An apparent contradiction lies at the center of our understandings about nuclear weapons and deterrence. On the one hand, it is widely believed that nuclear weapons were an important factor in maintaining the "long peace" between the United States and the Soviet Union during the Cold War. The two superpowers avoided war despite a deep geopolitical rivalry, repeated crises, and a prolonged arms race. On the other hand, it is also widely believed that the continuing spread of nuclear weapons will greatly increase the risks of nuclear war. New nuclear powers, with similar characteristics of rivalry, are considered unlikely to maintain stable deterrence.

A prominent group of political scientists have pointed to the apparent contradiction between a peaceful nuclear past and a fearful nuclear future and argue that the further spread of nuclear weapons will be a stabilizing factor in international relations. Kenneth Waltz's 1981 monograph—The Spread of Nuclear Weapons: More May Be Better—presented the first detailed and forceful set of arguments in favor of proliferation.¹ Since that time, however, a significant number of rational choice and neorealist political scientists have jumped onto the pro-proliferation bandwagon. Bruce Bueno de Mesquita and William Riker advocate spreading nuclear weapons into areas where non-nuclear states face nuclear-armed adversaries since "the chance of bilateral conflict becoming nuclear . . . decreases to zero when all nations are nuclear armed."² John Mearsheimer believes that "nuclear weapons are

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a superb deterrent and argues that both Germany and Ukraine should be encouraged to become nuclear powers in the post-Cold War era. Other neorealist scholars reach similar conclusions: Stephen Van Evera calls for German acquisition of a nuclear arsenal to deter Russia; Barry Posen recommends that Ukraine should keep nuclear weapons as a deterrent against Russian military intervention; Peter Lavoy predicts that nuclear weapons will prevent future wars between India and Pakistan; and Shai Feldman argues that nuclear proliferation in the Middle East can stabilize the Arab-Israeli conflict. The logic of this proliferation optimist position flows easily from the expected-utility assumptions of rational deterrence theory: the possession of nuclear weapons by two powers reduces the likelihood of war precisely because it makes the costs of war so great.

Such optimistic views of the effects of nuclear proliferation have not escaped criticism, of course, and a number of scholars have argued that nuclear deterrence may not be stable in specific regional settings. What is missing

3. In 1990, Mearsheimer argued that “Europe will be more stable if Germany acquires a secure nuclear deterrent, but proliferation does not go beyond that point.” In 1993, he amended his prescription: “the best formula for maintaining stability in post-Cold War Europe is for all the great powers—including Germany and Ukraine—to have secure nuclear deterrents.” John J. Mearsheimer, “Back to the Future: Instability in Europe After the Cold War,” International Security, Vol. 15, No. 1 (Summer 1990), pp. 5–56 (quotations at p. 20 and p. 8); and Mearsheimer, “The Case for a Ukrainian Nuclear Deterrent,” Foreign Affairs, Vol. 72, No. 3 (Summer 1993), pp. 50–66 (quotation at p. 51). In both articles, Mearsheimer acknowledges that widespread nuclear proliferation poses increased risks of unstable balances and of accidental war.


in this literature, however, is an alternative theory of the consequences of nuclear proliferation: a broader conception of the effects of nuclear weapons proliferation on the likelihood of war. This article presents such an alternative, rooted in organization theory, which leads to a far more pessimistic assessment of the future prospects for peace. There are two central arguments. First, I argue that professional military organizations—because of common biases, inflexible routines, and parochial interests—display strong proclivities toward organizational behaviors that lead to deterrence failures. Whereas the widespread psychological critique of rational deterrence theory maintains that many political leaders lack the cognitive capabilities or emotional stability to make deterrence work, this organizational critique argues that professional military organizations, if left on their own, are unlikely to fulfill the operational requirements for rational nuclear deterrence.

