

To be published in:

Harold Feiveson, ed., *The Nuclear Turning Point: A Blueprint for Deep Cuts and De-alerting of Nuclear Weapons* (Washington, DC: The Brookings Institution, 1999).

## Chapter 4

### **Nuclear Strategy and Targeting Doctrine**

As long as the United States maintains a nuclear arsenal, a doctrine is needed to guide its operation and possible use. It is not enough to have a nuclear capability; the United States needs a conceptual framework to guide decisions about how many and what type of weapons are required and how its arsenal would be operated in various military and political situations. Even if all nuclear weapons were taken off alert and placed in storage, plans would still exist for how to ready the weapons for use and against what targets they should be aimed.

#### **Counterforce Targeting**

U.S. nuclear doctrine has two primary objectives: to deter nuclear attacks on the United States and its allies and to limit damage if deterrence fails. During the cold war the first objective was achieved by maintaining forces of sufficient size and capability to hold at risk a range of assets Soviet political and military leaders valued. These included nuclear forces and related command-and-control targets, conventional military forces, political and military leadership, and defense industries. This doctrine was developed to deter Soviet political and military leaders who were believed to be implacable, aggressive, and risk-taking adversaries that valued the perpetuation, expansion, and aggrandizement of their regime more than the lives of millions of ordinary citizens.

If deterrence failed or seemed about to fail, the second objective, limiting damage to the United States, would be achieved in three ways: by limiting the scope of initial nuclear attacks, avoiding attacks on Soviet cities while holding in reserve weapons to destroy them, and degrading the Soviet capacity to execute nuclear attacks by destroying its nuclear forces, command-and-control assets and, ultimately, its political and military leadership. Thus the United States would give the Soviet Union the incentive to avoid attacks on U.S. cities through the threat of retaliation in kind, even while degrading the Soviet ability to attack. The Soviet policy also appeared to emphasize early and massive counterforce attacks, as evidenced by the huge ICBM force it fielded during the 1970s.

Cold war nuclear strategy was complicated enormously by the U.S. threat to use nuclear weapons first in defense of allies facing superior Soviet and Chinese forces. To make such threats credible, the United States sought ways it could initiate the use of nuclear weapons that would not lead to an all-out nuclear war and the destruction of American cities. In the beginning this was accomplished through a massive supremacy in strategic weapons that gave the United States a

reasonable prospect of a disarming first strike. As the Soviet Union attained nuclear parity in the 1960s, however, the threat of a massive U.S. response to limited Soviet attacks was no longer credible. The United States responded by bolstering the conventional defense of its allies, developing limited and selective nuclear options, and deploying thousands of warheads of greater accuracy to improve the prospects for successful counterforce attacks.

Some military and civilian nuclear strategists believe that cold war nuclear doctrine continues to be relevant and appropriate. This was the basic conclusion of the Nuclear Posture Review that was completed by the U.S. Defense Department in September 1994. The review concluded that the United States should retain existing purposes and missions for nuclear weapons and that it should maintain an ability to upload its nuclear forces rapidly to double the START II limits as a hedge against the “possible emergence of a hostile government in Russia or failure of the arms control process in the [former Soviet Union].”<sup>1</sup> Although the more recent presidential review directive 60, which cleared the way for cuts down to 2,500 deployed strategic warheads, reportedly eliminated the requirement to prevail in a protracted nuclear war, it nevertheless maintained the basic structure of U.S. nuclear doctrine and targeting plans.<sup>2</sup>

The decisive argument for maintaining thousands of strategic nuclear warheads, even after the end of the cold war, was that U.S. nuclear forces must maintain a capability to threaten a wide spectrum of targets in Russia and other countries that might become hostile to the United States. As General John Shalikashvili, chairman of the U.S. Joint Chiefs of Staff, stated during the START II hearings, “It was our view that with the 3,500 warheads allowed under this treaty, we would remain capable of holding at risk a broad enough range of high value political and military targets to deter any rational adversary from launching a nuclear attack against our nation or our allies.”<sup>3</sup>

