inadvertent escalation.

Thus, occasional encounters between conventional and nuclear units are not the main concern; rather, large-scale conventional operations that produce patterns of damage or threat to the major elements of a state's nuclear forces are the principal issue. Direct conventional attacks on critical nuclear forces, attacks that degrade strategic early warning or command and control systems, or even attacks on general-purpose forces that protect strategic nuclear forces, could all produce strong reactions from the party on the receiving end.

Large-scale conventional attacks on nuclear forces or their supporting structure are thus already a form of inadvertent nuclear escalation. The salience of nuclear forces for the conflict is raised inadvertently, before the imminent loss of the stakes that precipitated the conflict raises the nuclear specter. The threatened party could respond in many ways. It could ignore these attacks—a likely reaction if the state subscribed to a simple countervalue deterrence doctrine and the attacks really did not substantially erode the security of its retaliatory capability. If the state had not subscribed to a simple deterrent doctrine, it might suddenly be converted to such a doctrine—again ignoring these attacks unless they eroded the state's retaliatory capability. But if the attacks did erode the state's assured destruction capability, or the state subscribed to a strategy that called for the limited use of strategic nuclear weapons for purposes of bargaining or damage limitation and these capabilities were damaged by conventional attack, then stronger reactions from the threatened party are likely. And if its adversary was known to have a counterforce doctrine, a strong reaction seems even more likely. The most plausible response would be heightened preparations for nuclear operations, including the loosening of central civilian control over nuclear weapons and the dissemination of launch authority to military commanders. Among small nuclear powers this could be particularly dangerous, since their early warning and command and control apparatuses are likely to be less redundant and resilient than those found today in the medium-sized and great powers. More dangerous would be responses that actually employed nuclear weapons, ranging from

limited demonstrative or tactical employment, through large-scale theater attacks, to full-scale counterforce exchanges.

Inadvertent nuclear escalation is clearly a difficult problem to study. We have no examples of such escalation so I cannot simply review multiple case studies and infer some lessons. Prospective analysis of plausible conventional wars among nuclear or near nuclear powers outside the superpower competition founders on an utter lack of data in most cases. The Israelis have told the world very little about their real military capabilities, and the Iraqis were equally reticent.

The NATO–Pact military competition—particularly in the 1980s—does provide useful material for this study. This period is notable for the extraordinary flow into the public domain of large amounts of data about both the military capabilities and the nuclear and conventional strategies of the East and West. Moreover, both sides had very large and very capable conventional and nuclear forces of tremendous range and striking power. Both stressed offensive operations of one type or another in both the conventional and nuclear realms.

U.S. and Soviet Nuclear Forces and Strategies in the 1980s

Aside from the loss of the stakes that precipitated war in the first place, the most long-lived and plausible hypothesized cause of nuclear escalation is perceived first-strike advantage. Standard criteria of strategic stability apply as much to escalation from conventional to nuclear war as they do to day-to-day strategic nuclear relationships. When both sides have large survivable retaliatory capabilities, nobody wants to move first. If one does and the other does not have a second-strike capability, then the dominant actor will be tempted to strike because he can thus save his country. Knowing this, the weaker, although he cannot save himself by striking first, may choose to operate his forces in ways that permit launch on warning or launch under attack in order to convince the dominant party not to try to exploit his capability. Some crisis instability may ensue.

The problem is, of course, much worse if both sides perceive that they have sizable first-strike advantages. Each will likely be tempted to strike first to exploit the advantage. If each also knows that the other perceives the world this way, they may both be tempted to strike first because of fear that the other will do so. Finally, there may even be "reciprocal fear of surprise attack." "I think that you will go first because

you fear that I will go first, so I might as well go first."[1] When both sides perceive themselves and their adversary to have offensive advantages, it is very hard to imagine that serious, full-scale, conventional warfare could go on for long without one side or the other succumbing to the pressures and temptations of the situation and launching a nuclear preemption. Limited-war theorists of the late 1950s and early 1960s specified that secure second-strike capabilities were a precondition for sustained intense *conventional combat*.[2]

What would have induced either NATO or the Warsaw Pact to use nuclear weapons in the 1980s? Attitudes toward the first use of nuclear weapons among the western security elite were (and remain) contradictory. From one perspective, it came to be widely believed that neither the United States nor the Soviets have particularly itchy nuclear trigger fingers. Each side has deployed such massive nuclear forces, of such variety, that neither can generate a particularly plausible "theory of victory" for nuclear war.[3] Since the Cuban missile crisis, political leaders have shown great restraint whenever nuclear weapons were involved, and one suspects that the long-feared "clever briefer" would need powers of salesmanship that would put the most successful American used-car dealer to shame. Although mutual assured destruction (MAD), a purely punitive strategy based more or less exclusively on the ability to retaliate against adversary values, enjoyed no official political favor

[1]Stephen Van Evera suggests that reciprocal fear of surprise attack has been unusual in non-nuclear crises.

[2]William W. Kaufmann, "Limited Warfare," in *Military Policy and National Security*, ed. Kaufmann (Princeton, 1956), p. 119, observes of the Strategic Air Command, "Armed with nuclear weapons, it is not only the great instrument of last resort; it is also an absolute prerequisite to the conduct of limited war. It has the dual role of umpire and potential belligerent. As such it permits of military action on a lesser scale." Morton Halperin, *Limited War in the Nuclear Age* (New York, 1963), p. 98, observes: "Once both sides have invulnerable strategic forces the danger of preemption is low regardless of the strategies involved." See also p. 109. For similar views see Robert Osgood, *Limited War: The Challenge to American Strategy* (Chicago, 1957), pp. 125–130; Bernard Brodie, *Strategy in the Missile Age* (1959; reprint Princeton, 1965), pp. 331, 357; Thomas Schelling and Morton Halperin, *Strategy and Arms Control* (Washington, D.C., 1985), pp. 30–31, 62; Thomas Schelling, *Arms and Influence* (New Haven, 1966), pp. 105–116, 246–248.

[3]The most complete open-source technical analysis ever attempted is Michael Salman, Kevin Sullivan, and Stephen Van Evera, "Analysis or Propaganda? Measuring American Strategic Nuclear Capabilities, 1969–88," in *Nuclear Arguments*, ed. Lynn Eden and Steven E. Miller (Ithaca, 1989), tables 3.1 and 3.2, pp. 214–215, 222. The analysis suggests that had a war occurred "out of the blue" in 1987, after a surprise attack, 4436 U.S. strategic nuclear warheads, carrying 1411 equivalent megatons of explosive power, would have survived. After a similar attack by the United States against the Soviet Union, 847 warheads carrying 532 equivalent megatons would have survived. In either case, the residuals would have permitted not only utter destruction of the adversary's society but attacks against a large number of military targets, assuming that command and control survived.

in either the United States or the Soviet Union in the 1980s and continues to be unpopular, it appears that civilian decision makers have for a long time had very low confidence that any other nuclear war outcome is likely.[4] From the perspective of political leaders and their revealed propensity for risk, any first use of nuclear weapons has seemed quite improbable since the U.S. nuclear alert of the 1973 Arab-Israeli war, and even the heating up of Soviet-U.S. relations in the late 1970s and early 1980s did not increase the propensity for nuclear risk. Nevertheless, it is important to consider the potential energy for nuclear first use that has remained. On close inspection it seems to have been, and still is, surprisingly powerful. It is a worthwhile exercise to apply the most mature theories we have to try to predict the circumstances under which it might be released.

During the 1980s both superpowers organized their strategic nuclear forces to "wage" general thermonuclear war with objectives that were consistent with classical military thinking—the destruction of the adversary's forces.[5] Indeed, it is now clear that U.S. strategic nuclear forces have had a "warfighting" doctrine almost since their inception. Given the ineffectiveness of defenses against these forces, any possibility of unilaterally limiting damage to one's own country, should war come, depended on the strength of the offensive, the elimination of the adversary's nuclear weapons. Each side labored persistently and patiently in an effort to find ways to destroy the other's forces in the event of nuclear war. As of the period in question, each side had achieved only modest, and highly scenario dependent, success in this endeavor. For example, although the 1970s ended with a U.S. panic that predicted an imminent

[4]Raymond L. Garthoff, "Mutual Deterrence and Strategic Arms Limitation in Soviet Policy," *International Security* 3 (Summer 1978): 112–147, argues that this is the basic view of Soviet political and military leaders on the likely course of nuclear war. Western views on this matter are well known.

[5]David Holloway, *The Soviet Union and the Arms Race* (New Haven, 1983), chap. 3, pp. 29–64, presents the ambivalence of Soviet thinking about nuclear war; Michael MccGwire, *Military Objectives in Soviet Foreign Policy* (Washington, D.C., 1987), pp. 13–35, offers an evolutionary view of Soviet nuclear doctrine, positing a reversal in 1966 of previous Soviet assumptions about the inevitability of the escalation of any East-West conflict to an intercontinental nuclear exchange and an emerging belief that escalation could be deterred. Fritz Ermarth, "Contrasts in American and Soviet Strategic Thought," *International Security* 3 (Fall 1978): 138–155, presents a more unidimensional view of the classical military aspects of Soviet nuclear strategy. Aaron L. Friedberg, "A History of the US Strategic Doctrine, 1945–1980," *Journal of Strategic Studies* 3 (December 1980): 37–71, is one of several accounts that describe the long-standing commitment to counterforce operations in the U.S. strategic nuclear forces. For other descriptions of U.S. nuclear strategy see Barry R. Posen, *Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (Ithaca, 1984), pp. 18–19, esp. n. 14.

Soviet first-strike capability against the U.S. ICBM force, the 1980s ended with a slightly less pessimistic assessment of Soviet capability. Official sources estimated that a Soviet ICBM attack could have destroyed, assuming no U.S. launch on warning or launch under attack, some 75 percent of the U.S. ICBMs.[6] This estimated outcome was hardly a splendid first-strike capability, but the Soviet capability it reflected scarcely seems unintended. The Soviet military was trying to target the ICBM force. For the most part, any success in these damage-limiting endeavors would have been dependent on beating the other side to the punch. The lethalness of the likely residuals ("secure second-strike capabilities") was very large and severely reduced the incentives of political leaders to permit soldiers to strike either "first" or early. All the same, the competition continued; political leaders may have been quite cautious about the first use of these weapons, but they were also quite unwilling to deny themselves the option to use them to reduce damage to their countries should some unforeseeable chain of circumstances have compelled it. This remains the situation as of publication.

In an effort to buy the time to track and kill the adversary's second-strike capability, military planners on both sides in the 1980s, perhaps earlier, turned their attention to the exploitation of the main potential weak link in the strategic nuclear forces—their command and control.[7] Modern communications systems are fragile, considering the damage that nuclear weapons can do. Nuclear command and control centers present a relatively small set of targets, partly as a natural consequence of bureaucratic hierarchy and partly as a consequence of the stress placed on the primacy of political control over these weapons.[8] It was

[6] Joshua Epstein, *The 1987 Defense Budget* (Washington, D.C., 1986), pp. 16–17, has done calculations that suggest this result. Lawrence Woodruff, deputy undersecretary of defense for strategic and theater nuclear forces, basically confirmed this estimate in March 1988. "The SS-18 Mod 4 force alone is capable of destroying well over ⅔ of all US ICBM silos while retaining over 1000 SS18 warheads in reserve." U.S. Congress, House, Committee on Armed Services, Subcommittee on Research and Development, *Statement on Nuclear Force Modernization*, 100th Cong., 2d sess., 1 March 1988 (mimeo), p. 6.

[7] Bruce G. Blair, *Strategic Command and Control: Redefining the Nuclear Threat* (Washington, D.C., 1985), esp. pp. 281–287, starkly summarizes the argument. See also Daniel Ford, "The Button," pts. I and II, *New Yorker*, 1 and 8 April 1985. He quotes Gen. Bruce Holloway, a former commander of the Strategic Air Command (1968–72): "Degradation of the over-all political and military control apparatus must be the primary targeting objective. Irrespective of whether we strike first or respond to a Soviet strike . . . it assumes the importance of absolute priority planning. Striking first would offer a tremendous advantage and would emphasize degrading the highest political and military control to the greatest possible degree" (pt. 2, p. 49). Although this quote is rather lurid, it should be understood that the Soviets have long been credited with the same thinking.

[8] John Steinbruner, "Launch under Attack," *Scientific American* 250 (January 1984): 43, argues that the U.S. command system "can be effectively destroyed by the direct blast

hoped that because of the destruction or temporary disablement of the "brain" of the adversary's strategic nuclear forces, those parts of the body that survive a first attack could be hacked up at leisure. There are, of course, grave risks associated with this strategy. The possibility that surviving forces will act with no, or partial, authorization cannot be denied. Given the destructiveness of single nuclear units (a lone bomber, ICBM squadron, or especially an SSBN at sea can wreak incredible havoc on urban targets), the consequences of such insubordination could be extraordinary. Nevertheless, attacks on command and control may be one of the few sources of leverage in a nuclear war.[9]

Thus the 1980s presented inherent contradictions in superpower attitudes toward nuclear weapons and nuclear war. Neither side showed any optimism about its ability to fare well in such a war. But both sides built their forces in the hopes of finding a way to do so. Any chance of faring well depended on getting the jump on the other side, but it is very hard to imagine circumstances in which the probability of success would have outweighed the risks of failure. The potential energy was there, however. In crisis, and especially in conventional war, the military commanders of the nuclear forces, at minimum, would have pointed out the costs of conceding the initiative to the other side. Military organizations on both sides would probably have pressed for ever higher levels of alert in order to better discourage preemption by the adversary, and better prepare for preemption themselves. Soviet and American nuclear commanders would have pointed out each other's preparations to their respective political masters in the hopes of eliciting still higher levels of alert. At some point recommendations for nuclear attacks were possible. These problems will remain with us so long as the strategic nuclear forces of both parties retain a commitment

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effects of a few hundred weapons and very severely degraded by as few as 50 weapons." He notes that "although the Russian command system is thought to be more protected, the destructive effects of nuclear weapons appear to be so inherently damaging to any command network that differences in exposure between the U.S. and the U.S.S.R. are not likely to be significant given the scale of offensive firepower available."

[9]Of command and control attacks that aim to disrupt and delay the adversary's nuclear response in the hopes of buying the time to finish off his residual forces, John Steinbruner states," However heavily such a scheme might be discounted, it remains one of the few coherent methods of significantly reducing the damage suffered from retaliation, perhaps the only one, that cannot be dismissed on technical grounds." "Choices and Tradeoffs," in *Managing Nuclear Operations*, ed. Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket (Washington, D.C., 1987), p. 545; Ashton Carter's essay in the same volume, "Assessing Command System Vulnerability," pp. 555–611, offers a thorough assessment of U.S. command system vulnerability in the mid-1980s. He is skeptical that a surgical decapitation could be performed by the strategic nuclear forces of the Soviet Union against U.S. command and control, but he does believe that such attacks could have caused U.S. forces some very serious problems.

to damage limitation; it is likely (for reasons discussed below) that they will want to preserve this commitment in the future and that they will persuade civilian authorities to let them do so.

Conventional operations that degrade second-strike capabilities were thus rendered especially dangerous by the ambivalent strategic nuclear doctrines of the two superpowers. If both superpowers had subscribed to the much criticized doctrine of MAD and postured their forces accordingly, it would have taken a great deal of conventional damage to provoke one side or the other to use some nuclear weapons as a vehicle for saving the rest.[10] In general, the greater the counterforce capabilities in Soviet and American strategic nuclear forces and the greater their commitment to counterforce strategies for nuclear warfighting, the greater the likelihood that the factors discussed in this book will lead to nuclear escalation. What might ordinarily seem an accidental or ambiguous conventional threat to one's strategic forces is more likely to be seen as deliberate and direct if one's adversary is believed to have a counterforce nuclear doctrine. What might seem a minor loss if one had a large, invulnerable second-strike capability could appear as a major loss if one's adversary were known to have many counterforce options. In this sense, large counterforce capabilities, which are often presented as a tool to control and limit damage in a superpower conflict, may become a cause of escalation from conventional to nuclear war.

If each superpower had dedicated its 1980s level of strategic nuclear resources to the simple task of assured retaliation, it would have been very difficult to do enough damage with conventional operations to produce a nuclear response. This was true for three reasons. The victim would easily have retained an imposing retaliatory capability for a very long time, so he would not have needed nuclear operations to save his deterrent. The victim would have known that the attacker had little incentive to attempt a nuclear counterforce attack to exploit his conventional successes, since the attacker's nuclear forces would have lacked the capability for effective counterforce operations; thus, the defender would not have needed to preempt the conventional attacker's possible

[10]Recent analysis confirms the widespread and long-standing belief that it does not take many nuclear weapons to do incredible damage to the social and economic fabric of a modern industrial power. William Daugherty, Barbara Levi, and Frank Von Hippel, "The Consequences of 'Limited' Nuclear Attacks on the United States," *International Security* 10 (Spring 1986), have carefully reviewed the possible casualties that might arise from a variety of Soviet nuclear attacks. A full-scale counterforce attack, with 2839 warheads, could kill between 20 million and 34 million Americans. An attack by 100 one-megaton warheads with the deliberate objective of killing U.S. population could produce between 25 million and 66 million fatalities. The same weapons targeted against the U.S. defense industry could kill between 11 million and 29 million Americans.

nuclear strike. Finally, the victim would have known that the attacker knew that the defender's retaliatory capability remained powerful. Escalation for the purpose of saving the remainder of one's nuclear forces was clearly not impossible in this situation, however. It is plausible that conventional operations could, over a very long time, succeed in taking away nearly all the defender's retaliatory capability. As the trend worsens, the defender might begin to fire nuclear weapons to indicate his fear and convince the attacker to desist. Nevertheless, in a self-consciously MAD world, *inadvertent* escalation from conventional to nuclear war seems unlikely. But the 1980s were not such a world, and we do not now live in such a world.

In spite of their continued attention to counterforce nuclear capabilities and doctrines, during the 1980s both superpowers gave some evidence of having developed the expectation that a very large conventional war might indeed be possible. U.S. views were clearer than Soviet and provide a good example.[11]

Since Secretary of Defense Robert McNamara began the review that culminated in NATO's 1967 adoption of MC 14/3, the strategy of flexible response, the achievement of a Western conventional force posture that would permit open-ended non-nuclear resistance has been a consistent U.S. objective.[12] Early in the Reagan administration decision makers embraced the idea of preparing for a long conventional war, as evidenced by its concern with the mobilization potential of the American defense industry.[13] Insufficient Western conventional capabilities were

[11]MccGwire, *Military Objectives*, offers perhaps the lengthiest treatment of Soviet military strategy for general war that suggests an expectation of protracted conventional conflict. For a summary and critique of Soviet conventional strategy for a European war, see Richard Ned Lebow, "The Soviet Offensive in Europe: The Schlieffen Plan Revisited?" *International Security* 9 (Spring 1985): 44–78.

[12]The United States and its European allies have disagreed about the extent of "conventionalization" that is either possible or desirable, with the United States a strong supporter. See Karsten Voigt, *Interim Report of the Sub-Committee on Conventional Defense in Europe* (Brussels, 1984), pp. 5–6, 27; William W. Kaufmann asserts that the U.S. objective in promulgating the shift to flexible response prior to its adoption in 1967 was "the acquisition of a nonnuclear deterrent fully capable of halting an all-out conventional attack by the Warsaw Pact." See his "Nuclear Deterrence in Central Europe," chap. 3, in *Alliance Security: NATO and the No-First-Use Question*, ed. John D. Steinbruner and Leon V. Sigal (Washington, D.C., 1983), p. 22. David Schwartz suggests that the United States and the allies disagreed about the meaning of flexible response: the United States wanted a conventional posture so strong that the Soviet Union would have to decide whether or not to use nuclear weapons first in the event of war, and the allies wanted to retain a threat of deliberate NATO first use. See *NATO's Nuclear Dilemmas* (Washington, D.C., 1983), pp. 176–177.

[13]See, e.g., the accounts of Secretary Caspar Weinberger's views in George Wilson, "Weinberger Order; Plan for Wider War," *Boston Globe*, 17 July 1981; and Richard Halloran, "Weinberger Tells of New Conventional-Force Strategy," *New York Times*, 7 May 1981. For further indications of the administration's views on this subject, see also Richard

often portrayed as the most probable cause of precipitate nuclear escalation. For example, in 1984 Gen. Bernard Rogers, then supreme allied commander in Europe, declared, "Because of our lack of sustainability—primarily ammunition, materials to replace losses on the battlefield, tanks, howitzers, trained manpower—I have to request the release of nuclear weapons fairly quickly after a conventional attack. And I'm talking about in terms of days, not in terms of weeks or months."[14] By 1987 Caspar Weinberger could declare that "US strategy seeks to limit the scope and intensity of any war, and confine it to conventional means. Our goal is to end hostilities on favorable terms to us by employing conventional forces that do not engender or risk escalation."[15] Underlying this policy was the belief that the United States should be prepared to fight a war that, in duration and character, would resemble World War II.[16] As of the date of publication many American strategists continue to seem optimistic about their chances of avoiding nuclear escalation in such a war if they so desire, providing they have sufficient quantities of conventional forces, weapons, and munitions to avoid conventional defeat.

Thus by virtue of data, forces, strategies, and beliefs, the East-West military competition in the 1980s seemed an ideal prospective case study. It also has the merit that much of the substantive information and insights developed from this period will have considerable relevance for the next decade and thus to current defense-policy debates. Political developments are calling into question some element of the 1980s case. Most notably, the conventional ground balance in Central Europe has

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Halloran, "Needed: A Leader for the Joint Chiefs," *New York Times*, 1 February 1982; Richard Halloran, "Reagan Selling Navy Budget as Heart of Military Mission," *New York Times*, 11 April 1982; and U.S. Department of Defense, *Annual Report to Congress*, FY 1983 (Washington, D.C., 1983), pp. 1–13, 16–17, 28–29. Hereafter, U.S. Department of Defense, *Annual Report* and fiscal year.

[14] *Wall Street Journal*, 5 June 1984, p. 16.

[15] U.S. Department of Defense, *Annual Report*, FY 1988, p. 47; for additional evidence of "long-war" thinking, see pp. 45–47, 139–146, 221–226. It will be evident from the subsequent discussion that I do not believe that U.S. decision makers had a theory to guide the development or employment of conventional forces so that they would "not engender or risk escalation."

[16] A senior analyst of the Rand Corporation and veteran of the Department of Defense Office of Program Analysis and Evaluation recently declared that the Alliance should "develop stockpiles and production capability to sustain conventional conflict as long as necessary to thwart a Pact invasion." He also advises a reinterpretation of MC 14/3, the alliance document that lays out the strategy of flexible response to "require of the national partners development of stockpiles, production capability, and wartime distribution systems adequate to sustain NATO forces in a protracted conventional war." Paul K. Davis, *The Role of Uncertainty in Assessing the NATO–PACT Central-Region Balance* (Santa Monica, 1988), pp. 24–25. These observations were accompanied by the ritual declaration of the continuing importance of nuclear forces and the nuclear deterrent.

improved mightily by virtue of political changes in Eastern Europe that have all but eliminated the reliability of Eastern European forces as Soviet allies. But basic capabilities remain great, and it is unlikely that the offensive caste of military operational plans will change as quickly as public rhetoric.

The Model of Inadvertent Escalation: Theoretical Foundations

The causes of inadvertent escalation are derived from three bodies of theory: the work of Robert Jervis (and others) on the "security dilemma"; the application of organization theory to the behavior of military organizations; and Carl Von Clausewitz's analysis of the phenomenon of war itself, especially the concept of the "fog of war."

The Structure of the Situation: The Security Dilemma

The measures that one state takes to defend itself may seem offensive to the state against whom they are directed. Military resources acquired for the purpose of protecting national sovereignty often have the potential to threaten the security of others. Because international politics is a self-help system in which states have no recourse to higher authority if they are threatened, they tend to eye each other warily. When they perceive an increase in the offensive potential of others, they tend to assume the worst and initiate compensating political or military activity. This situation is called the security dilemma.[17] The state that initiates a particular improvement in its military resources *may have no choice* but to take such actions, even if its leaders understand that they threaten assets that others value highly. Sound political and military reasons may induce states to adopt explicitly offensive military strategies and to develop offensive military capabilities. But special dangers often arise because the leaders of states frequently do not understand how threatening their behavior, though defensively motivated, may seem to others. Thus, when those affected react, as is generally the case when vital interests are threatened, the initiator is surprised and may respond even more extremely.