Second, I argue that such organizational proclivities can be effectively countered only by tight and sustained civilian control of the military. Unfortunately, there are strong reasons to believe that future nuclear-armed states will lack such positive mechanisms of civilian control. Many current and emerging proliferators either have military-run governments, or have weak civilian-led governments in which the professional military has a strong and direct influence on policy-making. In such states, the biases, routines, and parochial interests of powerful military organizations, not the “objective” interests of the state, can determine state behavior. These problems can be compounded by the fact that such militaries are “inward-looking,” focusing on internal issues of domestic stability and politics, rather than on external threats to national security. Extensive military involvement in domestic affairs, however, changes the focus of officers’ energies and interests, and the military’s professional competence as a fighting force (and therefore also as a deterrent) suffers. Finally, some new nuclear states have been “born nu-


7. See Samuel P. Huntington, The Soldier and the State (Cambridge: Harvard University Press,
clear": Ukraine, Belarus, and Kazakhstan inherited nuclear weapons from the Soviet Union, without inheriting its stable civil-military relations, historical learning experience, or extensive command and control mechanisms.

What are the likely effects of the spread of nuclear weapons? My argument proceeds in three steps. First, I contrast the assumptions and logic of proliferation optimists with the assumptions and logic of a more pessimistic organizational-level approach to nuclear proliferation. Next, I compare the two theories’ predictions about three major operational requirements of deterrence, and then present the existing empirical evidence concerning each requirement. Finally, the conclusions present some lessons for international relations theory and some observations about current United States non-proliferation policy.

**Rational Deterrence Theory and Organization Theory**

The influential writings of Kenneth Waltz are the most clear and confident expressions of faith in rational nuclear deterrence. "Nuclear weapons have been given a bad name," Waltz maintains:

"Because catastrophic outcomes of nuclear exchanges are easy to imagine, leaders of states will shrink in horror from initiating them. With nuclear weapons, stability and peace rest on easy calculations of what one country can do to another. Anyone—political leader or man in the street—can see that catastrophe lurks if events spiral out of control and nuclear warheads begin to fly." 8

Given that the costs of nuclear war are so high, even a small risk of war can deter in Waltz’s world. Because “a nation will be deterred from attacking even if it believes that there is only a possibility that its adversary will retaliate,” Waltz maintains that “the probability of major war among states

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8. Kenneth N. Waltz, “Nuclear Myths and Political Realities,” American Political Science Review, Vol. 84, No. 3 (September 1990), pp. 731, 734. One measure of Waltz’s influence on this issue is the fact that this article won the Heinz Eulau award for the best article published in the APSR in 1990.
having nuclear weapons approaches zero." If this is true, then the spread of nuclear weapons should have very positive consequences:

Nuclear weapons, responsibly used, make wars hard to start. Nations that have nuclear weapons have strong incentives to use them responsibly. These statements hold true for small as for big nuclear powers. Because they do, the measured spread of nuclear weapons is more to be welcomed than feared.  

Waltz writes with disdain about what he calls the "ethnocentric views" of psychological critics of deterrence: "Many Westerners who write fearfully of a future in which third-world countries have nuclear weapons seem to view their people in the once familiar imperial manner as 'lesser breeds without the law'." For nuclear deterrence to work, he argues, one does not need to assume that decision-makers in newly proliferating states make intricate rational calculations about every policy decision: it is sufficient that statesmen are highly "sensitive to costs," a requirement, Waltz acknowledges, "which for convenience can be called an assumption of rationality." When costs are so high, sensitivity is easy. Indeed, choosing the most extreme case, Waltz insists that even Nazi Germany would not have used nuclear weapons: "Hitler would almost surely have been deterred from acting in ways that immediately threatened massive death and widespread destruction in Germany" if all major powers had possessed nuclear weapons in 1939; if a conventional war broke out anyway, the allied powers would then have been deterred from marching on Berlin in 1945 because of the fear of desperate German nuclear retaliation. In short, deterrence is not difficult: "One need not become preoccupied with the characteristics of the state that is to be

11. Ibid., p. 11.
13. Waltz, The Spread of Nuclear Weapons, p. 20. Just to be sure, Waltz adds that "if Hitler had not been deterred, would his generals have obeyed his commands?" Ibid. This tack-on argument, however, is inconsistent with Waltz's complete lack of concern for the danger of unauthorized use of nuclear weapons, as noted below. If German generals had the ability and will to disobey Hitler's nuclear commands, could they not also order the use of nuclear weapons on their own authority?
deterred or scrutinize its leaders,” Waltz insists, since “in a nuclear world any state will be deterred by another state’s second-strike forces.”