A previous nuclear policy review, known as the Reed-Wheeler report after its principal authors, was more explicit about what should constitute a broad range of targets: nuclear forces, general-purpose military forces, hostile leaderships, and war-supporting industries and supporting infrastructures.<sup>4</sup> Particularly prominent in the target list are Russian nuclear forces, including missile silos, bomber and submarine bases, nuclear warhead storage sites, air and ballistic missile defense sites, communications centers, and nuclear command sites from launch control facilities up to the military and political leaderships, perhaps 3,000 targets in all.<sup>5</sup>

A counterforce retaliatory doctrine demands large strategic forces on hair-trigger alert, which increases the risks of escalation or accidental use during crises. We believe that these risks made the doctrine unwise even during the cold war. But whatever its appropriateness in the past, the balance of nuclear risks has shifted decisively. It is no longer sensible that the focus of U.S. nuclear doctrine should be the deterrence of a deliberate, massive attack against U.S. nuclear forces or the limitation of damage in a war involving the detonation of thousands of warheads. Today, the most important risks are accidental, unauthorized, or erroneous attacks triggered by a breakdown in the Russian command-and-control system.

Counterforce doctrine increases the risk of accidental or erroneous strikes. A policy of targeting opposing nuclear forces for rapid destruction puts pressure on the other side to be ready at all times to launch vulnerable forces (particularly ICBMs and pier-side SLBMs) on short notice before they are destroyed. This hair-trigger posture could lead to a launch of Russian nuclear forces in response to a false warning or a massive U.S. response to a small accidental or unauthorized Russian attack. A doctrine that provides for the rapid launch of nuclear forces during peacetime simply cannot be justified in the post—cold war security environment where the probability of an accidental, unauthorized, or erroneous launch is far greater than the probability of a deliberate nuclear attack. Even an *option* to launch under attack is unwise because it forces political and military leaders to make momentous decisions in a few minutes with incomplete information on the nature or origin of the attack.

Although the goal of counterforce attacks is to limit damage by destroying an opponent's nuclear forces, such attacks are more likely to have the opposite effect because an opponent may launch forces upon warning of attack rather than wait while they are destroyed. Thus a counterforce attack may do little more than trigger the launch of opposing forces. Counterforce attacks cannot achieve the objective of damage limitation in any case because nuclear forces sufficient to destroy U.S. cities almost certainly would survive.<sup>6</sup>

Targeting command and control and political and military leadership does not make sense either. The point is often made that deterrence is improved if the leaders who might order and carry out nuclear attacks know that they are targeted. But leaders who fear for their own survival would be tempted to launch the forces under their command if they believed—perhaps mistakenly—that they were under attack. They also would be more inclined to delegate launch authority to lower-level officers, increasing the probability of unauthorized use and making attacks more difficult to control and terminate. If erroneous or unauthorized use is more worrisome than deliberate attack, it makes sense not to target leadership or command and control. Even in the event of deliberate attack, it would be foolish to kill enemy leaders and destroy their capacity to order a cease fire unless the United States had already been destroyed. Leadership should be targeted last, if at all.

A counterforce doctrine perpetuates the misperception that large numbers of nuclear weapons are needed for deterrence. Even today, after the collapse of the Warsaw Pact, the breakup of the Soviet Union, and substantial reductions in Russian nuclear forces, thousands of potential counterforce targets remain in Russia, including hundreds of ICBM silos, launch control centers, and mobile missile garrisons; dozens of strategic bomber and submarine bases; hundreds of air defense, nuclear weapon storage, and command-and-control targets; and hundreds of leadership targets. The reluctance of many U.S. defense officials to endorse deep reductions is due in large part to their continued attachment to counterforce doctrine.

It will not be easy to break out of cold war thought patterns regarding the use of nuclear weapons. War plans are carefully guarded secrets, and changes in them can at best be verified only indirectly and over time through corresponding changes in force posture. Nuclear doctrine is important, however, because it is the basis for force structure and operations and could largely

determine how the entire nuclear command system would react in a crisis. An evolving dialogue between U.S. and Russian military leaders on this subject would be useful and could help pave the way toward very deep reductions in nuclear forces.