The security dilemma is a concept generally employed to discuss peacetime spirals of increasing political hostility and military prepara-

[17]Robert Jervis, "Cooperation under the Security Dilemma," *World Politics* 30 (January 1978): 167–214.

tions—from arms races to crisis mobilizations and even preemptive war. To my knowledge, it has not been employed to examine the escalation of violence after military conflict begins.[18] But one of the critical aspects of the security dilemma is its "inadvertent" operation. The structure of the situation and the frequently amorphous nature of military capabilities permit states inadvertently to threaten each other and stumble into spirals of mutual hostility and competitive military preparations.[19]

Conventional war between nuclear powers involves elements of conflict and cooperation. If one or both states wanted to have a nuclear war, they could easily initiate hostilities with nuclear weapons. For analytic purposes, and consistent with the major defense policy assumptions of the NATO alliance for the past twenty-five years and with the evidence from Soviet military doctrine and practice, this analysis assumes that a war begins with conventional fighting. By the weapons they choose, the disputants indicate that they do not want the war to escalate to the use of nuclear weapons, even if they are willing to run the risks that it might. They have a shared interest in the avoidance of nuclear escalation. Thus, it is appropriate to examine the potential for nuclear escalation from the perspective of the security dilemma—duly adapted to the problem at hand.

Of course, no one can say with much certainty that what would induce a civilian or military leader to advocate, much less order, the use of nuclear weapons against an adversary so armed. It would surely be the most frightening decision any leader would ever have made. Nevertheless, we should be alert to the basic ingredients of the security dilemma as an engine of escalation in a conventional war among nuclear powers. These ingredients are as follows.

(1) Each side has nuclear forces that it values highly. Its nuclear forces are a core security asset, a vital interest. Threats to their integrity will be viewed with utmost seriousness. If the nuclear competition follows the pattern of the superpower arms race, in which each side tries deliberately to preserve a damage-limitation capability against the other, then the nuclear forces will be on high levels of alert, and nuclear planners will be looking for signs that the other side intends to operate its doctrine. Civilian cognizance of the delicacy of the situation may not be as high as is warranted since nuclear war plans are likely to be closely held by the military, and civilian leaders tend not to want to think about nuclear war in times of international quiet.

[18]John Mearsheimer called this point to my attention.
[19]Jervis employs the term *inadvertence* at least twice in his seminal article; see "Cooperation," pp. 170, 193.

(2) Conventional operations devised by either side to achieve success from the perspective of conventional warfare may nevertheless have deleterious consequences for nuclear forces. This is a subtle amendment to the basic assumption of the security dilemma—that states undertake military efforts that they perceive to be defensive. In this case, states may undertake conventional operations that an unbiased observer would concede were defensively motivated, and yet for reasons discussed below have offensive implications for nuclear warfare. Or states may undertake conventional operations that they know are offensive from a perspective of conventional war but that, unknown to the initiator, are also offensive from the perspective of nuclear warfare.

(3) The effects on the adversary's nuclear forces are sufficiently exotic, and the conventional plans themselves are sufficiently arcane, that political leaders are unlikely to have foreseen these consequences.

(4) Harsh reactions by the threatened party will thus probably be misconstrued as new indications of fresh malign intent, not reactions to one's own operations. Hence, new and more violent maneuvers may seem warranted, which when launched will be even more frightening to the other party.

(5) By virtue of the fact that conventional conflict is already under way, each side would be in a state of heightened competitiveness. Thus, the spiral of action and reaction is likely to be much more intense than it would be in time of peace.

In standard discussions of the security dilemma, both geography and technology can exert strong influences on whether or not offensive and defensive capabilities and actions are distinguishable.

In the case of the NATO–Pact competition, geography has been and will likely remain a particularly important contributor to this identification problem: territory necessary for defense may also facilitate offense. One geographic problem, for example, that would plague efforts to limit an east-west war is the proximity to Soviet borders of much of what the United States seeks to defend. The competition between the two alliances in Europe has created two major military asymmetries that substantially affect the relative security position of the two superpowers.[20] U.S. decision makers often seem to forget these asymmetries.

[20]This analysis in no way implies that the United States should have withdrawn from its alliance commitments on the Soviet periphery—or that it should do so now. The combination of the power and proximity of the Soviet Union, the repugnance inspired by its system of government, and the fear precipitated by its excessive military preparations and oftentimes belligerent foreign policy drove its neighbors into alliance with the United States. Fundamentally, the problems outlined in this book were exacerbated by the failure of both Soviet diplomacy and military strategy. Reforms in both areas assuaged the fears of Russia's neighbors. Understanding of how the Soviets might have perceived

The Soviet Union faces the possibility of very intense conventional military conflict close to its national boundaries; the United States does not. The Soviet Union faces an impressive array of nuclear forces based on its periphery and capable of penetrating deep into the Soviet Union. The United States faces a much smaller array of such forces, usually less than a half-dozen forward-deployed Soviet SSBNs. Most importantly, NATO's conventional and nuclear forces are all mixed together. They produce a special conventional war problem for the Soviet Union. Conventional war can become a cloak behind which a nuclear attack against the Soviet Union can be prepared and launched.[21]

A conventional conflict in Europe would involve large-scale military engagements near or over the Soviet Union which could be (or be perceived to be) threatening to Soviet strategic nuclear forces. Commanders of Soviet strategic forces may fear that surprise nuclear attacks could be camouflaged by the confusion and tumult of intense conventional combat. As Chapter 2 demonstrates, in an air battle over Central Europe thousands of planes would have been in the air in circumstances that could easily have made Soviet leaders nervous: Soviet air defenses would probably have been degraded, NATO would almost surely have had nuclear-capable aircraft in the air, and the Soviets might well have felt that important strategic assets such as command, control, communications, and intelligence facilities were threatened.

In short, what the West does conventionally to defend itself can produce an offensive threat against Soviet strategic nuclear forces. Because the United States does not now have an analogous geographical problem, it is difficult for American leaders to recognize the stress that conventional war might put on Soviet leaders concerned about the survivability of their strategic forces.

In conventional disputes among future nuclear competitors this problem could be much worse. With the exception of the rivalry between the Soviet Union and the People's Republic of China, we have had no

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their military situation in the 1980s may provide insights into their current concerns and could be useful to the limitation of any great war that might still erupt in Europe.

[21]Maj. Gen. N. Vasendin and Col. N. Kuznetsov, "Modern Warfare and Surprise Attack," *Voyennaya Mysl* 6 (1968), reprinted and translated in *Selected Readings from Military Thought 1963–1973, USAF Studies in Communist Affairs* (Washington, D.C., 1982), vol. 5, pt. 1, pp. 226–233. "We cannot exclude attempts to achieve surprise by means of unleashing a local war. . . . The local war can be used by the aggressor for the additional mobilization of forces. In the guise of moving troops to the regions of the military conflict, a strike grouping of forces and means can be created for an attack. Such a war gives rise to an increase in the combat readiness of all armed forces of the aggressor, an intensification of strategic reconnaissance, the deployment of control points and communications centers in the territory of the dependent countries, and the carrying out of an entire series of other measures" (p. 230).

nuclear competition between states with a common border. And the USSR–PRC competition does not tell us much, in part because of poor data, in part because of the huge disparity in nuclear capabilities, but largely because of the long shadow on their conflict cast by the United States. But geography could be a critical problem among future competitors sharing common borders—especially if one or both has limited access to the sea for basing of its deterrent force.

Technology, like geography, can blur the line between offense and defense. Weapons useful for defense are often equally useful for attack. The United States, for example, maintains substantial antisubmarine warfare (ASW) forces to protect the sea lanes to Europe; many of those forces, however, could also attack Soviet ballistic missile submarines. Fighter aircraft of great range and payload can help defend Western Europe conventionally by interdicting the arrival of Soviet ground-force reinforcements. These same aircraft can carry nuclear weapons into the Soviet Union.

The Nature of Military Organizations: The Offensive Inclination and the Quest for Autonomy

Offensive military actions can cause, or require, hostile contact between conventional and strategic forces. For example, had war emerged in the mid-1980s, the offensive operations envisioned in the U.S. Navy's "maritime strategy" would have taken Western military forces close to the bases of Soviet strategic nuclear power on NATO's northern flank and in the Far East—with unpredictable consequences. This type of problem is hard to avoid because military organizations have both a proclivity for offensive operations and because they often resist civilian intervention in operational planning and execution.[22]

Planning. There is a generalized tendency for military organizations to prefer offensive doctrines and force postures long in advance of war. The Europe-wide cult of the offensive prior to World War I is the best example of military preferences for the offensive.[23] The Royal Air Force (RAF) in the 1930s was committed to the bombing of enemy

[22]The offensive and autonomy-seeking proclivities of military organizations can be deduced from organization theory, the civil-military relations literature, and from the instrumental problems of combat. See Posen, *The Sources of Military Doctrine*.

[23]See Stephen Van Evera, "The Cult of the Offensive and the Origins of the First World War," and Jack Snyder, "Civil-Military Relations and the Cult of the Offensive, 1914 and 1984," in *Military Strategy and the Origins of the First World War*, ed. Steven E. Miller (Princeton, 1985).

industry as their preferred military strategy, and considerable outside pressure was required to induce that service to plan carefully for the air defense of the country. Among the most influential and committed supporters of counterforce nuclear strategies in both superpowers today are the U.S. Strategic Air Command and the Soviet Strategic Rocket Forces.

Military organizations, like all large organizations, tend to seek autonomy from outside influences. Thus, in peacetime civilians are seldom exposed to the intricacies of military planning. As the editors of a recent monumental study of nuclear force operations have observed "the uniformed military views operations as its exclusive domain and does not welcome detailed involvement of even high ranking civilians in the Defense Department."[24]

Offensive Actions in Crisis or War. There are many historical examples of militaries striking out on offensive actions unbeknownst to their civilian superiors. In the immediate aftermath of the Soviet destruction of KAL Flight 007, unknown U.S. Air Force commanders, on their own authority, apparently ordered F-15 and AWACS operations close to the presumed crash area. The objective was unclear, and the operation was stopped when cooler heads prevailed. On 19 November 1985 two Israeli fighter pilots on their own initiative and without provocation shot down two Syrian MiGs in Syrian airspace, precipitating an unwanted extension of Syrian ground-based air defenses into Lebanon. Gen. John Lavelle conducted twenty unauthorized bombings of North Vietnam in 1971–72.[25] The U.S. Navy engaged in anti-submarine warfare operations against Soviet submarines during the Cuban missile crisis of an intensity and geographic scope unknown to the president or his advisers.[26]

Even when the intensity of a crisis or a conflict increases civilian efforts to intervene in the details of military policy, soldiers often interpret policymakers' injunctions in ways that allow them maximum operational discretion.

[24]Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, eds., *Managing Nuclear Operations* (Washington, D.C., 1987), p. 2.

[25]Seymour M. Hersh, *The Target Is Destroyed* (New York, 1986), pp. 74, 114. Thomas L. Friedman, "Israelis Wary on Striking at Missiles," *New York Times*, 17 December 1985; Richard K. Betts, *Soldiers, Statesmen, and Cold War Crises* (Cambridge, 1977), p. 49. British generals sent to protect the Abadan oil facilities at the outbreak of World War I decided to attempt the capture of Baghdad. Norman Dixon, *On the Psychology of Military Incompetence* (London, 1976), p. 96.

[26]Steinbruner, "Choices and Trade-offs," pp. 541–543; Scott D. Sagan, "Nuclear Alerts and Crisis Management," *International Security* 9 (Spring 1985): 112–117.

The 1982 Israeli invasion of Lebanon now appears to have gone far beyond the original objectives approved by the Israeli cabinet. Defense Minister Ariel Sharon (a retired general), Chief of Staff Rafael Eitan, and some other high-ranking officers orchestrated military operations in such a way as to elicit incremental cabinet approval for ever more extensive actions, especially against Syrian forces (although many high-ranking Israeli officers opposed these actions).[27]

During the Cuban missile crisis the U.S. Navy initially set its blockade line some 800 miles from Cuba. When President John F. Kennedy ordered it moved closer on the evening of 23 October (500 miles out from Cuba) to give the Russians more time, the navy resisted. This precipitated a short, sharp dispute that Kennedy and Robert McNamara seem to have won.[28] Yet the experience must have scared the president and his secretary of defense, since on the following day the secretary felt compelled to review aggressively the procedures for stopping a ship with the navy admiral responsible for coordinating operations.

On 5 November 1950 Gen. Douglas MacArthur ordered the Far East Air Force to bomb virtually anything usable to the communist logistical effort up to and including the Korean end of the Yalu River bridges. Even air force general George Stratemeyer understood that this order violated previous Joint Chiefs of Staff (JCS) directives that had been issued to help avoid bringing China into the war and passed the word to Washington where policymakers intervened to prevent the strikes on the bridges. Nevertheless, after considerable protestation by MacArthur, permission was finally granted to hit the bridges.[29]

During World War I the German chancellor endeavored to control the operations of German submarines so as not to antagonize the United States and risk its early entry into the war on the side of the Entente. Responding to public and naval pressure for submarine operations in response to the British blockade, he specified detailed and strict rules

[27]Ze'ev Schiff and Ehud Ya'ari, *Israel's Lebanon War*, ed. and trans. Ina Friedman (New York, 1984), pp. 43, 53, 301–304.

[28]Graham, Allison, *Essence of Decision* (Boston, 1971), pp. 129–130, argues that the navy evaded the order. But Dan Caldwell suggests that the original plan called for an 800-mile distance from Cuba, and that Kennedy successfully shifted in to a 500-mile distance. This version is better supported by the evidence. See Dan Caldwell, "A Research Note on the Quarantine of Cuba," *International Studies Quarterly* 22 (December 1978): 625–633. Sagan, "Nuclear Alerts," p. 110, n. 26, says that the commanding admiral's diary suggests that a 500-mile-distant destroyer picket line was the plan all along, and that Kennedy's intervention was probably meant to limit the discretion of the navy to intercept Soviet ships beyond 500 miles.

[29]Clay Blair, *The Forgotten War: America in Korea, 1950–1953* (New York, 1987), pp. 392–396.

of engagement against merchant ships for German submarines. The navy apparently made no effort to inform him that these were nearly impossible to follow. Instead, the potential for error within the rules was exacerbated by the unwillingness of German commanders even to try to follow them. In short order a crisis with the United States ensued.[30]

In an even earlier instance, prior to and during the Prussian war with France in 1870, the Prussian General Staff tried to prevent Bismarck from having any contact "with the operational aspects of the war."[31] These few examples suggest the difficulty that civilian leaders may have in exerting enough political control over military operations under way to have much influence on the risks of escalation.

Historically, offensive military strategies and operations have helped military organizations evade civilian control. The advocacy of offensive strategies has been a vehicle for the pursuit of organizational size, wealth, and autonomy in time of peace. In time of war the pursuit of offensive actions without seeking civilian concurrence, or in actual violation of civilian instructions, has been common. If a NATO–Pact war had broken out in the 1980s, this historical pattern suggests that American civilian policymakers would probably have had the least foreknowledge of, and influence over, the most escalatory operations. This, coupled with the geographical circumstances of the war, allows us to summarize the probable course of events with ease. Western conventional forces would have started the war close to the Soviet homeland and the strategic nuclear forces based there, and would probably have gotten closer. Civilians were unlikely to have grasped this fully before the outbreak of fighting, or to have understood the pattern of action and reaction that could have been set off. Once these operations were under way, military organizations would not have worked especially hard to explain the intricacies of the situation to civilian authorities. As of the date of publication, these risks remain.

The Fog of War

Inadvertent escalation may also result from the great difficulty of gathering and interpreting the most relevant information about a war in progress and using it to understand, control, and orchestrate the war. This is a problem that soldiers face, and they know something

[30]Karl E. Birnbaum, *Peace Moves and U-Boat Warfare* (Hamden, Conn., 1970), pp. 60–70; Ernest R. May, *The World War and American Isolation, 1914–1917* (Cambridge, Mass., 1966), pp. 248–252.
[31]Gordon Craig, *The Politics of the Prussian Army, 1640–1945* (London, 1955), p. 204.

about warfare; it would be worse for civilians. Not only might this difficulty help to cause inadvertent escalation but it may exacerbate potentially escalatory situations created by offensive operations or by the indistinguishability of offensive and defensive acts. The Fog of War works in two ways to increase the prospects of inadvertent escalation. First, it makes control of military operations under way difficult for high-level policymakers. Second, it creates conditions that heighten fears that an adversary can mount a successful surprise attack.

The disarray of command, control, communications, and intelligence, often called the "fog of war," would assume global proportions in an East-West war. Although modern technology may provide reams of intelligence data, it will not always be timely or accurate. Analysis is difficult under the pressure of intense conventional conflict. Communications to and from the theater of operations are likely to be uncertain and intermittent in any case. But critical links are often quite deliberately jammed or destroyed, as each side tries to gain a military advantage by reducing the other's understanding of events and control over its forces. Forces may end up in the wrong place, and events may be misreported. Civilians retaining the image of direct communication and control in the Cuban missile crisis or the Iran rescue mission may be shocked at how hard it is to follow, much less manage, a global war.

There are numerous examples of inaccurate or incomplete understanding by policymakers of ongoing military operations. General Lavelle's bombing of North Vietnam was apparently unknown to American leaders and damaged peace negotiations with North Vietnam.[32] During the Cuban missile crisis U-2 flights near the Soviet border were not authorized. But somehow a U-2 on a polar weather reconnaissance mission, which was permitted, strayed into Soviet airspace. U.S. fighters were launched without consultation with the national command authority to assist the U-2 in case it came under attack by Soviet fighters, which had scrambled. This intrusion may have hindered the negotiations to end the crisis, or it may have frightened the Soviets into a more cooperative attitude.[33] To this day we do not have an open-source accounting of why the intrusion occurred, nor do we know what were its real effects on the Russians.

The fog of war seems to have been one contributor to the entry of the People's Republic of China into the Korean War. The United States

[32]Betts, *Soldiers, Statesmen*, pp. 49–50.
[33]Allison, *Essence of Decision*, p. 141; Sagan, "Nuclear Alerts," pp. 118–121.

had three types of indicators that the Chinese intensely opposed the advance of U.N. forces to the Yalu River: diplomatic messages through third parties, propaganda declarations in the Chinese media, and limited military demonstrations in North Korea and along the Korean-Chinese border in late October and early November.[34] Although no indicators were missed entirely, the different channels by which the information was collected, the ambiguity of the meaning of Chinese military action, and a certain degree of self-deception all contributed to an underestimation of the risks.

Starting in the summer of 1940 the British and Germans both apparently misappraised the accuracy and reliability of the German bombing systems, especially at night.[35] The Germans were unaware of their initial accidental bombing of London on the night of August 24. This seemed a deliberate escalation to the British, who retaliated against Berlin with several feeble attacks. These attacks in turn enraged Hitler and, combined with a number of other motives, brought him to order a wholesale aerial assault on London, which became the Blitz. Even here, however, the Germans seem to have deluded themselves that military and industrial targets could be distinguished from residential areas.[36] Thus, the Blitz helped to further reduce any restraints the British might have been inclined to observe. The British, however, did cling to the illusion of discriminate bombing in the early phases of their aerial offensive, in order to make the action more palatable ethically.[37] In these examples the fog of war produced unintended military effects, obscured the meaning of adversary military actions, or both.

Modern conventional conflict in Central Europe would be characterized by large numbers, long range, and high lethality. Many of the longest ranged and most lethal weapons, tactical fighters, are capable of both conventional and nuclear operations. Central Region conflict

[34]Rosemary Foot, *The Wrong War: American Policy and the Dimensions of the Korean Conflict, 1950–1953* (Ithaca, 1985), pp. 79–80, 89; Blair, *Forgotten War*, pp. 340, 371–372, 382–384; James F. Schnabel, *United States Army in the Korean War, Policy and Direction: The First Year* (Washington, D.C., 1972), pp. 236–238. The traditional interpretation of the limited Chinese military actions during the last week of October and the first week of November is that they *were* meant as a warning. Whether or not the Chinese meant these operations as a warning, they should have been taken as such, especially in combination with explicit Chinese statements and against the background of other available intelligence.

[35]George Quester, *Deterrence before Hiroshima* (New York, 1955), pp. 115–122.

[36]F. M. Sallagar, *The Road to Total War: Escalation in World War II* (Santa Monica: Rand Corporation, 1969), pp. 89–93. Sallagar believes, however, that the Germans understood that their attacks on London would kill many people and would amount to mere terror warfare. His argument on this matter seems a bit convoluted.

[37]Ibid., pp. 128–131.

would also make greater use of radio, radar, electronic intelligence, and jamming than has ever occurred before in history. "Low observables" or "stealth" technology will create additional problems in any future conflict, as it will further reduce the ability of each side to keep track of the speediest and longest ranged platforms—aircraft and cruise missiles. In any conventional war in the 1980s NATO's conventional operations could easily have spilled across the borders of the Soviet Union, a possibility that will remain for some time to come. The result of this conventional war would have been to create a huge island of "fog" on the borders of the Soviet homeland. Hidden in this fog would have been nuclear weapons on such platforms as F-111 and Tornado fighter bombers with the range, yield, and accuracy to threaten a host of strategic targets from the Western Military Districts to Moscow. Lurking just offshore one would have found U.S. surface vessels and submarines armed with nuclear-tipped cruise missiles. In the mid-1980s ground-launched cruise missiles (GLCMs) and Pershing II missiles, both with the range to reach deep into the Soviet Union and the accuracy to attack very hard targets, were based on land in Europe.[38] If the Soviet strategy for very rapid conventional victory had failed, the Soviets might soon have found themselves in a dangerous strategic nuclear position. Soviet command and control facilities could have become vulnerable to nuclear attacks of which they would have had short warning or very ambiguous warning.[39]

In sum, the fog of war increases the likelihood of inadvertent escalation because misperceptions, misunderstandings, poor communications, and unauthorized or unrestrained offensive operations could reduce the ability of civilian authorities to influence the course of the war. It might also precipitate unexpected but powerful escalatory pressures due to the ever higher levels of uncertainty that would develop

[38]The successful conclusion of the negotiations for the elimination of Pershing II, GLCM, and SS20 eliminated what would have been a very potent source of the dynamics discussed in this essay. Problems of the kind discussed here and in the next chapter may be one of the reasons why the Soviets finally proved willing to accept the "zero option" proposal that they formerly rejected. It should be understood, however, that with some 1500–2000 nuclear bombs in Western Europe, NATO's tactical fighters, especially long-range aircraft such as F-111, Tornado, and the soon-to-be-deployed F-15E Strike Eagle, will continue to generate many of the uncertainties I have identified. The introduction of stealth fighters will further complicate matters.

[39]In effect, a Soviet decision to fight a conventional war would have automatically improved U.S. first-strike counterforce capability. This prospect might have strengthened NATO's ability to deter a Pact conventional attack, assuming that Soviet military planners understood how the war might have developed. I have not, however, found any evidence that NATO planners saw things this way. Thus, had *deterrence* failed and the Soviets attacked, these escalatory conventional operations would likely have been permitted to unfold, even though their deterrent power would have already disappeared.

about the status of the other side's strategic nuclear capabilities as intense conventional conflict unfolds.

Plan of the Book

The remainder of this book consists of two sections, each of two chapters. The first section deals with the possible course of combat on the Eurasian land mass, and the second with the war at sea. Each section has a chapter that addresses the potentially escalatory operations under consideration during the 1980s in that theater of war. Chapter 2 illustrates the complex, potentially escalatory interactions that might have arisen among NATO's conventional tactical air operations, Soviet strategic early-warning capabilities, NATO's long-range theater nuclear forces, and Soviet strategic nuclear command and control. Chapter 3 assesses the 1980s balance of conventional ground forces in Central Europe. The purpose of the chapter is twofold. First, it makes the case that conventional ground conflict could have unfolded favorably for NATO, still a somewhat controversial assessment of the conventional balance in that period. Therefore, other potential causes of nuclear escalation, aside from collapse, merited the attention of policymakers, attention that available evidence suggests was rarely paid. Second, because the assessment deliberately excludes consideration of the contribution of the air interdiction operations, discussed in Chapter 2, to NATO's ground effort, it shows that had NATO planners wanted to reduce the escalatory pressures set up by tactical air operations, they might have been able to do so without doing great damage to NATO's ability to resist successfully on the ground.

The second section addresses the maritime component of a NATO–Pact war. Chapter 4 discusses those aspects of the maritime strategy that were most escalatory, plans for attacks on Soviet nuclear-powered ballistic missile submarine (SSBN) bastions and naval bases ashore in the Barents Sea and the Kola Peninsula. I confine my remarks to the European theater of operations, but similar attacks would have unfolded in the Far East, with similar consequences. Because the U.S. Navy claimed that this strategy would be the only effective means of ensuring the supply of essential reinforcements to Europe across the Atlantic, Chapter 5 assesses the adequacy of a less escalatory defensive sea-control strategy for the successful completion of this mission with the forces then available. It makes the case that such an alternative was feasible, probably much more feasible than the maritime strategy. Indeed, the analysis suggests that the successful reinforcement

of NATO by the United States would probably have been achieved in any case, lending further support to the argument advanced in Chapter 3 that NATO's forces on the ground would probably have held—much against the common expectations of the time. In combination, the analysis presented in Chapters 3 and 5 suggests that NATO might have sustained successful conventional resistance for quite a long time. This is important because the audacious air and naval operations discussed in Chapters 2 and 4 would likely have taken some time to affect Soviet strategic nuclear forces. But the analysis also shows that these operations could have been scaled back substantially, if not eliminated altogether, with little damage to NATO's power of conventional resistance.