Within the rational deterrence framework, three major requirements for stable nuclear deterrence exist: 1) there must not be a preventive war during the transition period when one state has nuclear weapons and the other state is building, but has not yet achieved, a nuclear capability; 2) both states must develop not just the ability to inflict unacceptable damage to the other side, but also a sufficient degree of “second-strike” invulnerability so that its forces could retaliate if attacked first; and 3) the nuclear arsenals must not be prone to accidental or unauthorized use. Nuclear optimists believe that nuclear states will meet these requirements because it is in these states’ obvious interests to do so. This is, as I will show, a very problematic belief.

AN ORGANIZATIONAL PERSPECTIVE

The assumption that states behave in a basically rational manner, pursuing their interests according to expected-utility theory, is of course an assumption, not an empirically tested insight. International relations scholars often assume high degrees of rationality, not because it is accurate, but because it is helpful: it provides a relatively simple way of making predictions, by linking perceived interests with expected behavior. The rational unitary actor view is clearly not the only one possible, however, and it is not the only set of assumptions which lead to interesting predictions about nuclear proliferation.

A more realistic set of assumptions views government leaders as intending to behave rationally, yet envisions their beliefs, the options available to them, and the final implementation of their decisions as being influenced by powerful organizational actors. If this is the case, organization theory should be useful for the study of the consequences of proliferation. This is important, since such an organizational perspective challenges the central assumption that states are unitary actors behaving in a self-interested manner.

Two widespread themes in the organization theory literature focus attention on the major impediments to pure rationality in organizational behavior. First, large organizations function within a severely “bounded” form of rationality: they have inherent limits on calculation and coordination and use simplifying mechanisms to understand and respond to uncertainty in the

external environment. Organizations, by necessity, develop routines to coordinate action among different units: standard operating procedures and organizational rules, not individually reasoned decisions, therefore govern much behavior. Organizations commonly “satisfice”: rather than searching for the policy that maximizes their utility, they often accept the first option that is minimally satisfying. Organizations are often myopic: instead of surveying the entire environment for information, organization members undertake biased searches, focusing only on specific areas stemming from their past experience, recent training, and current responsibility. Organizations suffer from “goal displacement”: they often become fixated on the operational means to the ends and lose focus on the overall objectives. Organizational filters continually shape the beliefs and actions of individuals. As James March and Herbert Simon put it, “the world tends to be perceived by the organization members in terms of the particular concepts that are reflected in the organization’s vocabulary. The particular categories it employs are reified, and become, for members of the organization, attributes of the world rather than mere conventions.”

Second, complex organizations commonly have multiple conflicting goals and the process by which objectives are chosen and pursued is intensely political. Such a political perspective envisions apparently irrational behaviors as serving the narrow interests of some units within the organization.


17. March and Simon, Organizations, p. 165.

even if the actions appear "systematically stupid" from the leadership's overall perspective.\textsuperscript{19} Organizations are not simply tools in the hands of higher-level authorities, but are groups of self-interested and competitive sub-units and actors. "Theory should see conflict as an inevitable part of organizational life stemming from organizational characteristics rather than from the characteristics of individuals," Charles Perrow has argued. Organizational divisions and responsibilities help explain why "sales and production [are] in conflict in all firms . . . or faculty and administration in colleges, doctors and nurses and administrators in hospitals, the treatment and custodial staffs in prisons."\textsuperscript{20} In military organizations, weapon system operators often have different interests than their commanders, units in the field have different interests than the command headquarters, and a particular service has different interests than the Joint Chiefs of Staff. Even when a professional military service or command acts in relatively rational ways to maximize its interests—protecting its power, size, autonomy or organizational essence—such actions do not necessarily reflect the organizational interests of the military as a whole, much less the national interests of the state. To the degree that narrow organizational interests determine state behavior, the expected-utility theory of a rational unitary actor is seriously undermined.