The United States could take the lead by announcing that the only purpose of U.S. nuclear weapons is to deter nuclear attacks on the United States and its allies, adopting a policy of no first use of nuclear weapons and renouncing counterforce targeting. These changes in doctrine and declaratory policy would be a natural complement to efforts to reduce the role, size, and readiness of nuclear forces and to reinforce the nonproliferation regime. In repudiating counterforce the United States would acknowledge that damage could not be limited to any meaningful extent by destroying Russia's nuclear forces and the means to control them. The best hope for limiting damage is to prevent the use of nuclear weapons in the first place or, if nuclear weapons are used, to end their use as soon as possible.

### **Countervalue Targeting**

The traditional alternative to counterforce is countervalue targeting, in which the use of nuclear weapons is deterred by threatening to destroy cities and industry. Deterrence based on countervalue targeting is sometimes called minimum deterrence because relatively few weapons are needed to utterly destroy the cities and economy of even the largest country.

Perhaps the best-known formulation of countervalue deterrence is the "assured destruction" criterion set forth by Secretary of Defense Robert McNamara: U.S. strategic forces surviving a Soviet first strike should be capable of destroying 50 percent of Soviet industry and 20 to 25 percent of the Soviet population. The Department of Defense estimated that this level of destruction would require 200 to 400 one-megaton explosions.<sup>7</sup> More recent estimates for Russia indicate that this level of destruction could be caused by the detonation of about 100 U.S. warheads.<sup>8</sup> Another criterion might be the number of warheads needed to inflict casualties on the scale of history's most deadly war, World War II, which was responsible for the deaths of 20 million Soviet citizens and about the same number of Chinese. This level of death and destruction could be caused by the detonation of 15 warheads on Russian cities and as few as 5 on Chinese cities.<sup>9</sup>

The Reed-Wheeler report argued that a countervalue targeting doctrine would lack credibility, both with potential adversaries and with U.S. allies, since the threat to use nuclear weapons against another country's cities would be credible only in response to an attack on U.S. cities. Thus, it was argued, the United States would not be able to deter or respond to other, more limited nuclear attacks against itself. But a countervalue doctrine seems to have been adequate for the three "medium" nuclear powers, even during the cold war. Each seems to have been satisfied with the deterrent effect of its force, and only a fool would test the resolve of British, French, or Chinese leaders to use nuclear weapons in retaliation for any sort of nuclear attack against their territory.

In addition, the Reed-Wheeler report argued that a countervalue strategy would be unable to deter the use of nuclear weapons against U.S. allies because it is not credible to threaten to destroy enemy cities—and thereby trigger the destruction of one’s own cities—in response to a nuclear attack on an ally. Thus a countervalue strategy might be appropriate for China but not for the United States. Because allies also would doubt the credibility of a countervalue deterrent, the report argued that a move in this direction might trigger the acquisition of nuclear weapons by these states. “The concept of a minimum deterrent based upon a few hundred weapons or less is unrealistic...No non-nuclear industrial power is going to believe security guarantees from a nation with this posture. They would be increasingly inclined to seek nuclear capabilities of their own.”<sup>10</sup>

It is not so obvious, however, that the United States could not deter nuclear attacks on allies if it adopted a countervalue doctrine. The United Kingdom has for many years placed some of its weapons under NATO command, and France reportedly has considered offering nuclear guarantees to other European states. It is not necessary that potential adversaries be absolutely convinced that nuclear attacks on U.S. allies would trigger a nuclear response by the United States, but only that such a response could not be ruled out. Given the close and long-standing ties between the United States and its allies covered by nuclear security guarantees, this degree of credibility should not be difficult to maintain regardless of the doctrine that is adopted.

Finally, the Reed-Wheeler report argued that there are moral problems with targeting cities: “No responsible observer doubts that a major nuclear exchange would result in millions of casualties, including civilian casualties, whatever the targeting doctrine. However, the difference between intentionally attacking civilians, and attacking other targets (which will unavoidably result in civilian casualties) has been critical in Western thought on what is legitimate in warfare.”<sup>11</sup> The claim that counterforce is morally superior to countervalue targeting rings hollow inasmuch as the human consequences of counterforce attacks, which necessarily would involve a much larger number of warheads and attacks against targets near cities, would not be significantly different from attacks that explicitly targeted cities. Nevertheless, a countervalue doctrine is clearly at odds with established international humanitarian law, which requires that threats or uses of force must never be directed at civilians.