Although each section illustrates the full range of potential escalatory pressures outlined above, they do so with different emphases. Tactical air operations in Central Europe place less direct pressure on Soviet strategic forces. Moreover, the pressures they create arise more from the pure indistinguishability of offensive and defensive acts, the security dilemma, and the fog of war than from organizational dynamics.[40] The maritime strategy, on the other hand, owed its origin more to the pressures of organizational interest and preferences than to accidents of technology, geography, and the normal course of warfare. These two cases are not exhaustive; they are meant to illustrate the kinds of trouble that could have arisen in a large-scale East-West conventional war during the 1980s.

These problems might have been exacerbated by peculiarities of both sides' strategic nuclear forces, which were probably not well designed to ride out a lengthy conventional war. In an intense crisis these would likely be brought to much higher states of alert than they normally maintain. By definition, this is an extraordinary effort, which is difficult to sustain for very long. As the ready forces of one side or the other begin to shrink because of wear and tear, windows of opportunity may open for one side or the other.

Together, the four case studies encompass the main conventional military activities that would have attended a NATO–Pact war in the 1980s. Such a war would likely have begun with a major Pact offensive air operation to try to ruin NATO's air forces and tactical nuclear capabilities. If they survived this onslaught, NATO's air forces would have

[40]This is a relative statement. A good deal of NATO's deep interdiction effort owes its impetus to the heritage of strategic bombing in the U.S. and Royal air forces, and the association of independent operations of this kind with the struggle to win and preserve autonomy from the other services.

launched a number of different operations. A large share of NATO's offensive air capability would have been committed to battlefield air interdiction. A smaller share would have attacked critical Pact airfields, and some would have engaged in deep interdiction. The mix among these missions would have varied with the situation. Chapter 2 deals with a small but critical piece of NATO's offensive air operations, the effort to suppress Pact surface-to-air missiles. The Pact air offensive would have been launched simultaneously with a large offensive armored operation along the old inter-German border. The Soviets and their Eastern European allies would have mustered about fifty ready divisions for the initial assault, to be followed some time later by about fifty more.[41] This is discussed largely in Chapter 3. U.S. (and perhaps British) nuclear attack submarines would have tried to insert themselves into the Barents Sea during the period of crisis leading up to the war. If not, they would have fought their way forward from the outset of hostilities. Two or three dozen nuclear-powered attack submarines (SSNs) would have been involved. They would have tried to sink any submarine they encountered. This is discussed in Chapter 4. Finally, the United States would have tried to reinforce its ground troops in Europe. Depending on the nature of the crisis that precipitated the war, much of this reinforcement might have had to await the outbreak of hostilities. Although Soviet naval strategy in this period placed sea lane interdiction at the bottom of its list of priorities, some Soviet submarines would probably have been committed to the harassment of U.S. reinforcements. Chapter 4 addresses this campaign from the perspective of a Soviet force allocation greater than that suggested by Soviet doctrine.

Several aspects of the war are not addressed in detail in the case chapters. Ground and tactical air operations in defense against a possible Soviet assault on northern Norway are omitted. There is no discussion of military operations on NATO's southern flank. Finally, the spread of the war around the world, quite likely in my estimation, is not directly addressed. These omissions are not critical with reference to the main argument. If anything, these events would intensify the phenomena in question.

Another set of activities is germane to the overall argument: the whole panoply of alert activities of both side's strategic nuclear forces, and the wartime activities of each side's intelligence-gathering organizations. I allude to some of this in the course of the case studies. Both are arcane

[41]From the vantage point of 1991, the assumption of enthusiastic East European participation in Soviet offensive operations, customarily made for planning purposes in the West in the late 1970s and much of the 1980s, appears to have been overly conservative.

fields. Alert activities, at least from the U.S. perspective, have received considerable attention from competent people in the past decade, but intelligence gathering has received little attention, probably because of the very high levels of classification that surround it. Nevertheless, it seems plausible that the kind of painstaking and creative research techniques employed by those who have written about strategic command and control (see below) and those who have written about the peacetime intelligence world might be applied to assess the interactions of intelligence-collection activities in wartime.[42]

Most of the work on nuclear command and control is consistent with my discussion above of the offensive caste of Soviet and U.S. nuclear doctrine during the 1980s. On this subject I particularly commend three sources, which I cite frequently: *Can Nuclear War Be Controlled?* by Desmond Ball; *Strategic Command and Control: Redefining the Nuclear Threat* by Bruce Blair; and the collection of essays edited by Ashton Carter, John Steinbruner, and Charles Zraket entitled *Managing Nuclear Operations*.

I have devoted my personal effort to the study of conventional operations because less attention has been paid to them, and conventional forces seem to me to be the most likely and the most lethal tools that statesmen will initially grasp should diplomacy fail.

The concluding chapter briefly recapitulates the argument, discusses its possible future ramifications for the East-West security competition, and suggests some of the implications for other possible conflicts among other nuclear powers.

The methodology employed in this study has been quite simple. The professional military literature, the open-source technical military press, U.S. Department of Defense publications, and U.S. congressional hearings have been the principal sources. The escalation model outlined above has been used as a lens to pull critical information out of a mass of inchoate, unorganized data and fit it into a meaningful pattern.

These sources have been supplemented with a small number of interviews in the United States and in other countries with civilian policymakers, soldiers, and knowledgeable academics. I have also benefited from participation in two defense policy study groups, a short stint as a Pentagon analyst, and reactions to numerous presentations I have given on this project.

Finally, to sharpen the analysis, I have developed some simple quantitative models of ground, air, and naval combat. These models draw

[42]Notable in the latter category are James Bamford, William E. Burrows, Duncan Campbell, and Jeffrey T. Richelson.

their inspiration from professional operations research but include little beyond addition, subtraction, multiplication, and division.[43] Yet, the application of personal computer spreadsheet packages permits a good deal of insight into military problems through repeated calculations with basic arithmetic. With the exception of Chapter 3, these models are confined largely to appendices.[44]

[43]The so-called whiz-kid systems analysts employed by Robert McNamara in the 1960s also relied largely on simple arithmetic. See Alain C. Enthoven and K. Wayne Smith, *How Much Is Enough?* (New York, 1971).

[44]Those attentive to national security issues during the 1980s are aware of several instances of espionage against U.S. forces, especially the compromise of some U.S. Army plans for war in Europe, and some U.S. Navy codes and encryption machines. Though initial reports of these incidents indicated that they had done major damage to U.S. wartime capabilities, I have not tried to infer their implications for my own work. First, I am not convinced that public accounts of these matters provide a complete picture of the damage done. Second, information about these compromises is in the nature of "one hand clapping." We do not know what Western espionage may have achieved versus the Warsaw Pact. Thus, my own assessments of the relative competitiveness of the two sides' conventional forces do not address these issues. Books on this subject tend to be of the popular variety. See Thomas B. Allen and Normal Polmar, *Merchants of Treason* (New York: Delacorte, 1988); John Barron, *Breaking the Ring* (Boston: Houghton Mifflin, 1987); Pete Earley, *Family of Spies* (New York: Bantam, 1988).

[2]

Air War and Inadvertent Nuclear Escalation

Conventional-Nuclear Linkage on the Soviet Periphery

The purpose of this chapter is to explore the possible ways that large-scale conventional conflict in Central Europe might have affected the Soviet political and military leadership's confidence in the survivability, and thus deterrent power, of their strategic nuclear forces in a war that might have occurred in the 1980s.

Large-scale conventional aerial warfare over Central Europe could have done sufficient damage to Warsaw Pact and Soviet air defenses, and created sufficient confusion for Soviet air defense commanders, to have permitted NATO's long-range theater nuclear forces to threaten a surprise attack against critical Soviet strategic nuclear early warning and command and control facilities. This threat could have developed over a period of weeks and would probably have elicited substantial attention from Soviet air defense commanders. Real pressures could have arisen to compensate for this developing NATO advantage, either by devolution of nuclear launch authority or actual nuclear attacks on threatening NATO systems.

The analysis that follows proceeds through three steps.

First, the vulnerability of key Soviet command, control, communications, and intelligence (C^3I) assets to short-warning, peripheral attacks by forward-based, nuclear-armed tactical aircraft and cruise missiles will be demonstrated. This vulnerability was modest in peacetime but would have grown quickly under conditions of intensive conventional air combat in Central Europe. The long-standing role of Soviet and Warsaw Pact air defenses in the defense of the Soviet homeland from attacks originating on the Soviet *periphery* will be demonstrated. The great resources assigned to this mission suggest that this threat was

taken seriously by Soviet planners. Americans are accustomed to thinking of Soviet air defenses as enemies of the American bomber force attacking from over the North Pole. They are, but this oversimplifies their role and serves to obscure Soviet fear of attack from the west.

Second, the course of conventional air combat in Central Europe will be evaluated, including the full range of consequences that an intense Central Region air battle could have had for Soviet air defense and early warning capabilities. A very small piece of the overall air battle is examined in detail: NATO's planned effort to suppress the air defenses of the Warsaw Pact. A simple arithmetic model will be employed to illustrate the potential of this campaign to degrade air defenses over Eastern Europe. In effect, NATO's air-defense-suppression effort could have cut safe-passage corridors through Eastern Europe available for exploitation by NATO's nuclear-strike aircraft and ground-, sea-, or air-launched cruise missiles. This developing NATO capability would have attracted the attention of Soviet commanders, who in the event would have been unlikely to speculate on NATO's intentions.

Third, the pressures and temptations that could have arisen for the Soviet Union to employ nuclear weapons to reverse the course of this campaign are evaluated. Two subsidiary points are addressed. What does the analysis provided by Western specialists in Soviet theater nuclear doctrine tell us about when and how the Soviets might have employed nuclear weapons, and what inferences can we draw from their analysis for this specific situation? What targets could the Soviets have struck with limited numbers of nuclear weapons that might have reversed the success of the Western SEAD (suppression of enemy air defenses) campaign and degraded the surprise attack potential of NATO's theater nuclear forces?

Soviet "Strategic" Targets Vulnerable to Theater Surprise Attack

This section projects the worst fears of 1980s Soviet decision makers in the event of one plausible "worst case" contingency, a large-scale "first use" of forward-based NATO nuclear systems directed against key targets in the Soviet Union. To show that the Soviets did indeed take this contingency seriously, I show that they devoted substantial military resources to defend against it.

In the closing pages of his excellent and painstaking analysis of U.S. strategic command and control, Bruce Blair warns that because of their ability to avoid detection, cruise missiles are, in spite of their slow

speed, useful assets for attacking C³I. This is especially true if they can be "launched from delivery systems in close proximity to the targets." He advises the superpowers to agree "to prohibit close-in deployment of ships, submarines, aircraft, and ground bases armed with nuclear cruise missiles." Blair argues that forward-deployed cruise missiles "represent the most serious emerging threat to U.S. C³I systems."[1] Since U.S. cruise missile programs remain technologically ahead of their Soviet counterparts, and since air- and sea-launched cruise missiles were already deployed in large numbers by the United States, it seems quite likely that if Blair was right about an emerg*ing* Soviet cruise missile threat to U.S. C³I, then the threat of U.S. nuclear cruise missiles to Soviet C³I had already emerg*ed* in the 1980s.

Regrettably, although we have excellent open-source "command analysis" of the U.S. strategic command and control system and its vulnerabilities, corresponding analysis of the Soviet system remains rather sparse.[2] The Soviets are certainly not going to be any more open about this subject than they are about any other security-related subject.[3] The American intelligence community, from which much open-source information on the Soviet military originates, is most unlikely to say much about Soviet C³I, since the revelation of almost any detail about the system could compromise the very expensive intelligence asset that provided the detail. Moreover, since attacks on C³I offer perhaps the last remaining source of leverage in a disarming, counterforce attack, such revelations could produce changes in the other side's structure that would negate these advantages. In general, then, "command analysis" of the Soviet C³I system to assess its vulnerability to any kind of attack is exceedingly difficult. Nevertheless, the sources available do reveal a few fundamental facts that suggest dis-

[1]Blair, *Strategic Command and Control*, p. 301. See also Ashton Carter, "Assessing Command System Vulnerability," in Ashton Carter, John D. Steinbruner, and Charles A. Zraket, eds., *Managing Nuclear Operations* (Washington, D.C., 1987), p. 597.

[2]The term "command analysis" was coined by Bruce Blair.

[3]The most comprehensive recent survey of Soviet C³I is Stephen M. Meyer, "Soviet Nuclear Operations," in *Managing Nuclear Operations*, ed. Carter, Steinbruner, and Zraket, pp. 470–531. Desmond Ball, *Can Nuclear War Be Controlled?*, Adelphi Paper 169 (London, 1981), remains very useful. U.S. Department of Defense, *Soviet Military Power, 1985* (Washington, D.C., April 1985), chap. 3, "Strategic Defense and Space Programs," pp. 43–59, provides useful detail. Subsequent editions provide additional information with *Soviet Military Power, 1988*, pp. 16–17, and chap. 4, "Soviet Strategic Programs and Space Forces," pp. 44–67, offering the most comprehensive discussion of the Soviet hard shelter program. Thomas K. Longstreth, John E. Pike, and John B. Rhinelander, *The Impact of US and Soviet Ballistic Missile Defense Programs on the ABM Treaty*, 3d ed. (Washington, D.C., 1985), pp. 37–41, and maps on pp. 70, 72, 74, offers information on the location of Soviet early warning radars.

turbing conclusions from the Soviet perspective—especially in the context of the long-standing shortcomings of the Soviet air defense system and its probable degradation in a NATO–Pact conventional war. Although we would be unwise to conclude from this information that Soviet nuclear forces could literally have been decapitated, it is plausible that relatively limited attacks could have seriously degraded the speed and comprehensiveness of a Soviet response, buying sufficient time for U.S. counterforce capabilities to attack silos, bomber bases, and SSBNs in port.

The center of the Soviet command and control apparatus is said to be concentrated in the Moscow area, in thirty to seventy-five hardened bunkers, some of which may be several hundred feet deep and hardened to withstand at least 1000 psi blast overpressure.[4] Early warning and attack assessment is the responsibility of the Soviet national air defense organization, the VPVO (Soviet Strategic Air Defense Forces). Its main command post is said to be in Moscow, and an alternate command post is reported to be not far away, in Kalinin. Standard calculations suggest that even bunkers hardened to withstand 2000 psi of overpressure would have stood little chance of surviving an attack by two U.S. ground-launched cruise missiles with 50-kiloton warheads.[5] The "Dog House" and "Cat House" phased array radars of the Moscow ABM system (and the Pushkino radar under construction) would have added little to this target set. Presumably, some critical communications transmitters in the Moscow area would have been

[4]Ball, *Can Nuclear War Be Controlled?*, p. 44, uses the figure of seventy-five hardened bunkers in the Moscow area. Meyer, "Soviet Nuclear Operations," pp. 482, 485, uses the same figure but also alludes to the lower number, thirty. U.S. Department of Defense, *Soviet Military Power, 1988*, pp. 59–62, offers a general discussion of the Soviet program for deep underground facilities to protect the political and military leadership, although it offers no estimate of the number of very hard facilities. The discussion also offers no estimate of the survivability of these facilities against a determined nuclear attack.

[5]Two sea-launched cruise missiles or air-launched cruise missiles would have had more than a 90 percent chance of destroying such a target, assuming 80 percent reliability and 95 percent penetration. Two ground-launched cruise missiles would have had about an 85 percent chance, under the same assumptions. See U.S. Congress, Congressional Budget Office, *Modernizing US Strategic Offensive Forces*, prepared by Bonita Dombey (Washington, D.C., November 1987), pp. 86–87, for air- and sea-launched cruise missile effectiveness. See Van Evera et al., "Appendix: How Our Simulations Were Performed," in *Nuclear Arguments*, ed. Eden and Miller, pp. 248–249, for probability formulae for single-shot kills. An 80 percent reliability is a number commonly used in back-of-the-envelope analysis for strategic and conventional weapons systems. A 95 percent penetration credits Soviet air defenses with an ability to shoot down 5 percent of the attacking cruise missiles, an effectiveness that Soviet air defense hardware has seldom achieved against tactical aircraft. I believe the two values to be conservative for these purposes. The overall kill probability (opk) for a single shot is thus reliability × penetration probability × single-shot kill probability. Two-shot kill probability is given by $1 - (1 - \text{opk})^2$.

targeted. One would also hypothesize that the Russian communications network of buried land lines must have had certain critical nodes in the Moscow area that could be struck. Finally, there is at least one airfield in the Moscow area where command and control aircraft were based, although it seems likely that any field close to Moscow with a runway of sufficient length to permit operations would be a plausible nuclear target.[6] I doubt that all seventy-five of the bunkers noted above would have merited attack. Target proximity might permit coverage of several targets by a single warhead, further reducing the requirement. Altogether, it seems unlikely that more than one hundred and perhaps fewer than fifty designated ground zeros, each targeted by two weapons, would have been required to do very serious damage to the heart of the Soviet system for strategic C^{3}I in the Moscow area in the period in question. A dedicated strategic nuclear command and control attack probably would not have stopped here, however. Official U.S. government publications reported the existence of "an elaborate system of emergency relocation facilities, many of which are bunkered . . . equipped with hardened communications equipment."[7] Moreover, there were numerous hardened military command and control installations of all kinds, as well as mobile vans, trains, and aircraft.[8] Nevertheless, it seems quite plausible that only a few installations could have been capable of taking over major command functions of the highest civilian and military echelons in Moscow.[9] If they could have been located by intelligence, a limited number of dispersed sites would also have been struck in a dedicated counter–command and control attack.

The issue, of course, is not whether Moscow or other Soviet strategic C^{3}I targets could have been struck by ground-, sea-, or air-launched cruise missiles, or even fighter bombers, launched from the European periphery. Such attacks were feasible. Nor is the issue whether the relevant targets could have been destroyed by the available weapons. There were sufficient weapons. As of 1987 the United States, the United

[6]Meyer, "Soviet Nuclear Operations," p. 502. The main airfield is Khodinka.

[7]U.S. Department of Defense, *Soviet Military Power, 1985*, p. 19. There are said to be 1500–2000 installations, some hardened to several thousand psi. Meyer, "Soviet Nuclear Operations," p. 502. (I suspect that as in the United States, the very hard facilities are ICBM launch-control-center command capsules.)

[8]Meyer, "Soviet Nuclear Operations," pp. 504–507. See also U.S. Department of Defense, *Soviet Military Power, 1986*, pp. 53, 60.

[9]From the attacker's perspective, a dedicated counter–command and control nuclear attack would probably aim at every center that could plausibly contain an individual with the legitimate authority to launch a nuclear weapon, or that could carry a critical message. On the other hand, if the attacker had intelligence indicating that operations were still being run out of Moscow, he would have an incentive to confine his attack to this area. There is a clear trade-off from the attacker's perspective between "surprise" and mass.

Kingdom, and West Germany deployed some 425 nuclear-capable F-111s and Tornados suitable for long-range attacks deep into the Soviet Union. There were 108 Pershing II missiles and 256 ground-launched cruise missiles based in Europe as well. Thus, an extraordinarily successful Soviet conventional preemption would have been necessary to degrade just the land-based elements of this capability. Moreover, the United States then planned to place nuclear cruise missiles on nearly all its attack submarines and many surface combatants, for a total of nearly two hundred platforms. Finally, the issue is not even whether or not the cruise missiles stood a high probability of reaching Moscow. Given the demonstrated flaws in the Soviet air defense system (see below), enough would have gotten through to do very serious damage. Under the right circumstances, even a dedicated force of U.S. Air Force F-111s or RAF Tornados flying from Britain with tanker support might successfully have mounted such an attack. A modern cruise missile force would have had even higher odds of success.

The main issue is whether Soviet decision makers could have come to believe that cruise missiles or aircraft could have reached Moscow or other critical targets and dropped their nuclear weapons before the Soviet leaders understood that a major nuclear attack was underway, *and that Western planners might also have come to this conclusion*. As many have pointed out, under day-to-day conditions, and probably even during a crisis, an undetected NATO attack should not have been a Soviet concern. As we shall see below, however, the situation could have changed rather drastically after two to four weeks of conventional aerial combat in Central and Northern Europe. Under such conditions cruise-missile-equipped nuclear-attack submarines and surface combatants would have been dispersed around the periphery of the European land mass, where Soviet intelligence would have had a very difficult time tracking their activities. (Many would have been deployed in the Barents Sea, perhaps more detectable than those elsewhere, but also closer. See chapter 4.) Western SEAD would have chewed many holes through the air defense and early warning systems in Eastern Europe. Some conventional air operations might have accidentally or intentionally spilled across the Polish border into the Western Military Districts of the Soviet Union. B-52 bombers configured for conventional operations, but similar to those committed to strategic nuclear missions, might have participated in conventional attacks on the Soviet periphery. Soviet intelligence-gathering assets would have been systematically attacked. The sheer noise of the battle could have overloaded those intelligence assets that remained intact. At this point the calculation would have changed. Cruise missile or tactical fighter time of flight from the Soviet-

Polish border, or the Barents Sea, to Moscow is a little over an hour. Given the slow and creaky performance of the VPVO against KAL flight 007 in 1983 and against a small Cessna aircraft in 1987—both under peacetime conditions, without jamming, and in a relatively uncluttered aerial environment—the Soviets' confidence in their ability to detect and classify this kind of cruise missile or even fighter-bomber attack might have deteriorated rapidly under conditions of large-scale conventional air war.[10] Indeed, an unidentified U.S. Air Force officer made the following observation to the *Economist* magazine on the KAL 007 incident:

> If this is the best they can do against a high-flying airliner, we should have no trouble in a war. A B-52 with all its decoys, jammers and other countermeasures could be over Moscow before they figured out what was going on.[11]

Soviet concerns about more limited or more exotic attacks should also not be discounted. Although the various sources are not entirely consistent, three ballistic missile early warning radars were situated relatively close to the Russian-Polish border, including radars near Riga (Skrunda), Minsk (Baranovichi), and Kiev.[12] A fourth radar was quite close to the Czech border, near Mukachevo. The Skrunda, Baranovichi, and Mukachevo sites were apparently all then equipped with Hen House radars but were undergoing modernization with "Pechora" type long-range phased array radars.[13] These sites are all less than thirty

[10]For a critical appraisal of Soviet performance in this episode, see William Durch and Peter Almquist, "East-West Military Balance," in *International Security Year Book, 1984–85*, ed. Barry M. Blechman and Edward N. Luttwak (Boulder, Colo., 1985), pp. 41–43.

[11]"Flight 007: A Glimpse of Chaos," *The Economist*, 24 September 1983. Another anonymous U.S. official observed, "This horrible incident not only points out Soviet disregard for loss of life, but it shows the inflexibility of the system and a lack of air defense technology capable of operating in near real time." See "US Says Soviets Knew Korean Air Lines 747 Was Commercial Flight," *Aviation Week and Space Technology*, September 12, 1983, pp. 18–21. Subsequent information showed the Soviets did not in fact know they were shooting at an airliner. See David Shribman, "Experts Say Soviets Had Failed Identifying Plane before Shooting," *New York Times*, 7 October 1983. Speaking of unidentified U.S. government sources, "The informants said the experts had reached general agreement that the Soviet air defense force had displayed a poor capacity to intercept aircraft in Soviet airspace, to distinguish between commercial and military aircraft and to identify a plane before shooting it down." In general, off-the-record observations of American intelligence experts quoted in journalistic accounts of this event echo these conclusions. As of late 1983, the Soviet homeland air defense organization suffered from very serious shortcomings.

[12]International Institute for Strategic Studies, *The Military Balance, 1984–85* (London, 1985), p. 155 (map). Hereafter, IISS, *Military Balance* and year.

[13]U.S. Department of Defense, *Soviet Military Power, 1987*, p. 48.

minutes from the Polish border for a cruise missile or a fighter plane. The Kiev radar was paired with another Over the Horizon (OTH) radar on the other side of the Soviet Union. In combination with the Soviet satellite early warning system, their purpose was to provide a *reliable* thirty-minute warning of a U.S. ICBM launch.[14] The Hen House radar sites seem to have been directed against submarine-launched ballistic missiles (SLBMs), from the Atlantic.[15] The Soviets might have had reason to fear an attack in which cruise missiles, or nuclear-armed fighter bombers, destroyed their ability to detect a Pershing II launch and SLBMs followed up with a rapid attack against the Moscow command complex.