Although organization theory has been highly useful in a number of substantive areas of international relations, illuminating crisis behavior, alliance politics, weapons procurement, military doctrine, and nuclear weapons safety,\textsuperscript{21} it has not been used extensively to study the consequences of proliferation. This is unfortunate, since each of the three operational requirements for rational deterrence appears in a different light when viewed from an organizational perspective. What are professional military views about preventive war; could such views influence the probability of a nuclear attack?


\textsuperscript{20} Perrow, \textit{Complex Organizations}, p. 132. In any large organization, as Richard Cyert and James March similarly note, "the decision processes we observe seem to be infused with strategic actions and politics at every level and every point." Cyert and March, \textit{A Behavioral Theory of the Firm}, p. 229.

during the transition period of an early arms race? What is the likelihood that professional militaries will develop and deploy survivable nuclear forces to maintain stable deterrence? What is the likely influence of the structures and biases of military organizations on the prevention of accidental and unauthorized uses of nuclear weapons in new proliferating states?

The next section presents predictions and empirical evidence concerning the three operational requirements for stable nuclear deterrence. In each section, I first contrast the predictions made by nuclear optimists to the predictions deduced from an organizational approach. I then present two kinds of evidence. Evidence from the U.S. case will be given first, both because there is more evidence available on American nuclear weapons operations and because the United States should be considered a tough test of this approach, since it is widely considered to have a highly professionalized military under a strong and institutionalized system of civilian control. The currently available evidence about the nuclear weapons activities of new proliferants is then presented. Both kinds of evidence provide support for a pessimistic conclusion about the consequences of the spread of nuclear weapons.

**Preventive War in the Transition Period**

The first operational requirement of mutual nuclear deterrence between two powers concerns the transition period between a conventional world and a nuclear world: the first state to acquire weapons must not attack its rival in a preventive war now, in order to avoid the risk of a worse war later after the second state has acquired a large nuclear arsenal.22 There are two periods in a nuclear arms race, according to Waltz, during which a state might consider a preventive strike: when its rival is developing but has not yet constructed a bomb, and when the size of the rival’s nascent arsenal is extremely small. Waltz maintains that a preventive strike might seem to make sense “during the first stage of nuclear development [since] a state could strike without fearing that the country it attacked would return a nuclear

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blow." Yet, he insists that such attacks are unlikely, because it would not be in a state’s longer-term interests:

Would one strike so hard as to destroy the very potential for future nuclear development? If not, the country struck could simply resume its nuclear career. If the blow struck is less than devastating, one must be prepared to repeat it or to occupy and control the country. To do either would be difficult and costly.²³

Later, once an adversary has developed even a suspected nuclear capability, all rational incentives for preventive war are off. "Preventive strikes against states that have, or may have, nuclear weapons are hard to imagine," Waltz insists. "To know for sure that the country attacked has not already produced or otherwise acquired some deliverable warheads becomes increasingly difficult" over time.²⁴ A little uncertainty goes a long way in Waltz’s world: if there is even a remote chance of nuclear retaliation, a rational decision-maker will not launch a preventive war.

An organizational perspective, however, leads to a more pessimistic assessment of the likelihood of nuclear preventive wars, because it draws attention to military biases in favor of such attacks. This argument may appear counter-intuitive, since Richard Betts’s work has led to a widespread belief among political scientists that military leaders are not more likely than civilians to recommend the use of military force in general during crises.²⁵ Yet there are four strong reasons to expect that military officers are predisposed to view preventive war, in particular, in a much more favorable light than are civilian authorities.²⁶ First, military officers, because of self-selection into the