### **Counterpower Targeting**

A third option is to target conventional military forces and defense industries critical to supporting a war effort.<sup>12</sup> This counterpower strategy would avoid the instabilities associated with counterforce, because neither side would fear for the safety of its nuclear force, while offering credible retaliatory options other than the immoral and suicidal one of destroying cities. Options for retaliatory strikes could be designed to minimize civilian casualties in order to limit the pressure for escalation and allow political leaders time to negotiate an end to nuclear attacks. Such targets might include major military bases and storage areas and possibly energy infrastructure (refineries or transmission nodes for gas and electricity) located away from major cities. Unlike counterforce, counterpower targeting would require at most a hundred warheads,

enough to hold at risk the most valuable conventional military and energy targets located outside cities.

A possible drawback to counterpower targeting is that a nuclear attack against conventional military targets could be misinterpreted as an attempt to win the war rather than an attempt to retaliate in ways that minimize the potential for escalation. This concern is strengthened by the likelihood that nuclear weapons would be used only after the outbreak of a conventional war. Any use of nuclear weapons should be, and should be seen as, a political act designed to discourage additional nuclear attacks, not as a military attack designed to influence the outcome of a battle. Nuclear attacks against conventional military targets risk blurring the line between nuclear and conventional war and between strategic and tactical goals.

An alternative that has received relatively little attention is to retaliate with conventional rather than nuclear weapons, at least initially. This would be particularly appropriate against countries with clearly inferior conventional capabilities and without effective air defenses. In the Persian Gulf War the United States and its allies used a combination of stealth aircraft, cruise missiles, and smart munitions to disable Iraq's air defenses, destroy its communications systems, and disrupt its electricity and transportation networks. Not only did these actions by themselves inflict great damage on Iraqi military capability, but they left Iraq open to even more punishing strikes and to possible occupation. It is not clear, however, that a purely conventional retaliation could punish the attacker sufficiently while deterring further nuclear attacks. Even though the United States might attempt, at least initially, to limit its response to using conventional force, it should have plausible nuclear retaliatory options available that do not involve the suicidal or escalatory options of attacks on cities or nuclear forces.

### **Adaptive Targeting**

Rather than simply replace one set of targets with another, the United States should give serious thought to doing away with fixed nuclear war plans altogether. The title of the current U.S. nuclear war plan—the Single Integrated Operations Plan (SIOP)—implies a degree of focus and preplanning that is inappropriate today. The SIOP was constructed to coordinate a rapid attack consisting of thousands of warheads against a well-defined enemy. But Russia is no longer an enemy of the United States, and a deliberate attack by Moscow is almost unthinkable. Why then should the United States have detailed plans, which it updates and exercises regularly, to destroy Russia on a few minutes notice? As the size and alert status of nuclear forces are reduced and as the probability of a massive Russian attack becomes vanishingly small, it is no longer necessary or desirable to have standing plans for a massive, unidirectional U.S. response. Moreover, it no longer is technically necessary to have preprogrammed war plans; the technology exists to devise an attack and target missiles in a matter of hours.

The circumstances in which the United States might seriously consider the use of nuclear weapons are so uncertain and unforeseeable that it makes little sense to focus on a handful of preplanned options. A U.S. president who found himself in such a situation would likely find these

options unsatisfactory. At that point he undoubtedly would want to begin to consider afresh how, in that particular situation, U.S. nuclear forces could best be used—or not used—to protect the security of the United States and its allies. For this reason it would be wise to create a process that would encourage deliberation and allow the creation of options tailored to a particular situation.