Indeed, even conventionally armed fighter bombers might have been useful in such precursor attacks. As Desmond Ball points out, many strategic early warning assets are vulnerable to conventional weapons. This is especially true of radars and large radio transmitters.[16] Conventional air attacks on these assets close to the Soviet border would have created tremendous ambiguity for Soviet decision makers. In the absence of nuclear explosions, how easy would it be to make a launch-on-warning decision? But if the destruction of these large early warning radars could have even further reduced Soviet warning of an SLBM attack, how safe would it have been to allow the West to gain this opportunity, if the air battle went badly for the Warsaw Pact and NATO aircraft were regularly operating in proximity to these sites?

The Role of Soviet and East European Air Defenses

Observers of the Soviet military system have long been struck by the size and scope of the effort to defend the homeland from threats by aircraft, and now by cruise missiles. Although somewhat ambiguous as to what is being counted, the Pentagon's figures are the starting point for nearly all public discussions of the Soviet effort. According to *Soviet Military Power, 1985*, the Soviets deployed, as part of the strategic air defenses of their national territory, some "7000 radars of various types located at about 1200 sites."[17] These directed "nearly 10,000 SAM launchers at over 1200 sites for strategic defense" and "more than

[14]U.S. Department of Defense, *Soviet Military Power, 1985*, p. 45.

[15]These radars would presumably also have had a role to play in detecting a Pershing II launch from Germany. The Soviets complained about the ten-minute flight time of Pershing II, and insisted, in contrast to Western claims, that it could hit Moscow.

[16]Ball, *Can Nuclear War Be Controlled?*, p. 12.

[17]U.S. Department of Defense, Soviet Military Power, 1985, p. 45.

1200 interceptors."[18] According to the most recent open-source Central Intelligence Agency (CIA) analysis of Soviet defense spending, roughly half of all spending on Soviet strategic forces in the 1970s was allocated to these forces. Put another way, the Soviet Union spent more on these forces than the United States spent on *all* its strategic offensive forces during this period.[19]

Some 5000 tactical surface-to-air missile (SAM) launchers, associated mainly with the ground forces, 3000 radars, and 1800 interceptor aircraft associated with the tactical air forces should also be counted under the Soviet defensive effort for purposes of this analysis, since many of these assets would move into Eastern Europe in wartime, augmenting the barrier against intrusions from the West.[20] The efforts of the Eastern European allies are also important. Between them, Poland, East Germany, and Czechoslovakia deployed another 750-odd surface-to-air missiles on launchers, and 950 MiG-21 and MiG-23 interceptors in a strategic defense role.[21] East European ground forces were also equipped with mobile air defense missiles and radars.

It is quite common in official Western sources to view Soviet strategic defenses as oriented mainly against the U.S. strategic bomber force and its associated cruise missiles. For example, the unclassified summary of the 1985 national intelligence estimate of the Soviet strategic forces assesses the adequacy of Soviet defenses against a U.S. strategic bomber and cruise missile attack but says nothing about its vulnerability to attacks originating in Western Europe.[22] Similarly, the Department of

[18]Ibid., p. 48. *Soviet Military Power, 1988*, offers slightly different figures, 9000+ Sam launchers, and 2250 interceptors (p. 15). It offers no figure for total air defense radars but argues that the quality of Soviet air defense against low-altitude penetrators such as cruise missiles has improved (pp. 80–82). The 1988 document reports that the Soviets have since 1986 virtually reversed the reorganization of their air defenses attempted at the beginning of the decade (p. 80).

[19]U.S. Central Intelligence Agency, National Foreign Assessment Center, *Soviet and US Defense Activities, 1970–79: A Dollar Cost Comparison* (Washington, D.C., 1980), pp. 8–9. U.S. Department of Defense, *Soviet Military Power, 1987*, p. 5, observes that "since the late 1960s, the Soviets have greatly expanded and modernized their offensive nuclear forces and invested an approximately equal sum in strategic defenses."

[20]U.S. Department of Defense, *Soviet Military Power, 1988*, p. 80, for air defense aircraft; *Soviet Military Power, 1987*, p. 59, for SAM launchers. In the 1987 edition (p. 59), a figure of 10,000 was given for all air defense radars; in the 1985 edition a figure of 7000 was given for homeland air defense radars (p. 45). I deduce that subtracting the latter from the former gives us a figure of 3000 for tactical air defense radars. This figure probably does not count anti-aircraft gun engagement radars.

[21]IISS, *Military Balance, 1984–85*, pp. 24–27.

[22]Robert M. Gates, chairman, National Intelligence Council, and deputy director for intelligence, Central Intelligence Agency, and Lawrence K. Gershwin, national intelligence officer for strategic programs, National Intelligence Council, in U.S. Congress, Senate, Subcommittee on Strategic and Theater Nuclear Forces of the Senate Armed Services Committee and the Defense Subcommittee of the Senate Committee on Appro-

Defense is quick to compare directly the major air-defense efforts of the Soviet Union to the paltry effort of the United States, without any reference to the very different geographic and strategic circumstances of the two countries.[23] Hundreds of nuclear-armed enemy aircraft are not based in Canada, Mexico, or even Cuba. This "mirror imaging" obscures an important dimension of VPVO, that of opposing attacks originating on the Soviet periphery. Once this orientation is understood, the substantial resources allocated to the problem provide evidence of how large it looms in the minds of Soviet strategists.

Evidence for the proposition that Soviet air defenses have had a strong Western orientation can be found in a variety of sources. David R. Jones, a close observer of Soviet air-defense efforts for many years, has observed that in spite of its other missions, "the PVO continues to be concerned primarily with the threat from Western Europe."[24] Ironically, *Soviet Military Power, 1985*, contains the best evidence in support of this proposition. Its map, "Soviet Territorial Air Defense," shows the bulk of Soviet interceptor and SAM assets concentrated in the western part of the country.[25] This is consistent with the document's location of the Soviet Union's important strategic assets, including ammunition dumps, nuclear storage sites, petroleum stocks, air bases, strategic early warning radars, and even some intermediate and long-range nuclear offensive forces—all concentrated in the western part of the country.[26] The importance of these assets to the Soviet Union, as well as their vulnerability to aircraft attacks originating on the Soviet

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priations, *Soviet Strategic Force Developments* . . . , 99th Cong., 1st sess., 1985 (Washington, D.C., June 26, 1985), p. 6. Hereafter, *Soviet Strategic Force Developments*, 1985.

[23]See U.S. Department of Defense, *Soviet Military Power, 1985*, pp. 48–54; and Organization of the Joint Chiefs of Staff, *United States Military Posture, FY 1986* (Washington, D.C., 1985), pp. 30–32.

[24]David R. Jones, "Air Defense Forces," in *Soviet Armed Forces Review Annual, Vol. 6*, ed. David R.Jones (Gulf Breeze, Fla. 1982), p. 173. His contributions to the 1980 and 1981 editions of the annual are also very informative. For a somewhat similar view see Gordon Macdonald, Jack Ruina, and Mark Balaschak, "Soviet Strategic Air Defense," in *Cruise Missiles: Technology, Strategy, Politics*, ed. Richard K. Betts (Washington, D.C., 1981), p. 65. "Not surprisingly, the Soviet air defense network seems primarily occupied with targets from the west and north. As noted earlier, the most modern aircraft are based in the western USSR and constitute roughly 30 percent of the active force; another 25 percent in the Baku and Moscow districts indicate Soviet concern with defending command centers. The Warsaw Pact countries' air defenses add depth to the western bastion. The first EW (early warning) radars were built overlooking the Baltic and Eastern Europe. Only recently has the Soviet Union begun reshaping its forces to get more complete coverage. As far as is known, there are very light air defenses or none, associated with the missile fields."

[25]U.S. Department of Defense, *Soviet Military Power, 1985*, p. 51.

[26]Ibid., pp. 8–9, 70–71, 84.

periphery, not only helps explain the size of the Soviet effort to defend the western part of the country but the fact that all air-defense assets of its Warsaw Pact allies were integrated into the Soviet air-defense organization, the VPVO.[27]

David Jones is skeptical that their efforts achieved much, noting that "the existing ABM complex is helpless against any major missile assault. In a similar manner, the PVO is only slightly more capable of combatting low-level penetration by US strategic or NATO's tactical aircraft that employ penetration and other devices. And this, it must be stressed is even without the cruise missile."[28] Somewhat obliquely, the CIA lends support to this judgment. "Against a combined attack of penetrating bombers and cruise missiles, Soviet air defenses during the next 10 years probably would not be capable of inflicting sufficient losses to prevent large-scale damage to the USSR."[29]

In late 1981 Gen. A. I. Koldunov gave evidence of the Soviet opinion that their efforts were not keeping up with the threat. He noted that new nuclear delivery systems "in the immediate vicinity of the frontier of the Soviet Union and the lands of the Socialist Commonwealth, make the threat of a *surprise* attack from the side of the imperialist aggressors even greater than before."[30] It would be tempting to dismiss these remarks as simply part of the propaganda campaign to oppose NATO's deployment of Pershing II and GLCM. Yet, Soviet air defenses were apparently reorganized twice in the 1980s; the Soviets seem to have perceived that they had a serious problem and tested different solutions.

A reorganization of Soviet air defenses that began in 1980 permitted the closer "integration of strategic and tactical SAM systems." Originally there seem to have been two aspects to this effort. First, administratively all air-defense assets, including SAMs associated with the ground forces, were placed under the general authority of the VPVO, the national air-defense organization. Presumably, the purpose was to ensure some kind of commonality and interoperability among all Soviet air-defense assets. Since the ground forces' air defenses are geared more toward operations at low altitude, their expertise and weapons

[27]Jones, "Air Defense Forces," pp. 173–174. See also U.S. Department of Defense, *Soviet Strategic Defense Programs* (October 1985), p. 19: "The Soviets maintain the world's most extensive early warning system for air defense, composed of a widespread network of ground based radars *linked operationally with those of their Warsaw Pact allies.*"

[28]David R. Jones, "National Air Defense Forces," in *Soviet Armed Forces Review Annual, Vol. 4*, ed. David R. Jones (Gulf Breeze, Fla. 1980), p. 147.

[29]Testimony of Gates and Gershwin, *Soviet Strategic Force Developments*, 1985, p. 6. They do expect, however, "an increasingly capable air defense" of certain point targets.

[30]Quoted in Jones, "Air Defense Forces," p. 133.

systems would have given the national air-defense forces enhanced capability against low-level attackers including the current B-52, the B-1, tactical fighters, and especially the cruise missile. The second element of the reorganization was the *operational* grouping of *all* available air-defense assets—strategic and tactical—in a given area—especially border areas—under the command of the relevant military district. This suggested an effort to further reinforce the air-defense bulwark to attacks from the West, by ensuring that anything useful for the defense of the Soviet homeland was capable of operating in that mission.[31] Jones observed in 1982, "While the outlines of the restructured service remain unclear, all generally are agreed that it results from the Soviets' renewed recognition of the failings of their already extensive and costly anti-air defensive system."[32]

Whatever the early 1980s reorganization was meant to achieve, Soviet authorities appear not to have been satisfied with the results. Operational control of homeland air-defense missiles and radars was returned to the independent national air-defense structure, the VPVO, as were many interceptor aircraft. Tactical SAMs returned to the control of the ground forces. It is not clear who got operational control over air-defense fighters associated with the military districts and the groups of forces, but it does not seem to be the VPVO.[33]

As further evidence that the Soviets were concerned about air-breathing threats to command and control, it is worth noting that the best new Soviet strategic SAM for countering targets with small radar cross-sections such as the cruise missile, the Sa-10, was disproportionately fielded in the Moscow area. As of 1988 one-third of the 150 completed launch units were in the Moscow area.[34] The Department of Defense (DOD) argued that this suggests "a first priority on terminal defense of wartime command and control."[35]

Finally, as further support of the proposition that the Soviet Union took NATO's theater nuclear weapons very seriously, it is useful to recall that most analysts of Soviet theater conventional strategy during this period posited the conventional suppression of NATO's theater nuclear capability as the fundamental mission of Soviet tactical air

[31]U.S. Department of Defense, *Soviet Military Power, 1985*, pp. 48–51, quotation from p. 50.
[32]Jones, "Air Defense Forces." On the reorganization and the possible reasoning behind it, pp. 133–144.
[33]U.S. Department of Defense, *Soviet Military Power, 1988*, pp. 79–82, presents details on the latest Soviet air-defense efforts, especially the latest reorganization.
[34]Ibid., p. 81.
[35]U.S. Department of Defense, *Soviet Military Power, 1987*, p. 61. As of 1987 more than half the completed sites were reported in the Moscow area.

power.[36] The Soviet military made substantial and rather expensive improvements in the conventional attack capability of its tactical air power to support this operation. This was often explained by a hypothesized Soviet belief that the elimination of these forces would permit a Pact conventional victory in the theater to unfold without nuclear escalation by NATO. This is one possible explanation, but the huge number of warheads still in U.S. hands in such a situation makes the hope of *no* NATO nuclear response seem a faint one. It seems equally plausible to me that it was the use of NATO theater nuclear forces for strategic nuclear attacks that the Soviets really feared—since under conditions of intense conventional combat these could have done a special kind of very threatening damage to Soviet command and control and early warning assets.

To summarize, the Soviet Union invested massive sums in an air-defense system designed to oppose attacks from the west, not just attacks from the north. Consistent with the western orientation, the air-defense organizations of the Eastern European Pact allies were integrated with that of the Soviet Union. Reorganizations of the VPVO tried to integrate more effectively the air-defense assets of the ground forces, and tactical air forces with the radars, missiles, and interceptors of the VPVO. These were likely to have been among the best defenses against low-level attacks, and the most densely distributed assets in Eastern Europe after mobilization. Finally, the Soviets themselves seemed conscious of the combined "surprise attack" potential of Western conventional and nuclear theater forces.[37]

A skeptical reader will be justified at this point for asking how much difference this sort of vulnerability could have made. How much more problematic was an "air-breathing" counter command and control at-

[36] See Chapter 1.

[37] On this point, in addition to Koldunov's 1981 statement, see Vasendin and Kuznetsov, "Modern Warfare and Surprise Attack," pp. 226–233. "We cannot exclude attempts to achieve surprise by means of unleashing a local war. . . . The local war can be used by the aggressor for the additional mobilization of forces. In the guise of moving troops to the regions of the military conflict, a strike grouping of forces and means can be created for an attack. Such a war gives rise to an increase in the combat readiness of all armed forces the aggressor, an intensification of strategic reconnaissance, the deployment of control points and communications centers in the territory of the dependent countries, and the carrying out of an entire series of other measures" (p. 230).

Joseph Douglas and Amoretta Hoeber, *Conventional War and Escalation: The Soviet View* (New York, 1981), interpret this essay as an example of what the Soviets intend to do to the United States. A reading of the English translation suggests that this essay may mean exactly what it explicitly says, that local war increases the West's ability strategically to surprise the Soviet Union. The geopolitical reasons for this are clear. There are many places where *large-scale* local war could break out on the Soviet periphery, and virtually nowhere that it could occur on the U.S. periphery.

tack than one mounted by sea-based ballistic missile or European-based Pershing II? This question is impossible to answer with any great confidence. If, as Stephen Meyer argues, roughly five to ten minutes would have been consumed simply in the collection, analysis, and communication of the data that early warning technology provided, then a Soviet leader would have had between five and ten minutes to decide whether or not to launch on warning.[38] This is obviously not a long time to make such a momentous decision, and an attacker sufficiently daring to mount any kind of major nuclear first strike might also be daring enough to count on five or ten minutes of indecision.

On the other hand, a serious missile attack, aimed at a combination of direct destruction and the generation of disruptive electronic effects, would probably have required quite a number of reentry vehicles—at least as many as the minimum number of designated ground zeros I have estimated in the Moscow area—plus a few additional ground zeros for dispersed command centers and a small number of high-altitude bursts—seventy five targets. Assuming a requirement for 2-on-1 attacks for reliability, perhaps nineteen Trident C-4 missiles with eight 100 kiloton warheads each could have covered the target set, although these would have been inadequate against the hardest targets.[39] If one discounts Western claims that the Pershing II lacked the range to reach Moscow, which the Soviets almost certainly did, then they would have counted these highly accurate theater weapons as a dangerous strategic threat, but the 108 deployed would have been insufficient to cover the target set reliably. Though these are relatively small numbers, the "good" side of such attacks from the Soviet perspective would have been the relatively uncluttered environment out of which they would have arisen. The "bad" side of such attacks is that they might have left only five or ten minutes of decision time available to political leaders. But under wartime conditions, and given multiple warning sources, this could have sufficed. More importantly, from the attacker's perspective, attacks of this kind must seem likely to capture the defender's full attention. This is not to make light of such a situation. It is merely to

[38]Meyer, "Soviet Nuclear Operations," p. 484.

[39]Assuming 80 percent reliability, two Trident I warheads (100 kilotons each) would have had no better than a 40 percent chance of destroying a bunker hardened to 2000 psi. The imminent deployment of the accurate Trident D-5 missile with a 400–500 kiloton warhead will make feasible SLBM attacks against hardened command and control targets. Again, if we assume 80 percent reliability, two warheads launched would have better than a 90 percent chance of destroying such a target. Perhaps twenty D-5 missiles at six to nine warheads each would be required to mount such an attack. See Jeffrey A. Merkley, *Trident II Missiles: Capability, Costs, and Alternatives* (Washington, D.C.: Congressional Budget Office, July 1986), pp. 3, 51.

suggest that an attack by air-breathing systems, under conditions of intense conventional combat, might have offered special advantages to the attacker and special problems for the defender, which would have made this problem a serious one for the Soviets.

An attack by air-breathing nuclear systems surrenders the possibility of using speed to get inside the defender's decision-making process for launch on warning or launch under attack. But, as I shall elaborate below, it offers the possibility of slowing this system down by reducing the clarity of the information provided to the Soviet defender. The cruise missile, and ultimately the stealth bomber and stealth cruise missile, are effectively based on this principle of information denial. The first has a small radar cross-section and a minimal heat signature, and it travels at such a low altitude that it is out of the line of sight of most radars until it is virtually on top of them. Moreover, the "ground clutter" at this altitude saturates the radar with false returns. The radar thus has great difficulty pulling out the real information that indicates the presence of an attacker. Stealth technology further reduces the signature of the cruise missile or aircraft. In effect, air-breathing counter command and control attacks would elevate these tactical advantages to a strategic principle. For a variety of reasons, such weapons would become even more lethal under conventional war conditions. The Soviets might have a very difficult time distinguishing that an attack was under way until it was too late.

I do not wish to seem cavalier about the prospects for success, or the wisdom, of the preceding strategy. But all forms of counter command and control attacks, indeed all major strategic nuclear counterforce attacks, have an unreal quality. Nevertheless, as discussed in Chapter 1, both superpowers had nuclear war plans and force postures to execute counterforce attacks in this period. The threat posed by air-breathing systems to command and control survivability, especially under the conditions of intense conventional conflict, was no less plausible than the threats posited in any of the other strategic nuclear first-use scenarios that have been proposed over the years. And the air-breathing threat to command and control is especially important for our purposes, because an intense conventional air battle makes this threat even more plausible. Given that both the Soviets and the United States took seriously the possibility of extended conventional conflict in the 1980s, it is advisable to examine in detail the special problems such conflict could have created.

In the next section we turn to the question of how NATO would have conducted the conventional air campaign, how successful the campaign might have been, and what consequences it could have had for Soviet strategic early warning capabilities.

The Air War

A comprehensive analysis of the NATO–Pact tactical air "balance" could require a book in its own right. Indeed, one author devoted an entire book largely to an analysis of Pact offensive air operations.[40] Here I will offer an encapsulated description of the conventional wisdom about the pattern (not the outcome) of the air war. This will put the subsequent discussion in some kind of context.

First, it is important to note the numbers of aircraft that would likely have been involved in such a battle. One plausible accounting pits approximately 4400 Pact aircraft against approximately 3200 NATO aircraft in Northern and Central Europe after reinforcement.[41] Though they reveal little about the true balance of aerial capabilities, these figures do give an idea of the magnitude of the battle. By comparison, the entire Israeli air force in the 1973 October War included roughly 300 combat aircraft, and a big U.S. raid during the 1972 "Christmas Bombing" of North Vietnam included perhaps 200 aircraft.

A plausible 1980s scenario looks something like this. The Pact would have gotten in the first blow, starting with an independent air operation in which hundreds, if not thousands of fighter bombers, fighter escorts, and bombers would have hurled themselves at NATO's airfields, nuclear storage sites, air-defense missiles and radars, and perhaps ports, railroads, and bridges.[42] The Pact might have had some tactical surprise advantage, although given the size of this operation and the time it would take to assemble the aircraft into mutually supporting packages, the surprise was unlikely to have been great.

During the initial hours of this attack (perhaps the first forty-eight hours) NATO air planners would not have expected to have authority to cross into Warsaw Pact airspace. Therefore, many multipurpose fighter-bomber aircraft such as F-16s and F-4s were likely to have been used in an air-defense role during this phase of the air battle, shifting to an offensive bombing role once political authorities gave the go-ahead. By my accounting of the available assets, this procedure could

[40]Joshua Epstein, *Measuring Military Power: The Soviet Air Threat to Europe* (Princeton, 1984).

[41]Lt. Col. D. J. Alberts, *Deterrence in the 1980s: Part II, The Role of Conventional Air Power*, Adelphi Paper 193 (London, 1984), p. 56. Like many official comparisons, this is probably somewhat generous to the Pact, counting some air-defense fighters likely to be held within the Soviet Union against the possibility of nuclear escalation. Additionally, it is my understanding that most published accounts of this kind tend to ignore the fact that there are several dedicated training aircraft in each Soviet air regiment that would probably not be available for combat.

[42]Epstein, *Measuring Military Power*. See also Stephen M. Meyer, *Soviet Theatre Nuclear Forces*, pts. 1 and 2, Adelphi Papers 187 and 188 (London, 1984), pt. 1, pp. 25–27, and pt. 2, pp. 22–24.

have added as many as 1200 defending aircraft to the 500-odd "interceptors" normally counted as NATO's defensive aerial strength in the Northern and Central regions.[43] Thus, by one estimate 2500 Pact attacking aircraft would have gone against 1700 NATO defenders.[44] It is worth noting that the overall 1.5:1 force ratio would not have been grossly unfavorable to NATO, and once surface gun and missile defenses are factored in, the Pact could not have counted on mass to guarantee decisive victory.[45] Indeed, a DOD analysis, which tried to account for the quality of each side's aircraft, suggested a 1:1 ratio of combat potential after thirty days of mobilization.[46]

During the initial phase of the battle the direct help that NATO's air forces could have provided to its ground forces would have come mainly from a relatively small number of close air support and shallow interdiction aircraft, perhaps 750 machines. Once the authority to cross the border was granted, however, and presuming that the "swing" aircraft could be freed from their defensive activities, NATO would have a whole list of missions on the other side of the border.

Battlefield air interdiction (BAI), much favored by the European air forces, delays the movement of tactical and operational reserves toward or in the immediate vicinity of the battlefield.

[43]NATO Information Service, *Nato and the Warsaw Pact: Force Comparisons* (Brussels, 1984), p. 21, provides the stock picture of the unreinforced air balance between NATO and the Pact in the Northern and Central regions. It credits NATO with 500 "Interceptors." Alberts, "Role of Conventional Air Power," p. 56, suggests that after reinforcement NATO would have 250 dedicated air-defense fighters in the United Kingdom and the Central Region, but 1524 "swing" aircraft capable of both bombing and air-defense missions. By my count, NATO had some 570 dedicated air-defense aircraft in the same region, and some 1225 "swing" aircraft. Our totals are nearly identical.

[44]Alberts, *Deterrence*, p. 22. This estimate seems a fair one. Alberts allocates roughly one-half of the Pact dedicated air-defense aircraft in Eastern Europe—Soviet, East German, Polish, and Czech—to escort missions and adds them to his estimate of the Soviet fighter bomber and bomber strength. His method seems sensible, but I suspect that the numbers he attributes to the other side are a little high.

[45]Epstein, *Measuring Military Power*, offers the only thorough analysis of this effort. See esp. Appendix C, pp. 243–245. He concludes that the Soviets will be unlikely to enjoy anything like complete success, even under the relatively favorable assumption that they are able to fly their whole force three times every day, and that the individual aircraft will enjoy rather astonishing accuracy in the delivery of their munitions. On the other side, however, Epstein does assign a perhaps unrealistically high lethality to NATO's air defenses. It would seem that these assumptions balance out. His conclusion is that even after the Pact has flown its force through some sixteen sorties, nearly six days of combat, it will complete only about 44 percent of its counterairfield, counternuclear missions. It thus seems most unlikely that the initial several sorties of the Pact forces will be able in any sense to "shut-down" NATO airfields, or "destroy" NATO's air forces, or win air superiority. Rather, the Pact air effort, depending on how it is allocated, will cause selective trouble in selective areas of NATO capability.