²⁴. Ibid., p. 15 (emphasis added).
²⁶. Waltz’s optimism is partially based on an explicit extension of Betts’s argument. See Waltz, The Spread of Nuclear Weapons, p. 12. Betts, however, only examined advice about U.S. military intervention during the Cold War and did not compare military and civilian views on the attractiveness of preventive war.
profession and socialization afterwards, are more inclined than the rest of
the population to see war as likely in the near term and inevitable in the
long run.27 The professional focus of attention on warfare also makes military
officers skeptical of non-military alternatives to war, whereas civilian leaders
often place stronger hopes on diplomatic and economic methods of long-
term conflict resolution.28 Such beliefs make military officers particularly
susceptible to “better now than later” logic. Second, officers are trained to
focus on pure military logic when analyzing security problems. Diplomatic,
moral, or domestic political inhibitions against preventive war options are
therefore less likely to be influential. Third, military officers display strong
biases in favor of offensive doctrines and decisive operations.29 Offensive
doctrines enable military organizations to take the initiative, utilizing their
standard plans under conditions they control while forcing adversaries to
react to their favored strategies. Decisive operations utilize the principle of
mass, may reduce casualties, and are more likely to lead to a military decision
rather than a political stalemate. Preventive war would clearly have these
desired characteristics. Finally, the military, like most organizations, tends to
plan incrementally, leading it to focus on immediate plans for war and not
the subsequent problems of managing the postwar world. Moreover, since
managing the postwar world is the diplomats’ job, not part of military offi-
cers’ operational responsibility, the professional military is likely to be short-
sighted, not examining the long-term political and diplomatic consequences
of preventive war. In theory, these factors should make military officers more
likely to advocate preventive war.

27. Huntington, The Soldier and the State, p. 65; Alfred Vagts, Defense and Diplomacy: The Soldier
and the Conduct of Foreign Relations (New York: Crown Point Press, 1956), p. 263; and Jack Snyder,
The Ideology of the Offensive: Military Decision-Making and the Disasters of 1914 (Ithaca: Cornell
University Press, 1984), p. 28. For empirical support see John P. Lovell, “The Professional
Socialization of the West Point Cadet,” in Morris Janowitz, ed., The New Military (New York:
on the Probability of War,” in Jacques van Doorn, ed., Military Profession and Military Regimes
28. This focus on military means is often seen as a “cultural factor,” due to the “military mind.”
Yet, as Karl Weick has noted, socialization of individuals into an organizational culture is a
common and deliberate method used to preserve coordination and produce “a homogenous set
of assumptions” in a decentralized organization. See Karl E. Weick, “Organizational Culture as
29. See Snyder, Ideology of the Offensive, pp. 26–30; and Posen, The Sources of Military Doctrine,
EVIDENCE ON PREVENTIVE WAR FROM THE U.S. CASE

What differences existed between U.S. civilian and military advice on the use of nuclear weapons during the early Cold War? During major crises, few disagreements emerged. For example, after the Chinese military intervention in the Korean War in late November 1950, both Truman’s senior military advisors and his senior civilian advisors recommended against the use of the atomic bomb on the Korean peninsula.30 If one focuses specifically on the issue of preventive war, however, strong differences between civilian and military opinions can be seen. During both the Truman and Eisenhower administrations, senior U.S. military officers seriously advocated preventive war options and, in both cases, continued favoring such ideas well after civilian leaders ruled against them.

Although U.S. military officers were not alone in recommending preventive war during the Truman administration—as diverse a set of individuals as philosopher Bertrand Russell, mathematician John Von Neumann, and Navy Secretary Francis Matthews called for such a policy—within the government, military leaders were clearly the predominant and most persistent advocates.31 The Joint Chiefs of Staff (JCS) were quite direct in their advocacy of preventive options, calling for the “readiness and determination to take prompt and effective military action abroad to anticipate and prevent attack” in their September 1945 top secret report on postwar U.S. military policy: “When it becomes evident that forces of aggression are being arrayed against us by a potential enemy, we cannot afford, through any misguided and perilous idea of avoiding an aggressive attitude to permit the first blow to be struck against us.”32 Truman appears to have rejected the whole concept

30. It is important to note, however, that Truman’s military advisors tended to focus on tactical, military reasons for not using the bomb (such as the lack of suitable targets in Korea or the need to retain weapons for targets in the USSR), while civilians more often emphasized political factors (such as the effects on allied governments or U.S. public opinion). See John Lewis Gaddis, “The Origins of Self-Deterrence: The United States and the Non-Use of Nuclear Weapons, 1945–1958,” in Gaddis, The Long Peace: Inquiries into the History of the Cold War (New York: Oxford University Press, 1987), pp. 115–123; and Roger Dingman, “Atomic Diplomacy During the Korean War,” International Security, Vol. 13, No. 3 (Winter 1988/89), pp. 65–69.
of preventive war rather quickly, however, largely on moral and domestic political grounds. “We do not believe in aggression or preventive war,” he announced in a public broadcast in 1950: “Such a war is the weapon of dictators, not of free democratic countries like the United States.”