Adaptive or ad hoc targeting would not mean an end to war planning. Instead, the U.S. Strategic Command would be directed to rethink how nuclear weapons might be used within the confines of the limited role assigned to them and to subject the resulting concepts to periodic review by policymakers. At the operational level the ability to develop and execute plans in response to hypothetical scenarios would be exercised regularly. Contingency planning should be guided by several assumptions:

- the United States will not use nuclear weapons first;
- the United States will not use nuclear weapons in haste (no launch on warning or launch under attack);
- any U.S. nuclear retaliatory strike would be tailored to the circumstances and would be designed to facilitate a cease-fire and to minimize the risk of additional nuclear attacks, particularly against U.S. or allied cities; and
- the retaliatory strike would be directed at military targets and be designed to minimize civilian casualties.

As noted earlier these criteria could be satisfied with strikes against carefully selected military supply depots and transportation or energy targets located outside cities. It is not our intention to specify detailed options for retaliatory strikes here but simply to outline the political constraints and principles that should guide the formulation of such options.

### **Summary: Targeting Doctrine**

There is no satisfactory solution to the problem of how best to plan to use nuclear weapons in response to a nuclear attack on the United States or its allies. Plans to attack nuclear forces and command-and-control systems exacerbate crisis instabilities and risks of accidental, unauthorized, or inadvertent use. Plans to attack cities are suicidal and violate established humanitarian principles. Plans to attack conventional military forces risk sending the wrong message. Because a deliberate nuclear attack against the United States is almost unthinkable, we cannot foresee the circumstances under which the United States might use nuclear weapons. War planners should therefore create a process that presumes that any use of nuclear weapons would be tailored to a particular set of possibly unforeseeable circumstances. Planning would continue, guided by the general principles we have laid out, but it would not focus on a single, integrated operations plan.

## **Guidelines for Force Size and Structure**

The size and composition of nuclear forces should be dictated by the concepts, doctrines, and plans that are developed for their use. However, there should be no fixed plans for using nuclear weapons. Rather the U.S. nuclear arsenal should be regarded as a flexible contingency force for the very limited purpose of deterring or responding to the use of nuclear weapons against the United States and its allies.

How large should this contingency force be? Even if one rejects countervalue targeting, the threat to destroy another country's society is the inescapable core of deterrence. No sane adversary would believe that any political or military advantage would be worth a significant risk of the destruction of his own society. As noted earlier the delivery of one hundred U.S. warheads would be sufficient to destroy the society and economy of Russia or China, and as few as ten detonations could kill more people than have ever been killed in any country in any previous war. Thus ten to one hundred survivable warheads should be more than enough to deter any rational leader from ordering an attack on the cities of the United States or its allies.

Retaliating against cities would be suicidal unless one's own cities had already been destroyed. If the United States suffered less than all-out nuclear attack and a nuclear response was deemed necessary, the president should have options to use nuclear weapons on targets other than an opponent's cities, and thereby minimize the probability of escalation and mutual suicide. Ten to one hundred survivable warheads should be sufficient for such contingencies. Against Russia, for example, one hundred nuclear explosions would be enough to destroy all major air and naval bases, staging areas, command centers, and logistics centers that might be used to support a conventional attack.<sup>13</sup> Alternatively, one hundred explosions would be sufficient to destroy all major energy and industrial targets located outside cities.<sup>14</sup> It is, however, difficult to imagine that one hundred nuclear weapons could be used against an opponent, even in a manner that avoided cities, without triggering an all-out response. Indeed, ten warheads probably is closer to the upper limit of what would be interpreted by an adversary as a limited retaliatory attack.

Possible force structures and readiness postures during the various stages of reductions are discussed in more detail in later chapters. Here we note only that, however many weapons the United States decides are required for deterrence, a substantial fraction should not be vulnerable to attack either by nuclear or conventional means. In this context, "survivable" excludes targetable weapons, such as silo-based ICBMs and pier-side SLBMs.<sup>15</sup> A considered nuclear retaliatory response, tailored to the circumstances of the attack and designed to minimize the risks of additional attacks on U.S. cities, would not be possible if nuclear forces and their command-and-control systems were not capable of surviving a nuclear attack.