[46]U.S. Department of Defense, *Annual Report to the Congress, Fiscal Year 1989* (Washington, D.C., 1988), chart I.B.3, p. 31.

Offensive counter-air (OCA), favored by most NATO air forces, involves strikes against the airfields that support enemy air operations, especially offensive bombing operations.[47]

Air interdiction (AI), or "Deep Interdiction" as the Americans term it, seeks to delay the movement of large numbers of reinforcements and supplies to the battle area. This would involve strikes against railroads, bridges, and perhaps ports throughout Eastern Europe. For example, the gauge of the Soviet railroads differs from that of the East European and West European railroads. Thus, cargo must be transshipped in the vicinity of the border at special yards, some on the Soviet side and some on the Polish and Czech sides of the border. There are only four major lines going into Czechoslovakia and Poland from the Soviet Union.[48] There are about eight transshipment complexes along the Polish-Russian border.[49] An additional complex serves most traffic with Czechoslovakia and is located at Cierna just inside the Czech border.[50] It is less than fifty kilometers from Mukachevo, the site of a Soviet ballistic missile early warning radar. For fighter bombers traveling at speeds in excess of 1000 km per hour, this distance is insignificant and constitutes virtually no margin of safety. These transshipment points constituted huge bottlenecks in the Warsaw Pact logistics system, and under some circumstances they would have come under major conventional air attack. New attention focused on these areas in the early 1980s as an element in NATO's Follow-On-Forces-Attack (FOFA) initiative.[51] Large numbers of Soviet reserve divisions would have had to move through these yards, and in the event that hostilities had begun before such reinforcement were complete, it is unlikely that the U.S. Air Force, or indeed other NATO air forces, would have wanted to

[47]Federal Minister of Defense, Federal Republic of Germany, *White Paper 1985: The Situation and Development of the Federal Armed Forces* (Bonn, 1985), pp. 28–29. "The capability of attacking the enemy with firepower deep in his territory has long since been a part of the strategy of Flexible Response. This capability includes operations against the enemy's offensive air forces in their operating bases. NATO reserves part of its air forces for this mission."

[48]The major lines into Poland pass through Grodno, Brest, and Lvov in the Soviet Union. See "Thomas Cook Rail Map of Europe" (Peterborough, England, 1983).

[49]U.S. Congress, Office of Technology Assessment, *New Technology for NATO: Implementing Follow-On Forces Attack* (Washington, D.C., June 1987), p. 66, n. 27.

[50]*Jane's World Railways, 1984–1985* (London, 1984), p. 521.

[51]Boyd Sutton, et al., "Strategic and Doctrinal Implications of Deep Attack Concepts for the Defense of Central Europe," in *Military Strategy in Transition: Defense and Deterrence in the 1980s*, ed. Keith J. Dunn and William O. Staudenmaier (Boulder, Colo., 1984), p. 78. fig. 4-1, "Comparison of Air Interdiction Zones," prominently highlights a narrow strip along *both* sides of Polish-Russian and Czech-Russian borders, labeling the areas the "Follow-On Force Attack Interdiction Zone." See also U.S. Congress, OTA, *New Technology for NATO*, pp. 66, 80, 89.

leave these targets alone. It is important to note that this target system effectively straddles the Polish-Russian border and thus might have required conventional air attacks into the Soviet Union.[52] The U.S. Air Force seldom if ever indicated in public any plan or inclination to cross the borders of the Soviet Union during a conventional war. But testimony by the U.S. Navy indicated joint navy–air force planning for just such attacks, and many of the best interdiction targets were on the Soviet side of the border.[53]

To complicate matters further, it is entirely possible that bombers of the Strategic Air Command (SAC) would have been involved in conventional interdiction missions in Eastern Europe. Indeed, SAC's interest in conventional missions for strategic bombers grew in the mid-1980s.[54] "SAC has offices at USAFE and SHAPE to facilitate the tasking of these aircraft."[55] Training for such missions was reportedly under way.[56] The air force was also considering the possibility of attacking these interdiction targets along the Soviet-Polish border with conventional cruise missiles fired from B-52s flying out of bases in North America.[57] The Office of Technology Assessment (OTA) observed, how-

[52]In terms of FOFA plans for attacks against follow-on "fronts," a recent study observes that "the area of these attacks would range from about 17° east longitude to and perhaps across the Soviet border." U.S. Congress, OTA, *New Technology for NATO*, p. 80.

[53]U.S. Senate, Committee on Armed Services, *DOD Authorization for Appropriations for Fiscal Year 1985, Maritime Strategy, Part 8*, 98th Cong., 2d sess., 1984 (Washington, D.C., 1984), p. 3887. In response to questions about navy plans to attack the Soviet homeland with conventional weapons in the event of a conventional war, the former chief of naval operations, James Watkins, responded, "we simulate running strikes into the Crimea, low level strikes across the Black Sea using AWACs and F-15s and naval forces." He went on to discuss the possibility of early attacks against targets in the eastern Soviet Union. "We know where those weaknesses are up in Alekseyevka today. So we might put a carrier strike in there along with the Air Force. We know how to do that. We test that with the Air Force." The statement thus indicates that in principle, the air force, like the navy, does actively plan for conventional strikes into the Soviet Union in the event of war.

[54]See Gen. Bennie Davis, USAF, "Indivisible Airpower," *Air Force Magazine* 67 (March 1984): 46–50; and Edgar Ulsamer, "Bombers for the Battlefield," *Air Force Magazine* 70 (January 1987): 20–24. "SAC intends to allocate more of its heavy bomber fleet to theater operations. This will involve aircraft modifications, changes in training, and acquisition of precision-guided and stand-off weapons" (p. 12). Some allusions to conventional missions for stealth bombers have also appeared. See Richard Halloran, "Stealth Bomber Takes Shape: A Flying Wing and Crew of 2," *New York Times*, 16 May 1988.

[55]U.S. Congress, Office of Technology Assessment, *Technologies for Nato's Follow-On Forces Attack Concept* (Washington, D.C., July 1986), p. 15.

[56]U.S. Congress, OTA, *New Technology for NATO*, p. 138.

[57]Ibid. p. 8. Some seventy B-52s were already committed to conventional missions, but for the most part lacked sophisticated conventional ordnance, especially cruise missiles. See Stephen T. Hosmer and Glenn Kent, *The Military and Political Potential of Conventionally Armed Heavy Bombers* (Santa Monica, August 1987); U.S. Congress, Congressional Budget Office, *US Ground Forces and the Conventional Balance in Europe*, prepared by Frances M. Lussier (Washington, D.C., June 1988), pp. 58, 65–67.

ever, that "long range conventionally armed cruise missiles, like strategic bombers used for this mission, could raise a problem of confusion in wartime. Their use in the conventional role might appear to be escalatory, inducing the enemy to escalate to nuclear weapons."[58] Finally, one Pentagon publication indicated high-level political support for attacks on the Soviet homeland by very accurate long-range conventional weaponry that might be deployed in the 1990s.[59]

Although one cannot read NATO's war plans, it appears that BAI would have enjoyed a high priority, OCA a close second, and "deep" interdiction (AI) would have been of third priority, tied with close air support. In support of these offensive operations, NATO would have tried to suppress enemy air defenses (SEAD) in order to increase the effectiveness and lower the costs of these penetrations into Pact air space. SEAD involves both the destruction of enemy radars, air-defense missiles, and command and control, as well as the jamming of radars and communications within the air defense system. Below we shall return to a more detailed analysis of one aspect of this campaign.[60]

Effects on Soviet Strategic Air Defense

The NATO–Pact air battle could have influenced Soviet confidence in the ability of the VPVO to detect and classify potential strategic attacks in three basic ways. First, the act of waging this war would have

[58]U.S. Congress, OTA, *New Technology for NATO*, p. 96.

[59]The report is not particularly specific as to the exact type of weapon or when it could be deployed, but the general tenor suggests a stealth cruise missile with a conventional warhead. See Commission on Integrated Long-Term Strategy, *Discriminate Deterrence, Report of the Commission on Integrated Long-Term Strategy* (Washington, D.C., January 1988), pp. 29, 45–51. See esp. p. 50. "By the standards of a decade ago, the accuracies are extraordinary. Current technology makes it possible to attack fixed targets at any range with accuracies within one to three meters. These accuracies and modern munitions give us a high probability of destroying a wide variety of point and area targets with one or a few shots without using nuclear warheads. They make practical attacks on heavily defended military targets deep in enemy territory. *Airfields well inside the Soviet Union* [my emphasis] could be put out of commission with warheads designed to attack infrastructure (fuel and maintenance facilities, say) and command-and-control facilities. Bridges, surface-to-air missile sites, intelligence facilities, rail lines, electric generating plants, petroleum refineries—all are suddenly much more vulnerable in the emerging age of smart munitions." See also Carl Builder, *Strategic Conflict without Nuclear Weapons* (Santa Monica, April 1983), which takes an optimistic position on the technical effectiveness of such weapons, their strategic utility, and the unlikelihood that their use against targets in the Soviet Union would prove unduly escalatory. A team of Rand analysts subsequently further developed these ideas. See Carl Builder et al., *The Rand Winter Study on Nonnuclear Strategic Weapons: Executive Summary* (Santa Monica, December 1984).

[60]For a brief but extremely useful introduction to these missions and how they relate to each other, see Alberts, *Deterrence*, pp. 14–15, and pp. 48–49, nn. 12 and 13.

caused a tremendous amount of "noise." Extracting information from the noise would not have been easy. Second, the waging of war inevitably implies the compromise of technology and tactics. This is particularly true in the area of air defense and air attack. Third, NATO's prosecution of the air battle would inevitably have involved lethal and nonlethal attacks on the Pact's ability to detect and classify, as well as defend against, nuclear attacks by tactical aircraft and cruise missiles.

As outlined earlier, it is not unreasonable to suppose that some 6000 to 8000 NATO and Pact fixed-wing combat aircraft would have been engaged in the early stages of a NATO–Pact conflict. This would have created a tremendous amount of electronic noise. As additional sources of confusion, one must add flights by attack and transport helicopters, fixed-wing transport aviation, and reconnaissance aircraft. In the early stages of conflict every platform could conceivably fly twice a day, and some more often than that. As the conflict unfolds, wear and tear on the aircraft reduces sortie rates.

Hundreds of the Soviets' own aircraft would have transited from the Soviet Union into Eastern Europe, and perhaps as far as Western Europe, and back again each day. Their ability to track these aircraft and reliably distinguish friend from foe in this period is doubtful. For example, many analyses of the initial Soviet air operation assume that medium bombers (Backfire, Badger, and Blinder) and long-range fighter bombers (SU-24 Fencer) based in the Soviet Union make an important contribution to the Pact effort. These aircraft would be likely to fly from bases in the Soviet Union.[61] Similarly, Soviet transport aviation would fly many sorties from Soviet air space into Eastern Europe and back every day. Soviet air-defense fighters on the Soviet side of the Russian-Polish border would necessarily have been called upon to defend targets in Poland. Finally, the possibility that NATO aircraft would have crossed into Soviet airspace in small or large numbers cannot be ruled out. At minimum, the odd reconnaissance flight would have crossed the border. Maximally, NATO air commanders would have sought permission to strike the Russian bases out of which Soviet medium bombers and fighter bombers were flying sorties against the west, and the aforementioned transportation choke points. Thus, to improve their performance in the conventional air war, the Soviets would have had to create "fog" for themselves. They would probably have elicited NATO

[61]See, e.g., the Institute for Defense Analysis's briefing on its study "Nato Air Defense," U.S. Congress, House, Appropriations Committee, Subcommittee on Defense Appropriations, *Department of Defense Appropriations for Fiscal Year 1979*, pt. 4, 95th Cong., 2d sess., 1978 (Washington, D.C., 1978), pp. 283, 347. See also Meyer, *Soviet Theatre Nuclear Forces*, pt. 1, p. 26.

retaliation. They could have avoided these problems by limiting combat missions originating in their own territory, but only at some cost to their conventional capability.

The cumulative effect of all this aerial traffic would have rendered the task of classification in real time very difficult. This problem arises quite frequently when Soviet ground-based air defenses are deployed in actual combat. The Egyptians and Syrians had such a difficult time telling enemy from friendly aircraft in the 1973 war that they shot down large numbers of their own planes.[62] NATO planners are privately willing to admit that our own capability to do this is so poor that we shall inevitably shoot down large numbers of our own aircraft. Recall the argument above that strikes as small as 100 nuclear cruise missiles could have reduced the effectiveness of Soviet strategic C^3I to an important extent in this period.[63] It seems quite plausible that as the war unfolded this number would have been below the threshold of what the system as a whole was capable of identifying as "extraordinary."

Tactical and Technical Compromise

As a consequence of fighting the air war, NATO and the Pact would have learned a good bit about each other's hardware and tactics. The utility of this information depends a great deal on the speed with which it can be collected and exploited. The West has a demonstrated capability in this regard.[64]

The importance of capturing hardware is well known. The United States has long enjoyed, by way of Israel, and now Egypt, relatively privileged access to important items of Soviet equipment in good working order. For example, several Soviet fighter aircraft, including the MiG-23—the mainstay of Soviet air-defense fighters in Central Europe, are operated by the U.S. Air Force as training aircraft. Soviet air-defense missiles captured by Israel in 1973 were made available to the United

[62]Chaim Herzog, *The Arab-Israeli Wars: War and Peace in the Middle East* (New York: Vintage, 1984), p. 311.

[63]Here I am reasoning from the low end of the thirty to seventy-five bunkers estimated to be in the Moscow area. See n. 4 above.

[64]The U.S. Air Force was able to modify substantially its tactics and improve its performance in the eleven-day Linebacker Two bombing campaign against North Vietnam in 1982. See Brig. Gen. James R. McCarthy and Lt. Col. Robert E. Rayfield, *Linebacker Two: A View from the Rock*, USAF Southeast Asia Monograph Series, vol. VI, no. 8 (Maxwell Airforce Base, 1979), pp. 79–96. "ECM (electronic counter measure) tactics were changed significantly. Analyses of the ECM tests conducted in the States, plus additional reconnaissance information on enemy frequencies and techniques, gave the EWO's (electronic warfare officers) ideas on how their equipment could be used more effectively to degrade the defenses" (p. 121).

States for exploitation. In a NATO–Pact war important equipment is bound to fall into NATO's hands. Soviet fighter aircraft will crash in NATO territory, and it seems quite likely that their electronic equipment will prove of great interest to the United States. One can imagine, for example, how useful it would be to have a working Soviet IFF (identification friend or foe) device.[65]

Militarys do not like their best weapons to fall into enemy hands. During the 1982 Israeli war in Lebanon a Soviet Sa-8 surface-to-air missile apparently shot down an Israeli F-4 specially configured for attacking ground defenses. The Israeli Air Force wasted no time in ordering an immediate attack on the wreckage of the aircraft to prevent any of its electronic equipment falling into Soviet hands.[66] A critical feature of all modern Western electronic countermeasures equipment is "threat responsiveness." The devices are built in such a way that information gleaned from the battlefield can be quickly exploited tactically. According to one source, the United States began to install an "onboard active electronic countermeasures system" in its cruise missiles in 1982.[67]

Intense air combat in Central Europe would also provide tactical information to the West, not only on how air defenses work in Eastern Europe but about air defenses in the Soviet Union.[68] As the remarkably detailed accounts of its behavior during the KAL-007 incident show, Western intelligence means have the ability to extract a tremendous amount of information from an activated air-defense system. This one incident seems to have provided reams of useful information to the U.S. military.[69]

An air war over Eastern Europe would have activated the Soviet air

[65]In general, such systems do not work very well in any case, which is one reason why NATO officers believe that the Alliance would shoot down many of its own planes.

[66]"Soviets Order Sa-8s into Action in Bekaa after Israeli Successes," *Aviation Week and Space Technology*, 9 August 1982, pp. 18–19.

[67]"USAF Planning Stealth Cruise Missile," *Aviation Week and Space Technology*, 8 November 1982, pp. 18–21. A flurry of concern about the effectiveness of the cruise missile against developing Soviet air defenses erupted in 1982 and 1983. The upshot of this concern was the decision to add a countermeasures package to the forces deployed and to slow deployment of the current generation of cruise missiles in expectation of getting a "stealth" version soon. It is unclear whether this concern was warranted, how quickly stealth can be deployed, and whether it is needed. For a good discussion of these issues, see Michael Gordon, "Pentagon's Shift on Cruise Missiles Leaves Big Contractors Scrambling," *National Journal*, 26 March 1983, pp. 644–647. As the text of this essay indicates, I am skeptical that these weapons would have serious problems penetrating Soviet air space.

[68]Of course this cuts both ways; the Soviets will learn a lot about NATO's capabilities, but this would have fewer implications for U.S. strategic nuclear forces.

[69]See, e.g., Richard Halloran, "Soviet Air Defenses Rigid," *International Herald Tribune*, 19 September 1983; Shribman, "Experts Say Soviets Had Failed"; William Beecher,

defenses on a regular basis, under stressful conditions, in circumstances where the Soviets would have been more inclined to use everything they had out of fear that any given penetration could be particularly lethal. One practice that air-defense organizations like to pursue is to keep some of their radars mobile and some dormant so that the adversary lacks a complete picture of how well a given piece of terrain is surveyed. Constant "tickling" of Soviet air defenses would have forced these radars to emit, providing information that U.S. strike planners would have used to develop the best (which is to say, least defended) routes into the Soviet Union. The GLCM system was designed with the capability to plan strikes that exploit this kind of information.[70]

Of course, the effectiveness of NATO intelligence in gathering this information and the dispatch with which it may be exploited ought not to be overestimated. The fog of war would have had to affect NATO as well. Intelligence and deception operations in war are as competitive as the enterprise as a whole. One side may do better than the other in these efforts, and that side might not have been NATO. Nevertheless, the circumstantial evidence suggests that the United States was particularly well placed technically, organizationally, and geographically for an intelligence competition of this kind. The possible effects of U.S. success in this endeavor ought to be considered.

Direct Suppression of Enemy Air Defenses

To aid the offensive operations of its tactical air forces, NATO would have attacked Warsaw Pact air defenses, especially ground-based radars and missiles. This would include efforts to jam Pact radars and communications, and efforts to destroy Pact radars, surface-to-air missile launchers, and, perhaps, command and control installations.

Although it is difficult to extract the details of how these operations would have been conducted, it is probably fairer to view SEAD as actions taken to aid other offensive aircraft than as an independent campaign to win *theater* air dominance. Initial defense suppression operations within about one hundred kilometers of the forward edge of the battle area (FEBA) probably would have taken the form of a

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"Tracking Flight 007: What Really Happened?" *Boston Globe*, 4 December 1983; "Flight 007," *The Economist*; and Clarence A. Robinson, Jr., "US Says Soviets Knew Korean Air Lines 747 Was Commercial Flight," *Aviation Week and Space Technology*, 12 September 1983, pp. 18–21.

[70]Both the Air Force GLCM and the Navy SLCM have this capability. On GLCM, see Walter Pincus, "Pershings Packed to Go," *Washington Post*, 16 October 1983; on the SLCM, see Miles Libbey III, "Tomahawk," *US Naval Institute Proceedings, Naval Review* (1984), pp. 150–163, esp. pp. 158–160.

deliberate, concentrated campaign to win at least local air superiority. SEAD operations deeper in Eastern Europe would have suppressed point defenses in support of particular attacks.

Weapons. The NATO alliance had a number of important weapons dedicated to or useful for the SEAD mission. The best-known weapon was the U.S. F-4G Wild Weasel aircraft, a variant of the F-4 specially configured for SAM hunting and killing. During most of the 1980s the main weapon of the F-4G was the Shrike antiradiation missile, which homes on radar emissions. This weapon demonstrated many shortcomings in Vietnam, and hence, toward the end of the decade, it began to be replaced by a combination of the new, and supposedly far more capable, HARM (high-speed antiradiation missile), and the imaging infra-red Maverick, which homes on the heat generated by SAM ground-control equipment. The United States has maintained a force of about one hundred Weasels since the end of the Vietnam war. Each Weasel tends to operate with a standard F-4 (or other tactical fighter, usually an F-16) as a partner, to facilitate the delivery of more ordnance (including standard bombs, cluster munitions, unguided rockets, and even precision-guided munitions) against the air defenses. Other NATO allies lack the F-4G but have the capability to configure some of their standard fighter aircraft to attack SAMs. I assume that 60 percent of the U.S. Weasel force, sixty F-4Gs and sixty accompanying F-4Es, would have been allocated to the central front, although given the high concentration of air-defense assets there, it is entirely plausible that nearly all would have been deployed to Europe. Thus this analysis is conservative.

Another possible air-defense suppression platform would have been the first F-117 stealth fighters, then in production at Lockheed, and first based at Nellis Air Force Base in Nevada.[71] Such aircraft are ideal air-defense suppression weapons, since they are far less detectable to Pact radars than the F-4G Weasel. Thus, the SAM operators might be unable to shut down their radars to avoid antiradiation missile lock-on until too late. Because of its smaller radar signature, a stealth Weasel would have more time to survey a given area for emitters and could conceivably take greater care in setting up an attack. Indeed, it seems plausible that stealth aircraft would not aim for radars at all, but for the launch-control

[71]John H. Cushman, "Air Force Lifts Curtain, a Bit, on Secret Plane," *New York Times*, 11 November 1988, p. A27. Fifty-two of fifty-nine planes scheduled had been delivered by late 1988, although two had crashed. According to the article, "the plane is designed to elude detection by radar, and its job is to penetrate enemy territory and destroy a few especially important targets, such as command posts, during a war."

vehicles or vans. These often have a high infrared signature and would be ideal targets for Imaging Infrared Maverick missiles. These vans are fragile and expensive and, when they are hit by the powerful armor-piercing warhead of the Maverick, will be much harder to repair or replace than radar antennae. Thus the overall effectiveness of stealth aircraft attacks may be higher than those of a standard Weasel with antiradiation missiles.

Circumstantial evidence supports the hypothesis that defense suppression is one mission of the stealth aircraft. The F-4G was already an aging platform in the 1980s, and the size of the force remained around one hundred for most of the period. (Indeed, as of publication there are still about one hundred F-4Gs.) In spite of constant worry about the lethality of Soviet air defenses in Eastern Europe during the 1980s, the U.S. Air Force put little impetus into finding a replacement for the F-4G. Both the F-15 and the F-16 could have been adapted to this mission had the air force cared to do so. I deduce that little effort went into a conventional aircraft upgrade because the stealth fighter was expected to conduct at least part of the defense-suppression mission.[72]

Many air-defense sites are either fixed or moveable only with some difficulty. It would not necessarily have required the real-time, onboard radar-detection capability of the Wild Weasel to attack them. Specialized low-level attack aircraft like the F-111 and the European Tornado would have been quite useful in these missions. The F-111 was used very effectively in this way in Vietnam.[73] By my count, NATO had about 430 such aircraft available in the Central Region by the second half of the decade.[74] I assume that 60 would have been allocated to SEAD activities.

[72]As this book goes to press, information on the employment of the F-117 stealth fighter in the U.S. air campaign against Iraq in January and February of 1991 is beginning to appear. The F-117s were generally operated in small groups, at night, against very high value targets, including those associated with the Iraqi air defense system. Gen. Merrill McPeak, Chief of Staff of the U.S. Air Force, summarized the F-117's contribution to the first night's air attacks: "Our stealth aircraft, low observable aircraft, which these Iraqi radars could not see, jumped off at H-Hour, actually slightly before H-Hour, and blinded the Iraqi early warning system by knocking out these radars, and then proceeded on into Iraq to begin to work on the rest of the strategic targets—principally the command and control apparatus, the fighter defense direction system, and so forth." Later he added, "They also attacked key parts of the air defense system throughout Iraq." See "The Air Campaign: Part of the Combined Arms Operation," DOD News Briefing, 15 March 1991, 2:00 P.M., transcript, p. 4.

[73]Gen. William W. Momyer, USAF, *Airpower in Three Wars* (Washington, D.C., 1978), pp. 239–241.

[74]My count: 140 U.S. Air Force F-111E/F, 108 RAF Tornados, 108 German Air Force Tornados, and 72 Germany Navy Tornados. See IISS, *Military Balance, 1987–1988*, country entries. I have counted only aircraft that appear to be in combat squadrons; training aircraft and attrition fillers would increase the total.