Although nuclear forces must be survivable, they need not be capable of rapid retaliation. Time would be required to evaluate a nuclear attack on the United States and prepare an appropriate response. A potential attacker would not be less deterred if a retaliatory response was delayed by an hour or a day because the attacker could not, during such a delay, expect to gain a

political or military advantage that would in any way blunt or offset a devastating retaliatory strike.

Finally, there is no compelling military or strategic rationale for linking the size of U.S. nuclear forces to those of other nuclear weapon states. As long as the United States has enough survivable warheads to deter and respond to nuclear attacks, it should not matter how many weapons other countries have. If based and operated properly, the survivability of U.S. weapons would be insensitive to the size of other nuclear arsenals. Even a 10,000-warhead force could not nullify a 200-warhead force based on submarines at sea. Relative numbers will, of course, retain considerable symbolic political value because they will be viewed as making a statement about the relative stature of the countries. It is primarily for this reason, and not for purposes of maintaining strategic stability, that the relative sizes of nuclear forces would be an important factor in a deep cuts agreement.

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1. *Nuclear Posture Review: Press/Public Version*, September 1994.

2. William M. Arkin and Hans Kristensen, "Dangerous Directions," *Bulletin of the Atomic Scientists*, vol. 54 (March-April 1998).

3. U.S. Senate Committee on Foreign Relations, *Report on the START II Treaty*, 104th Congress, Exec. Report 104-10, December 15, 1996, p. 11.

4. Thomas C. Reed and Michael O. Wheeler, "The Role of Nuclear Weapons in the New World Order." The report was commissioned by General George Butler (then commander in chief of the Strategic Air Command). Reed was a former secretary of the air force (1976–77) and assistant to the president for national security policy (1982–83), and Wheeler was former special assistant to three chairmen of the Joint Chiefs of Staff and executive secretary of the National Security Council (1982–83). See also R. Jeffrey Smith, "U.S. Urged to Cut 50% of A-Arms," *Washington Post*, January 6, 1992.

5. The Reed-Wheeler report (pp. 26–27) recommended targeting "bomber bases, [ballistic missile submarine] ports, ICBM support bases, mobile ICBM garrisons, nuclear storage bunkers, and other command nodes." With regard to ICBM silos, it states that "in a START environment, where the silo force of possible adversaries probably will be no larger than 200 to 250 silos, there is not a high penalty paid in terms of number of U.S. weapons in placing a weapon on each silo." As described in Janne E. Nolan, *Guardians of the Arsenal: The Politics of Nuclear Strategy* (Basic Books, 1989), there has been very little change in U.S. targeting strategy over the decades.

6. This certainly is true for Russia. Some analysts claim that retaliatory or second-strike counterforce attacks can limit damage to the United States by, for example, destroying ICBMs that malfunctioned or destroying Russia's capacity to reload silos for a second round of nuclear strikes. First, such attacks would likely prompt the launch of any remaining Russian forces that are vulnerable to a U.S. attack. Other types of responses might be able to avoid or deter the launch of these forces, limiting damage far more effectively. Second, malfunctions and reloads are unlikely to be important compared with the capacity of submarines at sea or dispersed mobile missiles, which cannot be eliminated by a counterforce attack, to destroy the U.S. cities. Third, if reloads are worrisome, the possession of extra missiles above some nominal level could be prohibited by agreement.

Damage-limiting counterforce attacks may, however, be possible against China or some other country that acquires nuclear weapons. In these cases a disarming first strike might be contemplated if one was convinced that a nuclear attack was imminent. But even in the early 1960s, when the Soviet strategic nuclear force was much smaller than the U.S. force and extremely vulnerable, the U.S. military did not believe that it could prevent the destruction of many U.S. cities. See

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“Briefing for the President, SIOPB62,” quoted in Scott D. Sagan, “SIOPB62: The Nuclear War Plan Briefing to President *International Security*, vol. 12 (Summer 1987), p. 22. Nor does a counterforce *second* strike make sense, since it would easily prompt these countries to use their small residual forces—most likely against U.S. cities—rather than see them destroyed. If the leaders of these countries had initiated nuclear attacks against the United States, one must presume that they would be prepared to go all the way.

7. Alain C. Enthoven and K. Wayne Smith, *How Much Is Enough? Shaping the Defense Program, 1961–1969* (Harper and Row, 1971), p. 207.

8. More than 50 percent of Russian industry and 35 percent of Russian population are concentrated in fifty cities, which could be destroyed completely by about one hundred U.S. strategic nuclear warheads. Roger D. Speed, “Potential CIS/Russian Targets,” UCRL-ID-111040 (Livermore, Calif.: Lawrence Livermore National Laboratory, June 1992).

9. A simple calculation illustrates the destructive potential of a small number of nuclear weapons. Large Russian cities have average population densities ranging from 10,000 to 15,000 per square kilometer. An urban population of 20 million would therefore occupy a total area of 1,300 to 2,000 square kilometers, or about 1,500 square kilometers if one focuses on city centers. The U.S. warheads most likely to constitute a small, surviving force are the 100-kiloton W-76 and the 475-kiloton W-88 SLBM warheads. Detonation of the lower-yield W-76 warhead would destroy an urban area of 35 to 60 square kilometers; the area of destruction for the high-yield W-88 would be 100 to 150 square kilometers. The smaller areas are for blast effects alone, while the larger include the area potentially destroyed by fire. Thus the complete destruction 1,500 square kilometers of urban area could be accomplished with 25 to 40 W-76 or 10 to 15 W-88 warheads.

Chinese cities have population densities up to 45,000 per square kilometer. Twenty million people live in the four most densely populated Chinese cities, which have a combined area of only 530 square kilometers. These four cities could be destroyed by 10 to 15 W-76 or 5 W-88 warheads.

10. Reed-Wheeler report, p. 28.

11. Reed-Wheeler report, p. 25. For detailed estimates of civilian casualties from counterforce attacks see, for example, William Daugherty, Barbara Levi, and Frank von Hippel, “The Consequences of ‘Limited’ Nuclear Attacks on the United States,” *International Security*, vol. 10 (Spring 1986), pp. 3–45; and Barbara G. Levi, Frank von Hippel, and William H. Daugherty, “Civilian Casualties from ‘Limited’ Nuclear Attacks on the USSR,” *International Security*, vol. 12 (Winter 1987–88), pp. 168–89. For START II forces, the attacks and consequences would be somewhat reduced. In particular, there would be fewer missile silos to attack. Nevertheless, the *direct* civilian fatalities would still be on the order of 10 million each in the United States and Russia.

12. For a discussion of counterpower strategies, see Jeffrey Richelson, “The Dilemmas of Counterpower Targeting,” in *Strategic Nuclear Targeting*, edited by Desmond Ball and Jeffrey Richelson (Cornell University Press, 1985); Bernard Albert, “Constructive Counterpower,” *Orbis*, vol. 20 (Summer 1976); and Bruce Russett, “Assured Destruction of What? A Countercombatant Alternative to Nuclear MADness,” *Public Policy*, vol. 22 (Spring 1974).

13. Speed, “Potential CIS/Russian Targets.”

14. Fifty generating stations account for 50 percent of Russian electricity production, and twenty refineries account for 70 percent of its petroleum. Most of these and other major industrial and energy facilities are located in or near major cities, and attacks would be virtually indistinguishable from an attack on the population. The number of major industrial targets located outside major cities is almost certainly less than one hundred. See Speed, “Potential CIS/Russian Targets.”

15. Two arguments are often made for retaining relatively large numbers of silo-based ICBMs. First, if such missiles are armed with a single warhead, no advantage could be obtained by attacking the silos because no more than one warhead could be destroyed by each attacking warhead. This does not mean that both sides would not plan to destroy silos, however, just as they do today. Thus the existence of silo-based missiles will inevitably create pressures for quick decisions.

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Second, it is argued that the existence of numerous silos ensures that a counterforce attack would have to be large, which would make adversaries more reluctant to attempt such attacks. But any adversary that was foolish and risk taking enough to attempt a first strike against the United States, knowing that submarines at sea could not be destroyed, could just as easily avoid the silos. It is difficult to imagine circumstances in which the existence of silo-based missiles would make a significant difference in the calculations of an adversary about whether to launch a first strike.