Finally, the United States deployed specialized electronic reconnaissance and electronic warfare aircraft. The TR-1 variant of the U-2 spy plane was equipped with devices to locate threat radars, as was the TEREC equipped RF-4 reconnaissance version of the F-4 fighter. Both of these aircraft had some real-time capability to communicate the information they gather. Compass Call, a C-130 transport loaded with electronic gear, was designed to jam enemy communications. Gen. Wilbur Creech, formerly commander of the U.S. Air Force Tactical Air Command, called this aircraft "the world's greatest force subtractor" because of its ability to break down the cohesion of the Soviet air defense network in Eastern Europe.[75] The EF-111, a jammer-equipped version of the F-111, was designed to degrade the performance of Pact early warning radars. Although contractor claims must be taken with a grain of salt, Grumman has repeatedly asserted that "a force of 5 EF-111As could radiate enough power to affect most of Warsaw Pact's air defense radars from the Baltic to the Adriatic."[76] The United States planned to buy forty-two of these aircraft, and some were deployed in Europe during the 1980s. EF-111s and Weasels work together. When early warning radars are jammed, SAM operators are forced to rely on the shorter ranged engagement radars at the battery level to acquire their targets. Once these are turned on, the Weasel knows where they are and has a much better chance of getting a "lock-on" with a Shrike or calling in a "dumb bomb" or precision guided munition (PGM) attack by another aircraft.

Tactics. As suggested above, NATO's defense suppression aircraft would not simply have been sent forth to destroy air defenses. Air-defense suppression would probably have been conducted in two different patterns. The bulk of the suppression assets would have opened corridors in Pact air defenses along the NATO–Pact border through which large numbers of attacking aircraft would penetrate and then fan out to conduct a variety of attacks. Pact ground defenses would have been densest where Pact divisions were concentrated, and in wartime this tends to be close to the border. Even here, SAMs are not distributed equally, and NATO planners would have looked for places where the

[75]"An exclusive AFJI interview with General Wilbur L. Creech," *Armed Forces Journal International*, January 1983, p. 32. "When it flies along on our side of the border and turns on all those jammers, he won't be able to talk Mig-to-Mig, Mig-to-ground, ground-to-Mig, and we even can jam some of his SAM links. This gets us into his C^3 nervous system. That disrupts anybody; it certainly gives us fits. It will do even more violence to him because he is so dependent on his rigid command and control system."

[76]Martin Streetly, *World Electronic Warfare Aircraft* (London, 1983), pp. 69–70.

adversary was thin on the ground, and where the terrain would help mask low-flying aircraft from ground-based radars. Rough terrain inhibits high concentrations of ground forces and also helps mask the attacker. Thus, a look at a map reveals some of the likely places that NATO might have conducted these operations. In the northern sector (Northag) the Harz Mountains look lucrative, although an end run across the Baltic also seems plausible. In the southern sector there is much rough terrain, although the East German–Czech border area appears to have been favored.[77]

These corridors could not be kept permanently open. Rather, they would be opened as needed. Once the adversary figured out the game, he might have strengthened his defenses in the exploited areas. NATO planners might have continued to view them as lucrative corridors and simply tried to destroy the reinforcing SAMs. Alternatively, NATO planners would have shifted to other corridors.

In a small number of cases suppression would have been conducted in direct support of offensive air attacks against particular high-value targets deep in the enemy rear. Some high-value targets such as bridges, railroad marshaling yards, and fighter bomber bases are often surrounded by dense defenses. Weasels and EF-111s might accompany a group of bombing aircraft into a particular target area, supplementing the self-protection electronic countermeasures customarily deployed on NATO's most modern aircraft. Direct suppression of local defenses not only lowers the attrition that attackers suffer but increases their effectiveness. For example, many modern precision-guided air munitions, including television-guided bombs and laser-guided bombs, require excessive exposure in the optimal engagement envelope of surface-to-air missiles in order to acquire and lock on to the chosen target. The presence of Weasels and EF-111s could buy a "window" for the effective delivery of these weapons.

Effectiveness of the Campaign

At the outset I argued that from the Soviet perspective cruise-missile flight times to critical targets may have to be measured from the Polish-Russian border, if the SEAD campaign is effective. To examine how effective the campaign might be, I have designed a simple model that

[77]U.S. Congress, House, Armed Services Committee, *Department of Defense Authorization of Appropriations for Fiscal Year 1984, Part 3, Statement of General Lawrence Skantze*, (98th Cong., 1st sess., 1983 (Washington, D.C., 1983), pp. 1088–1090, offers a series of maps to illustrate the pattern of Western air operations. Major penetrations are shown in the Czech–East German border area and from the Baltic.

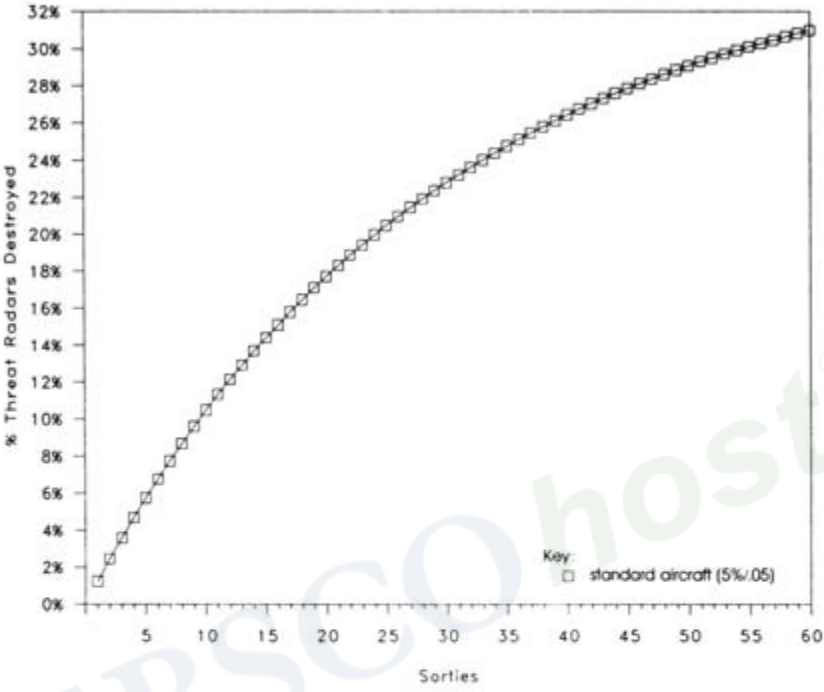
can be run on a Lotus 1-2-3 or Symphony spreadsheet package. I have run excursions with the 180 standard aircraft enumerated above against a 2200-radar target set in East Germany, Poland, and Czechoslovakia. I have also run excursions with the addition of 50 stealth fighters. Appendix 1 explains how this target set was developed. I would argue that it is a conservative number for the period in question. A variety of assumptions about the effectiveness of Pact air defenses against NATO SEAD aircraft, and the effectiveness of the SEAD aircraft against the target set, are tested. The values employed are, again, conservative in my estimation. I run the force through sixty-two attacks against the target set. Enthusiasts are often willing to claim that NATO can fly three sorties a day in the initial stages of combat. Historically, two sorties a day has been achieved for as long as three weeks.[78] If one believes that initial Soviet air attacks would have done much damage to NATO air bases, then perhaps a sortie a day is more plausible. My personal judgment is that for the sophisticated aircraft involved in SEAD, and given some adversary success in airfield attack, two sorties a day is a good estimate.

For purposes of discussion, and consistent with my personal judgment, table 2.1 represents NATO's progress in the SEAD campaign after two and four weeks of combat. Even under *highly conservative* assumptions (see Appendix 1) of 5 percent attrition and a low .05 probability of kill (pk) per shot, nearly a quarter of the adversary's radars are destroyed in two weeks; nearly a third, in four weeks. Under the conditions that I personally find most plausible, 4–5 percent attrition and .1 pk, half the threat is destroyed in two weeks and nearly all of it in four. Figure 2.2 shows the effects of adding 50 stealth aircraft to this campaign, assigning each one four munitions with a .25 pk and subjecting that force to only 2 percent attrition per sortie. This boosts performance of the entire force to 60 percent destruction of the Soviet radar network in two weeks, and virtually all of it in four.

One must, of course, qualify the implications of this analysis. This is a model of combat, an abstraction from reality. It does not tell us exactly how things would have gone; it gives us a general idea of how they might have gone. This is a simplification, in that it does not fully capture the tactics outlined above; it does not account for destruction of ground-based SAM equipment other than radars; it does not include the effects of radar or communications jamming, either NATO's or the Pact's; it

[78]See Alberts, *Deterrence*, p. 52, n. 60, for sortie rate estimates. See Trevor N. Dupuy, *Elusive Victory: The Arab-Israeli Wars, 1947–74* (New York, 1978), pp. 549–550.

Figure 2.1. Suppression of Pact air defenses, conservative case (180 ac/2200 radars)



does not capture attacks against major command and control installations; it does not account for the very strong possibility that NATO would try to destroy surface-to-air missile stocks. Thus, the model "sheds light" rather than predicts outcomes. But these results are broadly consistent with other assessments of the probable course of a SEAD campaign. A 1987 OTA study suggested, "It is expected that Warsaw Pact SAMs and interceptors will be increasingly (but not completely) suppressed as a war progresses."[79]

Even given these caveats, however, the implications are striking. The application of a relatively small (albeit highly specialized) portion of NATO's tactical air capabilities against the Pact air-defense system could, in two to four weeks, have torn sizable holes in the air defenses of Eastern Europe and thus caused substantial worries for the Soviet

[79]U.S. Congress OTA, *New Technology for NATO*, p. 149.

Table 2.1. Model results: 180 SEAD aircraft

Percentage of threat radars destroyed after 28 sorties

NATO munitions effectiveness[b]	NATO aircraft attrition rate[a] 5	4	3
.05	22	24	27
.1	45	50	54
.15	71	77	83

Percentage of threat radars destroyed after 62 sorties

NATO munitions effectiveness[b]	NATO aircraft attrition rate[a] 5	4	3
.05	31	37	44
.1	70	82	96
.15	120[c]	138	157

[a]NATO's loss rate at the beginning of the campaign. The model reduces this loss rate as it destroys Pact radars on the assumption that the effectiveness of the whole system declines as pieces are lost. See Appendix 1.

[b]The probability of kill per shot. I assume that each aircraft that successfully penetrates takes four shots against the enemy. This obscures the fact that Tornados and F-111s on low-altitude sorties might simply drop an entire load of bombs on a single large fixed radar.

[c]Killing more than 100 percent of the threat is an artifact of the model, which continues to cycle the force showing its potential kills even after the notional threat is destroyed. I have included these numbers to show how much "insurance" there is in case the adversary diverts additional air-defense assets from other theaters.

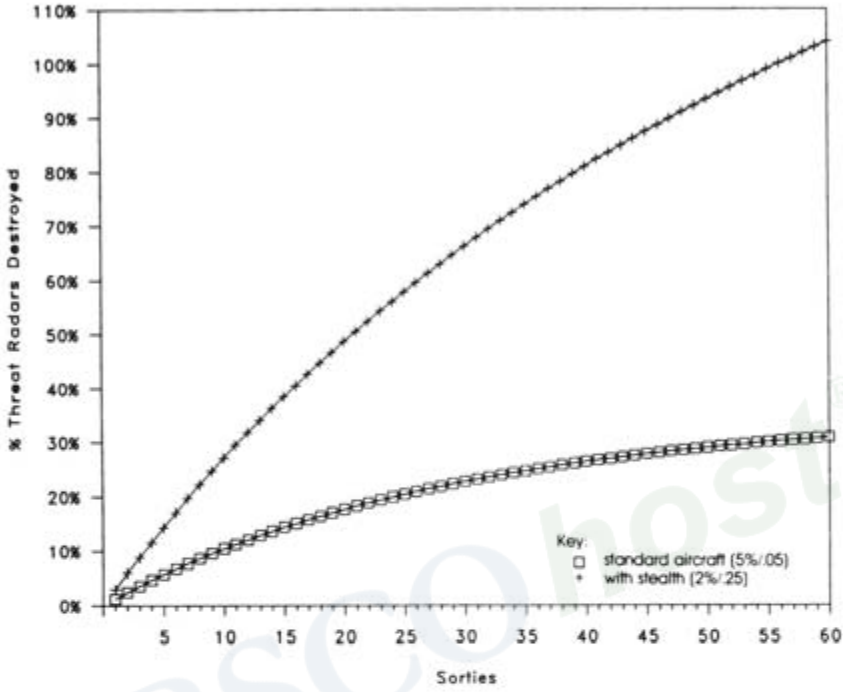
air-defense planner.[80] These worries would have been magnified if, as suggested earlier, NATO air commanders were to receive permission to mount regular conventional attacks into the Soviet Union against high-value assets such as medium bomber and long-range fighter-bomber bases and railroad junctions and transshipment points.[81]

The "real" degradation in the hardware of the air-defense system of

[80]Surveillance radars and fire control radars are lumped together as a single target set in the model. But only early warning, height finder, and ground control intercept, and target acquisition radars, by my crude estimate only 600 surveillance radars, about a quarter of the total, can plausibly be assumed to be netted into the Soviet strategic air-defense system. Thus, their destruction would exert disproportionate effects on Soviet early warning capability. Similarly, NATO's jamming aircraft focus on the disruption of these systems, further exacerbating the strategic warning problem.

[81]Another possibility exists, which I hesitate to term "inadvertent" escalation. As discussed in a subsequent chapter, one of the many reasons the U.S. Navy has advanced to support its wish to attack Soviet SSBNs is "counterforce coercion," the alteration of the strategic nuclear "balance" by direct conventional attacks on Soviet strategic nuclear assets. One cannot ignore the possibility that plans exist, or that in the event of war the suggestion will be made, for deliberate conventional attacks on Soviet strategic nuclear

Figure 2.2. Suppression of Pact air defenses, stealth contribution



the Warsaw Pact must be combined with our understanding of the other problems discussed above to assess the overall position of Soviet air defenses after two to four weeks of combat. The confidence of the Soviet air-defense commander in his system's ability to detect and classify cruise-missile attacks of the kind outlined early in this essay is unlikely to have been high. Moreover, as he saw the West exploiting the knowledge gained in the course of the battle to lower the overall effectiveness of the Pact air-defense effort, his thoughts would have turned to NATO's assessment of the remaining Soviet early warning and defense potential. He would have wondered if the West perceived itself to have the capability to decapitate Soviet strategic forces. Finally, he would have been looking for signs and indicators that the West was moving in this direction. The tendency to give any ambiguous

assets. Soviet missile early warning radars on the Soviet periphery would be vulnerable to such attacks. The purpose would be to reshape Soviet calculations of the strategic nuclear balance to encourage them to "back down." This would be a high-risk strategy.

intelligence the benefit of the doubt, already lowered by the simple fact of open conflict, would have further deteriorated. What factors would have influenced how the Soviets interpreted this situation?

Soviet Attitudes toward Theater Nuclear War

The study of Soviet military thought is a specialized field. Here I make no pretense to expertise in this field. Rather, I draw extensively, if critically, on the reporting of those who are experts.[82] According to most students of Soviet military doctrine, its most striking feature through the 1980s was its emphasis on the offensive. This was true whether conventional or nuclear weapons are discussed. Soviet strategy for war against NATO was no exception.

The Soviets were keenly concerned over the threat that NATO's theater nuclear weapons posed to the Soviet armed forces and to the Soviet state. One could argue that this concern focused on two problems. First, in the event of war, the Soviets would have liked to destroy NATO's military power on the Eurasian land mass, and to do so without suffering the wholesale destruction of its own military forces.[83] Thus NATO's theater nuclear forces were an important obstacle to the achievement of their offensive military objectives.[84] Second, the Soviets were concerned that some NATO theater capabilities, especially the Pershing II, the GLCM, and the U.S. Navy sea-launched cruise missile (SLCM) provided NATO with important offensive options against the strategic nuclear forces of the Soviet Union.[85]

[82]It is necessary to proceed with some caution, however, because, as in any field, there are disputes among the experts. Moreover, because the experts have incomplete access to Soviet sources, because Soviet sources have their own peculiarities, and because nonexperts (especially the majority who do not read Russian) cannot always review the sources cited by the experts, one must maintain a healthy skepticism in reading this literature.

[83]Lebow, "Soviet Offensive in Europe."

[84]Meyer, *Soviet Theatre Nuclear Forces*, pt. 1, pp. 18–19.

[85]Though they must be understood as part of the public relations campaign against NATO's long-range theater nuclear forces (LRTNF) modernization, numerous statements to this effect can be found. See, e.g., the interview with Arbatov conducted by *Der Spiegel*, 24 October 1983, pp. 154–161, translated in Foreign Broadcast Information Service (FBIS), Daily Report, Soviet Union, 26 October 1983, esp. AA13-14, the article by Col. General Chesnokov, first deputy commander in chief of the USSR Air Defense Forces, "Preparedness in the Interest of Peace," Bratislava *Pravda* 1 April 1983 (FBIS, Daily Report, Soviet Union, 6 April 1983, p. v1); and the remarks of General Gribkov, chief of staff and first deputy commander in chief of the Warsaw Treaty Joint Armed Forces, in *Neues Deutschland*, 10 December 1983 (BBC Summary of World Broadcasts, EE/7514/A1/1, 12 December 1983). These and many other statements by Soviet soldiers and political officials stressed the first-strike potential of the Pershing II and GLCM. Remarks by military leaders also tended to stress the requirements for a huge increase in the readiness of Pact air-defense

The Soviet answer to NATO theater nuclear forces was the development of two major offensive options. First, the Soviets substantially improved their conventional air attack capability against NATO's theater nuclear infrastructure. The Soviets envisioned at least a phase of conventional conflict in any war, but they still seem to have viewed the probability of nuclear escalation as high and wanted to be in an advantageous military position should the occasion arise. Hence, they would try to destroy NATO's nuclear weapons without themselves using nuclear weapons.[86]

Although the Soviets hoped to destroy NATO's nuclear capability conventionally, they still seem seriously to have doubted their probability of success. They feared nuclear escalation, and they hoped to be the first to use nuclear weapons *decisively*. Here, analysts of current Soviet beliefs found real tensions.[87] On the one hand, the Soviets appeared to plan seriously on an extended conventional phase of conflict. At the same time, however, the Soviets thought it essential to get in the first telling nuclear blow. Stephen Meyer suggests that since NATO nuclear doctrine seems to have planned on an initial demonstrative use of nuclear weapons, the Soviets may have hoped to get in the first decisive blow, even if NATO used nuclear weapons first.[88] It seems unlikely, however, that after several days or weeks of intense conventional conflict, Soviet intelligence could easily distinguish between NATO preparations for a limited or for a general nuclear strike. If the Soviets believed what they said about the advantages of the first blow in a theater nuclear exchange and they believed that escalation was all but inevitable, it is unlikely that they could have fine-tuned their analysis of what kind of nuclear strike any disparate intelligence indicators suggested NATO had in preparation. Far more likely under these conditions is a tendency to assume the worst. It thus seems quite plausible that developments of the kind discussed earlier would have further exacerbated an already strong propensity for nuclear escalation. Moreover, the expectation of these kinds of developments might have been a key driver in the Soviet decision to launch its conventional preemption.

Finally, we are left with an unresolved tension in Soviet doctrine in this period. If they really expected nuclear escalation and they believed the first nuclear blow to be so decisive, then why engage in this elaborate

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forces as a consequence of the new deployments. Of course, the nuclear SLCM causes similar kinds of problems, with the exception that it is harder to preempt.

[86]Meyer, *Soviet Theatre Nuclear Forces*, pt. 1, pp. 21–27; Phillip A. Peterson and John G. Hines, "The Conventional Offensive in Soviet Theater Strategy," *Orbis* 27 (Fall 1983): 695–739, esp. 705–711.

[87]Meyer, *Soviet Theatre Nuclear Forces*, pt. 2, pp. 32–38, lays out these issues very well.

[88]Ibid., pt. 1, pp. 27–30.

conventional phase at all? Does not the fact that they would devote so many resources to this effort indicate that they did not want to use nuclear weapons at all? These questions are difficult to answer. My own hypothesis is that the Soviet military tried to deal with a fundamental problem—Soviet civilians showed no sign of willingness to reach for nuclear weapons until they believed that all other options were closed to them. This development would parallel what has occurred in the West. At the same time, however, Soviet civilians and soldiers probably understood that a superpower conventional conflict does have a huge potential to escalate. Thus, their well-known caution in all superpower confrontations is explained. At the same time, however, should they be forced into war, they would have striven first for conventional victory. Failing that, they *hoped* to set the terms of the subsequent nuclear war. They did what they could in terms of planning and procurement to assure this. But, in the actual event, they would have had a very difficult time, and they probably knew it.

What Kind of Soviet Response?

Command and Control Adaptation?

Although, as discussed below, nuclear preemption was one possible Soviet reaction to the kinds of events I have outlined, there were other possible responses, not so immediately horrible but nevertheless creating the potential for subsequent catastrophe. If the Soviets had initiated any conventional attack, their nuclear forces would already have been brought to a high level of alert. They would have been on guard for any signs that NATO was "going nuclear." Indicators to that effect could have precipitated *even higher* levels of alert, which could have included limited and/or contingent diffusion of launch authority down the chain of command. Although the evidence suggests that the Soviet political leadership was firmly in control of its military and utterly committed to retaining the decision to use nuclear weapons in its own hands, we cannot know what kinds of procedures the Soviets may have worked out to govern circumstances like this one. Nor can we be sure that if and as stress were put on the Soviet early warning system, relatively clear delineations of authority would not have been muddied. Finally, we probably could not have maintained sufficient discrete control over our own military operations around the Soviet periphery, and over the Soviet ability to detect and interpret these operations, to have ensured that we did not inadvertently trigger a series of procedures

that would temporarily place the authority to launch nuclear weapons in the hands of either a lower-level civilian official or a military officer frightened or angry enough to use the weapons.

Thus, the Soviets had options short of nuclear preemption that would have had the effect of substantially complicating a deliberate U.S. "decapitation" attack. But the options were risky in and of themselves, and it might have been in NATO's interest to forgo military operations that could prompt the Soviets to alter their apparently strict preference for firm civilian control over nuclear weapons.

A Theater Nuclear Operation?

The Soviets had two fundamental choices as to how to use nuclear forces to deal with the problems outlined above. Generally, students of Soviet nuclear doctrine and planning believed that the Russians would have used nuclear weapons in large numbers, to achieve decisive results.[89] Meyer suggests a NATO target set of roughly 285 air, naval, and army bases, nuclear storage sites, logistics installations, and C^3I.[90] Prior to the INF agreement of December 1987, SS20 intermediate-range ballistic missiles would have been the preferred weapon for such a strike. Once the INF agreement began to eliminate these weapons, the Soviets had a host of others to replace them. SLBMs or ICBMs could have been targeted against Europe, as could the new generations of Soviet air- and sea-launched nuclear cruise missiles. Others who tried to develop target sets for a Soviet conventional preemption, or who simply tried to track NATO's nuclear-related installations, came up with similarly large numbers.[91] Thus, from the perspective of Soviet doctrine, Soviet weapons, and NATO targets, the ingredients existed for a massive Soviet nuclear preemption.

It would be a mistake, however, to leave the argument at this point. States are not bound to do in war that which is revealed by their prewar military planning—much less their publicly stated military doctrine. And it is the latter source from which inferences about Soviet military

[89]See, e.g., Dennis Gormley, "Understanding Soviet Motivations for Deploying Long-Range Theater Nuclear Forces," *Military Review* 61 (September 1981): 20–34, esp. pp. 23, 33; also, Douglas and Hoeber, *Conventional War and Escalation*, p. 41; Meyer, *Soviet Theatre Nuclear Forces*, pt. 1, p. 30.

[90]Meyer, *Soviet Theatre Nuclear Forces*, pt. 2, p. 24.

[91]Epstein, *Measuring Military Power*, pp. 174, 191–201, comes up with 250 major command and control, nuclear storage, and airfield targets in Germany alone, plus numerous other targets. William Arkin has discovered what he believes to be "241 nuclear-related facilities" in Germany alone; William M. Arkin and Richard W. Fieldhouse, *Nuclear Battlefields: Global Links in the Nuclear Arms Race* (Cambridge, Mass., 1985), p. 236.

strategy were drawn. Before World War II the RAF preached a doctrine of massive city bombing. Yet civilians would not permit this activity in the early months of the war. Although we were fortunate to have no test cases, President Eisenhower generally displayed great caution whenever it appeared that his pledge to "treat nuclear weapons like any other" might be called into effect. The actual first use of nuclear weapons is going to be a big decision. This essay has argued that by the time the Soviets reach that decision, fear rather than greed may have been the primary motive. It is not utterly inconceivable that Soviet leaders would have looked for some compromise between their military's general commitment to "massive" use and a last hope of avoiding general thermonuclear war. Although the data is poor, it does suggest that a more "limited" (although still rather large) attack might have succeeded in pushing the perceived danger back from the Soviet border.

For example, the Soviets might have improved their position with the destruction of the bulk of NATO's most capable offensive tactical aircraft, and some associated command and control. The Soviets might even have found it advantageous not to run the risk of a British or French national nuclear response and avoided their territory. The strike might thus have been limited to major installations in Belgium, the Netherlands, and the Federal Republic of Germany; nine F-16, F-4 and Tornado bases where nuclear weapons appear to have been co-located with the aircraft, and perhaps two dozen command and control facilities associated with NATO's offensive air campaign and with the coordination of nuclear strikes originating in these three countries. Perhaps a dozen GLCM, Pershing I, and Pershing II base areas would also have been struck.[92] In all, it does not seem unreasonable to argue that the nuclear destruction of some thirty or forty targets would have bought the Soviets a cushion against the possibility of the kind of "surprise" attack discussed above. Much of the fog of air war could have been pushed back from the Soviet borders, and many, but by no means all, of the capabilities for launching the kind of nuclear attack discussed above could have been eliminated. Finally, if the war has gone on for several weeks, the Soviets might have been able to mount this attack with forward-deployed short-range missiles (SS-21, SCUD) or fighter bombers, such as the SU-24. A Soviet planner might have seen these

[92]See Arkin and Fieldhouse, *Nuclear Battlefields*, pp. 215–216, 227, 236–245 for GLCM, Pershing, and aircraft bases. Until the INF agreement entered full effect, three to four GLCM bases, and nine Pershing I and II facilities would likely have been included in this target set. Command and control targets are hard to estimate; one could include hundreds. Ibid., p. 104 (map) shows roughly two dozen in the three countries. Epstein, *Measuring Military Power*, p. 196, shows roughly three dozen major sites in the same area.

forces as safer to use than forces based in the Soviet Union, since they would have been less likely inadvertently to trigger U.S. strategic nuclear early warning systems. Finally, the use of these forces might have seemed to the Soviet planner to convey better the message of limited intentions than the use of Russian-based ICBMs or even SSBNs at sea. Again, it is important to point out that students of Soviet doctrine did not view the Soviets as likely to reason or operate in this fashion. The option was open to them, and under the circumstances likely to have prevailed, it might have seemed a good deal more attractive than a wholesale theater nuclear strike.

Conclusions

In this chapter I have explored some of the ways that aerial warfare that would attend a NATO–Pact conventional conflict in the Central Region could have affected Soviet strategic nuclear forces through the 1980s. Though detailed information on how the air war would have unfolded is sparse, a survey of the available information, combined with inferences from historical experience and a simple model of one important aspect of the campaign, indicates a strong probability that NATO's conventional air operations would have created substantial pressures on the Soviet strategic early warning system in a matter of several weeks.

Let us review the argument. First, a substantial number of important Soviet strategic targets, especially command, control, communications, and early warning installations, were vulnerable to attacks by nuclear-armed aircraft, and especially by nuclear-armed cruise missiles. The importance of this threat is indicated by the tremendous resources that the Soviets have devoted to meeting it. Nevertheless, Soviet air defenses still seemed inadequate to the task they had set for themselves.

Second, a combination of noise, technological and tactical compromise, and lethal and nonlethal suppression would have substantially degraded the Soviet air-defense network in Eastern Europe and, to an indeterminate extent, that of the Soviet Union proper.

Thus, it seems plausible that the capability of the Soviet system to detect and classify attacks by modest numbers of nuclear cruise missiles or nuclear-armed fighters would have been much reduced after two to three weeks of combat (and certainly after eight weeks.) The Soviet air-defense commanders might have begun to fear that U.S. confidence in its ability to mount a strategic counter–command and control attack, without fear of a Soviet launch-under-attack response, was growing.

While in and of itself such a possibility might not have been sufficient

to provoke a decision to use nuclear weapons, it might have stimulated an erosion of tight central Soviet political control over the use of nuclear weapons. The fact that these developments would have occurred against the backdrop of a United States with the doctrine and capability for large-scale counterforce operations would have enhanced Soviet fears. And the Soviets' own counterforce doctrine and posture would have enhanced their own incentives to preempt. If, as suggested in Chapter 4, similar kinds of conventional "strategic" campaigns were under way elsewhere—for example counter-SSBN operations and conventional cruise-missile attacks against shore-based naval installations in both the Barents Sea and the northwest Pacific, the Soviet planner would have become even more nervous.

Finally, to the extent that we can infer anything from what the Soviets themselves have written about nuclear war, they had both a strong inclination and the developed capabilities to get in the first nuclear blow in the theater, as well as in intercontinental war. Ambiguous evidence in wartime suggesting that the United States could have beaten them to the punch could have been the spark that set off their nuclear offensive. Moreover, within their force structure, the Soviets had options well short of direct attack on the United States that could have strengthened their position by, at the very least, reducing the amount of noise they had to see through on a daily basis. In sum, the likely pattern of a NATO–Pact conventional air war did not bode well for the avoidance of nuclear escalation.

This analysis has implications for deterrence, for warfighting, and for our understanding of the Soviet Union.

First, the analysis suggests that on a normal day extended deterrence was probably quite strong. Soviet conventional aggression against NATO was unlikely to have occurred because a "clever briefer" made the risks out to be low, and the prospects for quick and easy victory high. A large-scale conventional war on the Soviet periphery would be very problematic for the Soviet Union. It seems quite likely that awareness of this fact was widespread in the Soviet national security elite in the 1980s and is even more so today.

Second, paradoxically, the stability of the East-West military relationship under serious crisis conditions was and remains much less certain. Here we are speaking of unforeseeable political events that create intense fears for regime survival in the Soviet Union, fears that are rightly or wrongly traced back to the West by the Soviet elite. In the early 1980s multiple political crises in Eastern Europe might have fallen into this category. Today, multiple crises within the Soviet Union proper or conflicts among East European countries that somehow would draw NATO forces toward the Soviet border might create such risks. Under

such conditions, in which the West would already be identified as highly malevolent, the uncertainties that complicate the task of the clever briefer advocating preventive or preemptive war might enhance the persuasiveness of the earnest, prudent, military adviser suggesting preemptive escalation.

The analysis shows why the Soviets have a great deal to fear from an extended conventional war on their periphery. During the 1970s and early 1980s students of Soviet theater doctrine stressed its offensive inclinations. The development of Soviet conventional air-attack capabilities against NATO's nuclear weapons storage sites, missile bases, and air bases was especially noteworthy. The preceding analysis shows why the Soviets may have perceived it to be so important to destroy these forces before NATO's conventional tactical air campaign could cut holes in their early warning and air-defense systems. The analysis thus helps explain why the Soviets made this investment and also the intensity of their motivation in a serious crisis to get in an early, massive, conventional blow.

Finally, something can be learned by considering the tensions that seem to have been inherent to Soviet doctrine. Given the nuclear dangers that arise for the Soviet Union in a prolonged conventional war, one wonders why they abandoned their previous strategy of massive, theater-level nuclear preemption. Here it is hard to avoid the suspicion that, like the United States during the waning years of massive retaliation, the Soviet elite came to doubt its own willingness to use nuclear weapons except under the most extreme provocation. Although nuclear weapons would have been far more effective than conventional ones as agents of preemption against NATO's theater nuclear forces, the Soviets chose the conventional route. They chose to run a sizable risk that they would *not* be the ones to strike the first large-scale nuclear blow in the theater. By waiting to use nuclear weapons, they would have permitted many of NATO's nuclear forces to disperse and become difficult to target. This difficulty would have been exacerbated by the damage that Soviet intelligence, early warning, and defensive systems would have suffered in the initial weeks of conventional combat.

That the Soviets were willing to run such risks indicates that they were not in the least bit cavalier about nuclear war. They ran "higher" risks of "losing" such a war with their conventional strategy than with their previous nuclear strategy. They incurred a high cost for following the United States down the road of "flexible response." The implication, then, is that we may be able to have some influence over the Soviet inclination to use nuclear weapons if we are judicious in our choice of conventional operations.

[3]

The Balance of Ground Forces on the Central Front

This chapter argues that during the 1980s NATO's power of conventional resistance in a ground war in Central Europe was vastly underestimated. This position has two important implications for the argument of the book. First, rapid Western conventional collapse would not have been the main cause of nuclear escalation. But that would mean that the air attacks discussed in the previous chapter, and the attacks on Soviet SSBNs discussed in the next one, could have proceeded for quite some time—long enough to damage military assets important to Soviet strategic nuclear forces. These conventional attacks could thus have been an important cause of nuclear escalation.

The second implication lies in the fact that one of the pillars of the arguments advanced for offensive air and naval operations, NATO's weakness on the ground, was at least open to challenge. Given the high cost of preparing for those offensive operations, direct improvement of NATO's ground forces was at least a reasonable alternative. NATO's ground forces might have been rendered *confidently* competitive with those of the Pact at quite moderate peacetime costs. There were doubtless many possible reasons why this option was not pursued with much vigor. But the triumph of bold air and naval solutions lends some support to my general theoretical argument—that military organizations prefer the offensive, and that they have considerable latitude to pursue these solutions in peacetime.

The Problem

The distinctive characteristic of military competition in Central Europe during the 1980s was the large concentration of mechanized

ground forces on both sides, supported by substantial numbers of attack helicopters and fighter aircraft. Most assessments gave the Warsaw Pact credit for quantitative superiority in these assets. These are the same kinds of forces that are associated with the major blitzkrieg operations of the past half-century: the German invasions of Poland, France, and the Soviet Union in World War II; the Israeli victory over the Arabs in 1967; and the Israeli counterattack across the Suez Canal in 1973. Western scholars and political leaders tended to fixate on the powerful offensive potential of Soviet armored forces, thus creating fears that a conventional war in Europe could end in a quick NATO defeat. As John Mearsheimer has pointed out, in the world of conventional deterrence it is confidence in quick, cheap, and decisive victory that tempts an aggressor to attack.[1]

In spite of the prevailing fears and perceptions, however, not all of the military history of the past fifty years confirms the hypothesis that armored forces enhance the offense's chances of success. Individual battles such as the Soviet defense at Kursk in 1943, perhaps the largest tank battle of World War II; the U.S. Army's defense against the surprise German armored offensive in the Ardennes in 1944, the Battle of the Bulge; and the Israeli defense of the Golan Heights in 1973 all suggest that armored assaults can be stopped—that mechanized defenders can also turn in impressive performances. Indeed, the German army's overall performance during the second half of World War II, when it was substantially outnumbered, is testimony to the defensive potential of even partially mechanized forces.

A survey of the history of armored warfare also suggests that the place to begin any assessment of the current NATO–Warsaw Pact military balance is the so-called breakthrough battle. Armored attackers customarily have concentrated their best resources on narrow sectors of their enemy's front, hoping to achieve a degree of quantitative superiority that could cause a serious rupture in the defense line. Such ruptures permit the deep exploitations associated with the classical German, and Israeli, practice of blitzkrieg, and the encirclements associated with German and Soviet operations on the Eastern Front during World War II. This essay, however, does not deal explicitly with the exploitation phase, but focuses on NATO's initial capability to keep it from arising.[2]

[1] John J. Mearsheimer, *Conventional Deterrence* (Ithaca, 1983), pp. 23–66.

[2] If breakthroughs do occur, operational reserves are necessary to combat the adversary's exploitation or encirclement efforts. Defenders should, therefore, to the extent that they can do so, maintain "operational reserves" to counterattack in the event that the adversary manages to achieve a clean breakthrough. This analysis cannot support a judgment as to the appropriate quantity of uncommitted operational reserves that NATO ought to have tried to maintain, although it does point to the size of the reserve NATO actually could

Most analyses of warfare in the Central Region of Europe correctly assumed a front of roughly 750 km and further assumed that the Soviets would have attempted to break through in a small number of areas where the terrain and the road net are particularly suitable for armored warfare. Figure 3.1, the map of the Central Region, shows the four most commonly discussed breakthrough sectors. Most analysts agreed that the Pact would have mounted at least one major attack in the north German plain, which is considered to be the best avenue of attack. One would almost surely have been launched in the Fulda Gap, if only to tie down the powerful U.S. V Corps. The Göttingen corridor running through the German III Corps sector just north of the Fulda Gap was more attractive as a third choice than the Hof corridor, which is a bit narrow. The first three corridors are roughly 50 km wide, the fourth perhaps 20 km.

In spite of the often cited Soviet numerical superiority in Europe, most analyses of potential Soviet attacks expected concentrated efforts on these three or four rather well-defined breakthrough sectors since the Pact's quantitative advantage over NATO was not great enough to permit it to greatly outnumber Western forces everywhere. (Indeed, the analysis I present below, and in Appendix 3, suggests that the Pact would not have found it advantageous to mount more than three breakthrough efforts.) Thus, the successful breakthrough battle was the first step to a quick Pact victory, and thwarting Pact breakthrough efforts was NATO's primary conventional military task. If NATO could achieve this in war, it ultimately could have mobilized its superior economic power against the Pact. If the Soviet Union believed that NATO could thwart the breakthrough effort, then overall deterrence was enhanced. This analysis, therefore, concentrates upon the relative ability of NATO and the Warsaw Pact to cope with the demands imposed by multiple breakthrough battles, had a war occurred in the 1980s.

NATO versus Pact Military Doctrine

How did the breakthrough battle figure in each side's general war plans? Every military organization, explicitly or implicitly, has a theory of victory, a notion of the combination of human and material resources

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have maintained under a variety of stressful conditions. Nor do I know of any widely accepted rule of thumb that would provide reliable guidance. It is possible that a highly structured wargame, played a number of times with an assortment of players, with reference to the campaign of interest, could provide insight into the question.

Figure 3.1. Most likely axes of advance in a Warsaw Pact attack against NATO. Reproduced from John Mearsheimer, "Why the Soviets Can't Win Quickly in Central Europe," *International Security* 7 (Summer 1982), by permission of the MIT Press.

and tactics that it believes is most likely to produce success on the battlefield. This theory of victory is the organization's military doctrine.

The Warsaw Pact's and NATO's military doctrines, which determined how each alliance built and organized its military forces, were quite different. At the most general level, the Pact preferred large numbers of major weapons and formations (often called "tooth") over training, the experience of military personnel, logistics, and the C^3I functions broadly defined. (Logistics and C^3I are often referred to as "tail.") Additionally, it preferred ground forces to tactical aviation, although the Soviet Union did have substantial tactical air capability. NATO, on the other hand, preferred a more balanced mix of tooth and tail, showed greater interest in the training and experience of its personnel, and placed greater emphasis on tactical airpower. Finally, even today, NATO continues to stress weapons quality to a greater extent than did the Pact.

In terms of military operations, Pact doctrine tended to extol the advantages of the offense. For years this was fairly explicit in Soviet military writings. Recently, the Soviet political leadership has begun to use the rhetoric of defensive specialization. This, coupled with some subtle developments in Soviet military literature and the planned withdrawal of its forces from Eastern Europe, suggest a possible change in the Soviet orientation. Nevertheless, even with these changes on the ground, Soviet ground forces are likely to retain impressive offensive capabilities. And given the basic proclivities of military organizations in general and the traditions of the Soviet military in particular, it is improbable that the Soviet Army will shed altogether its offensive tradition.

The Western alliance, on the other hand, partly as a function of its political orientation but also because of the lessons it has drawn from the school of military experience, tends toward a more balanced view of the relative advantages of defensive and offensive tactics. This view is more implicit than explicit in NATO doctrine, which as a whole tends to be less formal than that of the Pact. Particularly at the level of the small unit engagement, Western military thinkers have long held that the defense has a substantial advantage—one that can be turned into an overall strategic defensive advantage through careful planning and the skillful conduct of military operations.[3]

[3]On the defender's tactical advantage, see John J. Mearsheimer, "Why the Soviets Can't Win Quickly in Central Europe," *International Security* 7 (Summer 1982): 15–20, esp. n. 30. See his recent "Assessing the Conventional Balance: The 3:1 Rule and Its Critics," *International Security* 13 (Spring 1989): 54–89, for a lengthy discussion. The now superseded July 1976 version of the U.S. Army's basic field manual, *Operations* (FM 100-5), included some explicit statements on the extent of numerical inferiority that the defender could accept and still expect to hold successfully. In describing the tasks of a defending general,

The net result of these differences is that for many years the Warsaw Pact generated military forces that, at least at first glance, looked substantially more formidable than those of NATO. Although official comparisons of NATO and Warsaw Pact defense spending have consistently shown NATO outspending the Pact by varying degrees ($120 billion in 1985, according to one Department of Defense estimate), the tendency in both official and unofficial balance assessments has been to highlight Pact advantages in tanks, guns, planes, or divisions.[4] Moreover, official statistics suggested that the dollar value of NATO's military capital stock in the late 1980s was greater than that of the Warsaw Pact.[5] Finally, NATO had as much, if not more, military and civilian manpower directly associated with defense as the Warsaw Pact.[6] The

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it asserts, "As a rule of thumb, they should seek not to be outweighed more than 3:1 in terms of combat power. With very heavy air and field artillery support on favorable terrain, it may be possible to defend at a numerical disadvantage of something like 5:1 for short periods of time" (p. 5-3). Somewhat ambiguously, these ratios are said to apply "at the point and time of decision" (p. 3-5). The document also holds that on the offense, U.S. generals should strive for "concentrated combat power of about 6:1 superiority" (p. 3-5). In general, then, the field manual seems to hold that defenders can fight successfully if outnumbered 3:1 and may be able to do so if outnumbered as much as 5:1. The new version of the field manual is silent on these numerical ratios. It does, however, seem to imply that given certain tactical advantages held by the defender, the attacker must muster numerical superiority at a small number of times and places of his choosing. See U.S. Army, *Operations*, FM 100-5 (1982), pp. 8-5, 8-6, 10-3, 10-4.

[4]These figures are from the statement by Richard DeLauer, undersecretary of defense for research and engineering, "Estimated Dollar Cost of NATO and Warsaw Pact Defense Activities, 1965–1985," in U.S. Department of Defense, *The FY 1987 DOD Program for Research and Development*, 99th Cong., 2d sess., 18 February 1986 (Washington, D.C., 1986), p. II-2, fig. II-2. All figures are in 1987 dollars.

[5]The military capital stock of the United States, plus the Federal Republic of Germany, the United Kingdom, and France, was roughly 25 percent larger than that of the Soviet Union, according to a Pentagon-sponsored study, Future Security Environment Working Group, *Sources of Change in the Future Security Environment*, Report to the Commission on Integrated Long Term Strategy (Washington, D.C., April 1988), fig. 6, "Military Capital Stock, Share of 7-Country Total," p. 8. It is implausible that the introduction of the remaining allies on both sides would alter the relationship in favor of the Pact.

[6]Summing the individual country entries from IISS, *The Military Balance, 1988–1989*, yields a maximum total for the Warsaw Pact of some 6.9 million men in military uniform, including 2 million internal security, construction, railroad, and administrative personnel in the Soviet Union. There were few civilian direct hires associated with the Warsaw Pact militaries, but one source suggests that there might have been as many as another million miscellaneous civilian and military personnel associated with the Soviet military. U.S. Congress, House, Appropriations Committee, Subcommittee on the Department of Defense, *DOD Appropriations for 1985, Part 1, Secretary of Defense and Chairman Joint Chiefs of Staff*, 98th Cong., 2d sess., 1984 (Washington, D.C., 1984), p. 546. Thus, the maximum number of individuals plausibly associated with the direct generation of peacetime military power in the Pact was roughly 7.9 million. The U.S. Department of Defense suggested that the total number of uniformed personnel and direct civilian hires associated with NATO's military effort was roughly 8.1 million. The authors chose the total uniformed and civilian military manpower of Alliance members as the appropriate metric for comparing relative military effort within NATO. I can see no reason why the same metric should not be applied across the two opposing alliances. Frank C. Carlucci, *Report on Allied*

possibility that NATO's higher spending might have generated less visible, but equally important, elements of military capability seldom received much consideration.[7] Instead, NATO's superiority in the spending comparisons and apparent equality in manpower were ignored, or explained away with relatively cursory arguments.[8]

Contributions to the Common Defense (Washington, D.C., April 1988), p. 30. Thus, there was at least military manpower parity between the two coalitions in the 1980s, and I suspect that NATO actually outmanned the Pact.

[7]Richard DeLauer argued that the Soviet Union somehow had a lower cost of doing business than the United States or NATO. This argument was probably based on the CIA dollar model that prices Soviet activities at the rate that it would cost the United States to accomplish them in exactly the same way that the Soviets do. Pact manpower was largely valued according to U.S. wages and maintenance costs for individuals of equal rank and experience. If Soviet manpower costs in dollars appeared lower than NATO's, it should have been a result of the relatively smaller professional noncommissioned officer and officer cadre in the mass conscription Pact militaries, not of greater Soviet efficiency. Moreover, Soviet maintenance practices were probably less efficient than those of the West. When priced according to the dollar model, these inefficiencies emerged as a higher cost of doing business, making the Pact effort appear to be greater than if it allocated its resources more efficiently. See U.S. Department of Defense, *The FY 1984 DOD Program for Research, Development and Acquisition* (Washington, D.C., 1983), pp. 1–9. On the CIA methodology, see U.S. Central Intelligence Agency, *Soviet and US Defense Activities, 1970–79*. I have dealt with this issue at greater length in "The Defense Resource Riddle," in *European Assertiveness: Is There a New Role for Europe in International Relations*, ed. Beverly Crawford (Berkeley, Calif., 1990).

[8]Although the investment (i.e., major procurement) spending of NATO compared with the Pact was only somewhat lower in the early 1980s (roughly $113 to $135 billion in 1981) and is probably greater today, the argument has often been advanced that NATO's procurement spending is less efficient than the Pact's. U.S. Department of Defense, *Annual Report*, FY1984, pp. 21–23. (I have crudely estimated Japan's investment spending and subtracted it from the "NATO plus Japan" figure offered by Weinberger.) These Pact investment figures are probably a little high, as the CIA subsequently concluded that its previous estimates in this area were wrong, and that Soviet procurement spending did not grow very much from 1976 to 1984. See "Soviets Seen Slowing Pace of Arming," *Washington Post*, 20 November 1983, p. A-14. The efficiency argument has an element of plausibility, since more Pact production is concentrated in big Soviet plants than NATO production is in any plants. Still, more than a sentence is required. The Pact, indeed the Soviet Union itself, tends to produce several different types of the same weapon simultaneously. For instance, somewhere in the Pact three or four medium tanks (T-55, 62, 64, and 72) were in production during the early 1980s. Finally, it has long been believed that the Soviet Union is less efficient than the West in most areas of industrial production. Why should the advantages of scale economies totally wipe out the West's historical advantages in managerial skills and production efficiency? U.S. Central Intelligence Agency, Directorate of Intelligence, *The Soviet Weapons Industry: An Overview* (Washington, D.C., September 1986). The study notes "distortions and inefficiencies in Soviet industry as managers seek to maintain output at the expense of quality" and that " 'Storming' to meet production targets—a practice in which as much as half of a plant's output is produced in the last 10 days of each month—requires extra shifts, raises labor costs, and often degrades the quality of output" (p. 17). See also pp. 29–33. If arguments to the effect that NATO's spending superiority is virtually irrelevant to the military balance, indeed that it produced a net military inferiority of substantial proportions, are to be taken seriously, then proponents must make their arguments more thoroughly than they have.

In effect, then, NATO bought its military forces on the basis of its own theory of victory, its own military doctrine. But official portrayals of the military balance often assessed it by criteria more appropriate to the Soviet theory of victory. Adopting Soviet criteria for measuring the balance would have always made the West look bad in comparison with the Pact, short of very substantial increases in NATO defense spending and manpower, because NATO organized and procured its forces by the quite different criteria outlined above. Indeed, if NATO had tried to build a military force to redress the numerical imbalances portrayed by its typical assessments, yet preserve the kind of personnel, training, support, and command structures that it prefers, it would have had to further increase its spending lead over the Pact and keep even more men under arms. Although the Reagan administration's substantial increases in defense spending permitted the army and the air force to modernize their weaponry and enhance the quality of their personnel, there was little effort to increase the number of combat units. Although concern about the number of Soviet weapons in combat units had helped provide the political support for the buildup, an increase in U.S. numbers was not viewed as the appropriate remedy.

NATO's political and military leaders consistently allocated scarce financial and human resources according to a particular military doctrine. In spite of assaults by dedicated military reformers, this pattern of resource allocation continues to this day.[9] The only conclusion that can be drawn from this situation is that NATO planners believed that their theory of military outcomes was correct. It was prudent planning to ask what could have happened if most of NATO's fundamental decisions about the allocation of its military resources proved to be wrong, in order to support the acquisition of some insurance against this possibility. Absent convincing arguments that most of NATO's military decisions were wrong (and I believe that the arguments made fell well short of this standard), these "worst-case" analytical exercises should never have been permitted to stand alone. Rather, they should have been accompanied by analyses that captured the expected positive

[9]Steven Canby, *The Alliance and Europe Part IV, Military Doctrine and Technology*, Adelphi Paper 109 (London, 1978), pp. 15–41, offers the clearest critique. Not much actually changed. In the mid-1970s Sen. Sam Nunn of Georgia succeeded in getting the Seventh Army in Europe to trade off some support for combat assets—creating two new combat brigades in Europe. Subsequently, the U.S. Army effectively reversed the senator's reforms. The "Division '86" reorganization reduced the number of maneuver battalions in the European-based divisions from eleven or twelve each, down to ten. The army disbanded one of the independent brigades based in Europe. The net loss was at least seven maneuver battalions, more than the six battalions contained in the Nunn brigades. Meanwhile, total army manpower in Germany increased by nearly 20,000 men.

military impact of the fundamental doctrinal assumptions that guided NATO's defense decisions. Failure to do so permitted political leaders and civilian strategists to focus on a single theory of nuclear escalation—NATO's conventional collapse, to the exclusion of other hypotheses that should have influenced other aspects of conventional military planning.

Factors in Thorough Balance Assessment

Public discussion of the conventional balance in Europe often focused on simple force comparisons that failed to include factors vital to the outcome of any real battle. The official NATO statement on the potential for conventional arms control in Central Europe stressed "the Warsaw Pact's superiority in key conventional weapons systems" and stated that the aim of conventional arms control was to "redress the conventional imbalance." This required "highly asymmetrical reduction by the East."[10] Such simplistic analysis represents only the beginning of a complete assessment of a military threat. At least six other variables must be taken into account before we arrive at a reasonable appraisal of relative battlefield capabilities. Analyses that exclude these factors are incomplete and unrevealing, and they provide no meaningful basis for military planning—in Europe or anywhere else. These variables are as follows:

Relative Reinforcement Rates. At what rate could both sides move military forces into the battle area along the inter-German and Czech–West German border? What was the likely combat capability of these forces when training, maintenance, command and control, leadership, and quantity and quality of weaponry was taken into account?[11]

The Effect of Tactical Air Forces on the Ground Battle. Most public assessments of the balance omitted a detailed treatment of the possible contribution of "tacair" (tactical air) to the ground battle, and official assessments often gave each side equal credit for tactical air effective-

[10]NATO, "Conventional Arms Control: The Way Ahead," statement issued under the authority of the heads of state and government participating in the meeting of the North Atlantic Council in Brussels (March 2–3, 1988), in *Conventional Forces in Europe: The Facts* (Brussels, 25 November 1988), p. 2, n. 2; pp. 5–6.

[11]Western tanks are a case in point. See Malcolm Chalmers and Lutz Unterseher, "Is There a Tank Gap? Comparing NATO and Warsaw Pact Tank Fleets," *International Security* 13 (Summer 1988): 5–49; see esp. pp. 23–45 on the qualitative advantages of NATO tanks.

ness.[12] In either case, possible advantages that NATO might have held in this area were omitted. In this analysis NATO and the Pact are assigned partial credit for their tactical air forces, although much more work remains to be done on the interaction between air and ground operations.

Force-to-Space (and hence Force-to-Force) Ratios. Implicitly, or explicitly, the Soviet Union and its allies were often given credit for an ability not only to move many divisions to the battle area quickly but to actually concentrate them on small segments of the front to achieve the very high local offense-to-defense force ratios that could produce breakthroughs. Yet, historically, armies have found that there is a limit to how much force can be concentrated in a given space. If NATO could achieve some level of density of its ground forces across the front, then it should have been very difficult for the Pact, even with more forces overall, to achieve very high ratios in selected breakthrough sectors.

Attrition Rates. At what "pace" or "level of violence" will the battle proceed? What kinds of casualties are attackers willing to take? Does "friction" place some limits on the pace at which the battle can be forced? Historically, short periods of very intense combat can be identified in which one side or both suffered 10 percent or worse attrition to armored fighting vehicles per day. On the other hand, rarely are battles of this intensity sustained for more than a few days.

Exchange Rates. How many destroyed armored fighting vehicles would NATO have had to pay to kill a Pact vehicle? Given the Pact superiority in numbers of major weapons, NATO needed favorable exchange rates in order to defeat the Pact.[13] Favorable exchange rates are not uncommon for defenders fighting on their own ground, particu-

[12]For an exception see U.S. Congress, CBO, *US Ground Forces*, pp. 26–28, where Frances Lussier offers a brief discussion of numerical ratios of total fighter aircraft, and the results of an enhanced air capability rating system called TASCFORM, which is somewhat similar in concept to WEI/WUV (see n. 24 for an explanation). But she offers no direct treatment of how each side's total air capabilities would effect the ground battle. She does, however, include close air support assets in her analysis, as do I. It is notable that the Congressional Budget Office has yet to publish an assessment of the overall "air-balance" in the context of a possible NATO–Pact war.

[13]In a pure attrition battle between two sides equal in every respect except numbers, the inferior side logically requires an exchange rate equal to the unfavorable force ratio if it is to stay the course. This is a highly idealized situation. Some of the analysis outlined below and in Appendix 3 suggests that NATO may be able to squeak out a stalemate with average exchange rates as low as 1.25:1.

larly if that ground has been prepared with field fortifications, obstacles, and mines. Indeed, an often quoted rule of thumb suggests that the defender can hold at an engaged force ratio of 3:1 in favor of the offense.[14] This would be consistent with a 3:1 exchange rate.

Advance Rates. Students of Soviet military doctrine, and analysts of the Central Region conventional balance, often assigned rapid advance rates to Pact forces, several tens of kilometers per day in some cases. Some of this tendency can be attributed to Soviet military literature, which called for very high advance rates. There was also a tendency simply to assume that the high advance rates characteristic of armored warfare's headier historical successes would be replicated by the Soviets. Finally, crediting the Pact with very large forces and very high force ratios in breakthrough sectors tends to produce very rapid destruction of outnumbered defending forces, according to some widely employed dynamic analytical techniques, such as the Lanchester square laws. Analysts have hypothesized that either high attrition, or its consequent diminishing force-to-space ratio, will soon produce rapid retreat for the defender.[15] On the other hand, even with armor pitted against armor, and often with favorable force ratios, modern mechanized armies have frequently found forward movement against determined defenders to be very difficult.

These six variables can be combined into a model that provides a

[14]Mearsheimer, "Assessing the Conventional Balance," pp. 54–89. Although one finds frequent allusions to this rule in field manuals, military history books, and the analytic literature, it suffers from considerable ambiguity in terms of the conditions under which it applies and the units of account, as the debate between Mearsheimer and Joshua Epstein suggests. Mearsheimer has done much to clarify the rule and to indicate the extent to which historical cases would lend it support. Epstein is unsatisfied with everything about the rule, as well as Mearsheimer's defense of it, with the exception that Epstein's other work indicates that he perceives a tactical advantage of substantial proportions for the defender—sufficient to generate exchange rates between 1.5 and 1.85:1. See Joshua Epstein, *Strategy and Force Planning: The Case of the Persian Gulf* (Washington, D.C., 1987), for the development of the 1.5:1 figure; see Joshua Epstein, "The 3:1 Rule, the Adaptive Dynamic Model, and the Future of Security Studies," *International Security* 13 (Spring 1989): 90–127, for his critique of the rule. (N. 57 seems to indicate some sympathy with the proposition that there is a defensive advantage.) In Mearsheimer's judgment (and in mine) the basic thrust of the rule is that the defender enjoys a substantial tactical advantage. Short of special qualitative advantages, markedly superior tactics, or a high degree of surprise, surmounting these advantages should require a substantial material superiority of 3:1 or better.

[15]It is not my purpose to write a general essay on military modeling. For a lucid discussion of the Lanchester Square Law, see John W. R. Lepingwell, "The Laws of Combat? Lanchester Reexamined," *International Security* 12 (Summer 1987): 89–134; Thomas F. Homer-Dixon, "A Common Misapplication of the Lanchester Square Law, A Research Note," in ibid., pp. 135–139. See also Epstein, *Strategy and Force Planning*, app. E, "Critique of Lanchester Theory," pp. 146–155.

more comprehensive approach to comparing forces, for it will include quantitative and other factors in precisely the way the one-dimensional comparisons do not. One such model, known as the "Attrition-FEBA Expansion Model," provides the framework for the subsequent analysis.[16]

This model assumes that at the outset of war NATO populates the front evenly at densities that experience suggests should permit a resilient defense and holds its remaining forces in reserve.[17] The Pact similarly populates the less important sectors of the front but concentrates as much force as is practical in the breakthrough sectors. As each side takes attrition in the breakthrough battles, it replaces losses with reserves. Also, it is assumed that, as the Pact's breakthrough effort begins to move in NATO's direction, each side tries to move forces into the flanks of the penetrating salient at a density equal to that achieved on the nonbreakthrough parts of the front (see figure 3.2).

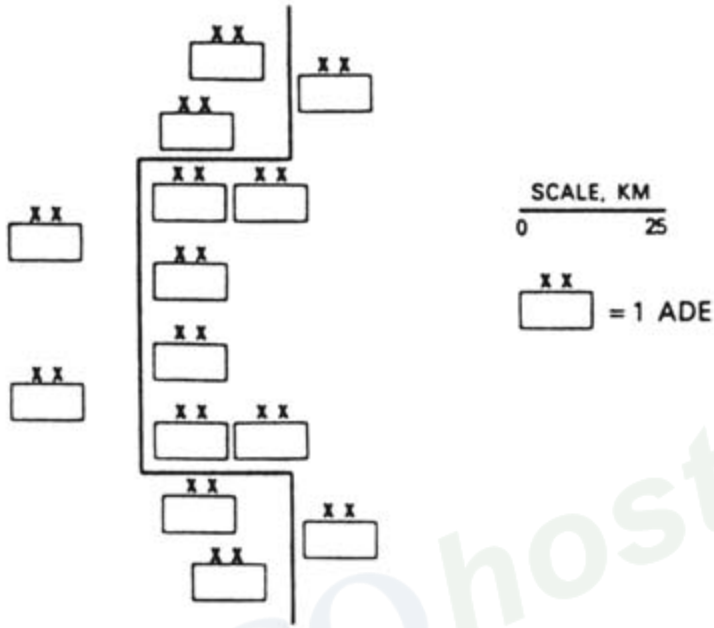
The model tests the adequacy of each side's forces to meet the demands of these multiple breakthrough battles. Once some assumptions are made about attrition, exchange rates, the role of tacair, movement rates, and force-to-space ratios, a curve can be generated that shows each side's military requirements starting out with the first day of the war, then rising with the accumulated consequences of daily attrition and the need to populate a FEBA that expands as a function of the forward movement of the breakthrough salients. This requirements curve for each side can be compared with each side's mobilization curve to test the adequacy of its forces.

At some point, if the defending forces are inadequate to fulfill their requirements, the defense finds itself having to defend with an ever-shrinking force-to-space ratio—that is, fewer and fewer defensive forces are available to hold the line. The consequence is that the attacker can muster the large local force ratios in his favor that could produce a clean

[16]The Attrition-FEBA Expansion Model illustrates the stresses imposed on Pact and NATO forces, depending on the values assigned to these six variables. FEBA is an acronym for "Forward Edge of the Battle Area." I am deeply indebted to Dr. Richard Kugler, who devised this model, for introducing it to me. The uses to which it has been put in this essay are my responsibility alone.

[17]The Attrition–FEBA Expansion Model uses Armored Division Equivalents (ADEs) as the common basic measure of combat power: "The ADE is a relative measure of effectiveness of ground forces based on quantity and quality of major weapons. This measure—which is widely used within DOD for ground force comparisons—is an improvement over simple counts of combat units and weapons; however, it does not take into account such factors as ammunition availability, logistical support, training, communications, and morale." Caspar W. Weinberger, *Report on Allied Contributions to the Common Defense* (Washington, D.C., 1983), p. 36. The ADE scoring system used in this essay is summarized in William Mako, *US Ground Forces and the Defense of Central Europe* (Washington, D.C., 1983), app. A, pp. 105–125.

Figure 3.2. Simple model of a Warsaw Pact breakthrough effort



breakthrough. The defender's forces may shatter under the weight of the attack, or they may find themselves so thin on the ground that the offense can easily bypass and isolate centers of resistance. If the defender has not already ordered a general withdrawal to "shorten the front," he may soon suffer a catastrophic rupture of the line, followed by a classical armored exploitation. Since the defender's reserves have been exhausted by the requirement of defending an expanded FEBA, he is not in a position to combat the exploitation. The model does not address the actual process of defensive collapse; it simply indicates when, on the basis of a variety of assumptions, it becomes plausible that this process could commence.

The offense, on the other hand, may find its breakthrough effort stalling as a function of insufficient reserves to sustain high-intensity combat at the front of his penetrating salients or to defend the flanks of those salients from the defender's likely counterattacks.[18]

[18]The "Force Needs" curves are derived as follows. In figure 3.6, NATO needs 1 ADE per 25 km of front to establish a defensive line. The Pact needs 1 ADE per 25 km to tie down NATO's forces in the nonbreakthrough sectors. The Pact manages to concentrate

This model of hypothetical military confrontation in Central Europe will be used to illustrate the sensitivity of the outcome of such a battle to assumptions that are either consistent with the caricature of Soviet doctrine often used for balance assessments (referred to here as the "Soviet" doctrine) or with the very different military doctrine that appears to guide the way NATO builds its forces (referred to here as the "NATO" doctrine). This model highlights the interrelated effects of several aspects of combat between NATO and the Pact about which there is substantial uncertainty. If we resolve all these uncertainties in favor of the Pact's military doctrine, we can produce the pessimistic portrayal of the outcome of a conventional clash in Europe that was common during the last decade. On the other hand, if we resolve these uncertainties in favor of NATO's military doctrine, the Alliance appears to have been capable of preventing a successful Pact breakthrough.

Limitations of the Analysis

Before turning to a discussion of what we learn about the NATO–Warsaw Pact balance by employing the Attrition-FEBA Expansion Model, it is necessary to note the limitations of this or any modeling effort that attempts to approximate the vast and unpredictable complexities of the battlefield.

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2 ADEs per 25 km in each of three 50-km breakthrough sectors for a total of 12 ADEs involved in breakthrough operations. Thus, for 750 km of front, NATO needs 30 ADEs to start; the Pact needs 36 to start. If 12 Pact ADEs on breakthrough sectors are willing to accept 10-percent attrition per day, they lose 1.2 ADEs. If the Pact-to-NATO exchange rate is 1.5:1, NATO loses 0.8 of an ADE to destroy the Pact forces. To generate the total demand for additional forces imposed by the day's action, the forces needed to populate the "expanding FEBA" must be calculated. Here, it is assumed that the Pact manages to advance 5 km per day, producing 30 km of additional FEBA (i.e., two flanks, 5 km long, for each of three penetrations). Both NATO and the Pact need another 1.2 ADEs to populate the flanks of the penetrating sectors. Thus, the Pact's total additional force requirement after a day of combat is 2.4 ADEs. NATO's is 2 ADEs. Each side's demand for forces rises at this daily rate whenever the Pact has a modest surplus of forces over its previous day's total requirements, producing the "Force Needs" curves. If the Pact has equal or fewer forces than it needed the previous day, it is not permitted to engage in intense combat. This same basic procedure is applied in figure 3.9. Aside from changing the attrition, exchange, and movement rates, the major change is the factoring in of armored vehicles killed by tacair. NATO's estimated number of tacair armored vehicle kills is converted to an ADE score and subtracted from the total daily attrition that the Pact is willing to accept. NATO must pay to kill the rest of the Pact's ground-force loss for the day in the coin of its own ground forces. The damage done by Pact tacair is added to this attrition to arrive at NATO's daily loss rate. For a more detailed discussion, please see Appendix 3.

Like all models, this one does not generate predictions for specific outcomes of a war in the Central Region. There are simply too many uncertainties for any model to capture, certainly too many for a model to capture with high confidence. This model tests the adequacy of forces of a given capability to cope with particular sets of military demands. The values assigned to the six variables discussed above determine the demands imposed and the amount of capability present to deal with those demands. Thus, the principal utility of the model is not a portrayal of a particular battlefield outcome in terms of forces destroyed or territory lost. Rather, it says, "Depending on how well Western and Eastern forces perform in combat in the likely breakthrough sectors, NATO should or should not be able to forestall a catastrophic rupture of its defense line with or without a major withdrawal across the front." The model tests NATO's forces against demands. These demands are determined by the analyst. The analyst employs the model to aid in the formation of judgments about the relative competitiveness of the two sides.

The Attrition-FEBA Expansion Model is a substantial abstraction from reality. Breakthrough sectors are not exactly 50 km wide; attrition does not occur at a steady rate; the offense does not move forward at a steady rate; all offensive efforts are not equally successful, or necessarily successful at all. Moreover, in real combat, divisions do not "fight to the finish" as assumed here; rather, they fight until they are down to 50–70 percent of their initial strength, and then they are pulled out of the line for rest and refitting. Additionally, not all the attrition is taken in breakthrough sectors; some occurs on "quiet" sectors of the front. Finally, this model does not make any complicated tactical assumptions. As any student of armored warfare knows, defenders and attackers do not merely attempt to populate the flanks of the penetration; the defender may counterattack to pinch off the salient, while the attacker tries to widen the hole in the enemy line.

The model also does not deal with the fluid warfare that would probably have characterized a Pact attack launched after only a few days of mobilization, one that would have caught most NATO forces before they were able to form a coherent defense line—in other words, a surprise attack. Such an attack would have pitted about three dozen Soviet and East German divisions against various U.S., West German, French, and other NATO forces, equivalent in strength to roughly two dozen U.S. mechanized divisions. This fighting would, at least initially, have taken the form of mobile warfare, in which NATO's small, ready, forward-deployed covering forces (equivalent to a few armored brigades), supported by some portion of NATO's tactical aircraft, would

fight a running battle of delay to enable the rest of NATO's standing forces to form a rough defense line several tens of kilometers back from the inter-German border. The model would become useful only as an analytical tool if and when such a line were established. Under these circumstances NATO's forces might also try to mount some quick, sizable counterattacks during this covering force battle, in order to exploit some of the coordination and logistics problems that would surely attend the Pact's efforts to mount an attack with such little preparation time.

While it is true that, if Polish and Czech Category I divisions joined the Soviet and East German attack, the Pact could have outnumbered NATO in firepower assets (ADEs) by as much as 2:1, both sides would have experienced problems getting into action with only a few days of mobilization. To assess relative performance under these circumstances, one must do a thorough comparative assessment of the peacetime readiness for combat of each side's ground and tactical air forces, as well as an assessment of how many days would have been required for each to overcome its deficiencies. The circumstantial evidence is that NATO's standing forces were substantially readier for combat than those of the Pact, but data available in the public domain do not permit a high-confidence judgment. Skepticism emerged in the late 1980s regarding the Soviet ability to mount a short-preparation attack in Western Europe.[19] Subsequent political events cast doubt on the military reliability of the Soviet Union's Eastern European allies during this period, doubts that the Soviets themselves surely entertained.

Assigning Values in the Attrition-FEBA Expansion Model

These caveats aside, the Attrition-FEBA Expansion Model illustrates the effects of various assumptions about NATO–Warsaw Pact military

[19]See "A Soviet Attack Seen as Unlikely," *New York Times*, 5 December 1988, p. A-14. See U.S. Congress, House, Committee on Armed Services, *Soviet Readiness for War: Assessing One of the Major Sources of East-West Instability, Report of the Defense Policy Panel*, 100th Cong., 2d sess., 5 December 1988 (Washington, D.C., 1988). See also Stephen M. Meyer, "Soviets Can Make Cuts Be Major or Minor," *Los Angeles Times*, 11 December 1988, pt. V, p. 5. "There are now new intelligence findings that strongly suggest that forward deployed Soviet units in East Germany may be in a lower state of readiness than is commonly believed." Les Aspin, "The World after Zero INF," news release, House Armed Services Committee, 29 September 1987, p. 12. William W. Kaufmann, "Defense Policy," in *Setting National Priorities: Agenda for the 1980s*, ed. Joseph A. Pechman (Washington, D.C., 1980), p. 300; and William W. Kaufmann, "Nonnuclear Deterrence," in *Alliance Security: NATO and the No-First-Use Question*, ed. John D. Steinbruner and Leon V. Sigal (Washington, D.C., 1983), pp. 59, 70.

capabilities and the course of combat on NATO's ability to forestall a Pact breakthrough. But how are we to assign specific values to the variables captured by the model? In principle, one could assign values based upon a historical survey of many battles or upon an intensive examination of a few battles that one believes to be sufficiently similar to a NATO–Warsaw Pact clash to be instructive, or upon the use of military rules of thumb or planning factors. The analysis presented here relies upon all of these methods.

The values of the variables that determine the demands on military capabilities—tactical air attrition rates and kill rates, force-to-space ratios, ground force attrition rates, exchange rates, and advance rates—can be set to suit the user. The same is true of the mobilization schedules for each side's ground forces, the extent to which Western forces should receive "extra credit" for relatively greater resources allocated to the command and logistics functions, the quantity of available close air support forces, and their sortie rate.[20] *The only requirement is that the reasons for the user's judgments on these matters be explicit.* Below, I discuss my choices at length. Since these variables affect one another, the user should also work out plausible relationships among them.[21] For instance, it seems unlikely that low attrition rates and high offense-defense exchange rates would produce much retreat by the defender. In exploiting the model, I set variables at values that I judged to be within the broad range of those considered plausible by the conventional forces analysis community, and representative of the two different doctrines employed by the Alliance: the "Soviet" doctrine often used for balance assessment, and the "NATO" doctrine that in fact seems to drive NATO's force planning.

[20]The basic mobilization schedules for each side cannot be set by altering the values of particular variables in the Symphony version of the Attrition-FEBA Expansion Model. They include so many assumptions and estimates that I prefer to develop them directly and load them as data into the model. See Appendix 3.

[21]The most widely used dynamic analytical technique—the Lanchester Square law—assumes a relationship between force ratio and relative attrition, once some assumptions are made about the effectiveness of the forces engaged in a battle. An exchange rate can be derived from the calculation. Analysts have also attached movement equations to the laws, although they cannot be deduced theoretically from Lanchester's work. It is important to note, however, that those who use the equations must make several judgments about the values assigned to the key variables—particularly the forces included in the engagement, their effectiveness, and the relationship between the attrition suffered by the defender and his propensity to withdraw. Military analysis based upon the Lanchester Square law is thus nearly as dependent upon the analyst's "military judgment" as is the model suggested here. For a clear explanation of the Lanchester laws and how to use them, see William W. Kaufmann, "The Arithmetic of Force Planning," in *Alliance Security*, ed. Steinbruner and Sigal, pp. 208–216; Lepingwell, "The Laws of Combat?"; and Homer-Dixon, "A Common Misapplication."

Capabilities over Time

Assessments showing decisive Pact superiority in the 1980s shared certain questionable assumptions that reinforced their pessimistic conclusions. First, they stressed numbers of major weapons, without reference to quality. Second, they assumed that many Pact reserve units could be made combat ready in a matter of days and deployed quickly to combat zones; that Western reserve forces would have taken months to become combat ready and to reach the theater; and that France would have contributed less than she could have to NATO's defense. Third, they failed to estimate the contribution of NATO's greater efforts in command-and-support structures for ground forces.

By contrast, I employ a methodology for measuring firepower that effectively gives NATO some credit (although probably not enough) for the superior average quality of its weapons. This makes a marginal improvement in NATO's showing. Second, and more important, I more realistically assess the arrival times of Pact reserve divisions on the basis of their low peacetime readiness. I make similar assumptions (less pessimistic than the usual) regarding the readiness and arrival times of U.S. National Guard brigades and divisions. And I also include, rather than discount, most French ground forces as active participants in NATO's defense of West Germany. Third, and of great significance, is an increase in the basic firepower score of Western divisions to credit NATO's greater investment in command and logistics.[22]

I will discuss each of these three elements in turn and then demonstrate their effect on predictions of NATO's ability to meet the force needs of the opening phases of a Central European war, based upon very demanding combat assumptions.

The Pact and NATO ground force capabilities that could have been brought into Central Europe for a conventional confrontation (an estimate based on the improved weaponry and mobilization assumptions) are compared in figure 3.3 (showing force ratios in ADEs, explained below) and figure 3.4 (showing numbers of ADEs). Comparing only aggregated weapons quantity and quality, and assuming that NATO's mobilization decision lags the Pact's by seven days, one finds that the force ratio rises briefly to 1.6:1 in favor of the Pact in approximately ten days, but except for this brief peak, the Pact advantage is generally

[22]The principal differences between my mobilization estimates presented in Posen, "Measuring the European Conventional Balance: Coping with Complexity in Threat Assessment," *International Security* 9 (Winter 1984–85), and those presented here are an increase in estimated firepower to reflect equipment modernization and more favorable treatment of U.S. reserve units.