The issue was not thoroughly addressed at the highest levels, however, until April 1950, when NSC 68 presented three key arguments against preventive war. First, intelligence estimates suggested that a U.S. atomic attack on the USSR “would not force or induce the Kremlin to capitulate and that the Kremlin would still be able to use the forces under its control to dominate most or all of Eurasia.” Second, a preventive attack “would be repugnant to many Americans” and therefore difficult to justify at home. Third, U.S. allies, especially in Western Europe, would share those beliefs, hurting U.S. relations with them and making it “difficult after such a war to create satisfactory international order.” The conclusion was clear: “These considerations are no less weighty because they are imponderable, and they rule out an attack unless it is demonstrably in the nature of a counter-attack to a blow which is on its way or about to be delivered.”

Senior Air Force leaders were very cautious about discussing preventive nuclear war in public after that, with the exception of Major General Orvil Anderson, the commandant of the Air War College, whom Truman fired for advocating preventive war to the press in September 1950. Yet military support for preventive options remained high. Generals George Kenney,
Curtis LeMay, Thomas Power, Nathan Twining, Thomas White, and Hoyt Vandenberg all privately expressed sympathy for preventive war, and official Air Force doctrine manuals continued to support preventive war ideas.36 There was, nevertheless, no high-level reconsideration of basic national policy under Truman.

Serious discussions of the preventive war option reemerged at the highest levels of the U.S. government during the first two years of the Eisenhower administration. Throughout the new administration’s reevaluation of U.S. security strategy, senior military officers again supported preventive options. The U.S. Air War College, for example, produced the extensive “Project Control” study in 1953 and 1954, which advocated preventive war if necessary.37 The study called for taking direct control of Soviet airspace, and threatening massive bombing unless the Kremlin agreed to an ultimatum to withdraw troops from Eastern Europe, dissolve the Cominform, and abandon the Sino-Soviet alliance. Project Control was greeted with enthusiasm when it was briefed to Chairman of the Joint Chiefs of Staff Admiral Arthur Radford in July 1954, though State Department officials complained that such schemes were “simply another version of preventive war.”38 In addition, Eisenhower himself was briefed on a JCS Advanced Study Group report in mid-1954 which, according to a contemporary memorandum on the report, “pointed unmistakably to an advocacy of the US deliberately precipitating war with the USSR in the near future—that is before the USSR could achieve a large enough thermo-nuclear capability to be a real menace to the Continental U.S.”39

The most extreme preventive war arguments by a senior officer, however, can be found in General Twining’s August 1953 memorandum to the JCS on

37. Project Control suggested the following standard for “aggression” calling for a U.S. military response after issuing the ultimatum: “Any nation that persists in the development and production of military force capable of threatening the existence of the Free World and whose political actions and stated national intent leaves no doubt that she intends to use military force to conquer or subjugate free countries should be considered as an aggressor who is preparing to commit an aggressive act against the United States.” Quoted in Tami Davis Biddle, “Handling the Soviet Threat: ‘Project Control’ and the Debate on American Strategy in the Early Cold War Years,” Journal of Strategic Studies, Vol. 12, No. 3 (September 1989), p. 287.
38. Ibid., pp. 291–292.
"The Coming National Crisis," which would occur, he maintained, when the USSR developed sufficient nuclear forces so that "our military establishment would be unable to insure the survival of our nation":

Prior to entering the second period of time [when the Soviet Union could destroy the United States] if our objectives have not been achieved by means short of general war, it will be necessary to adopt other measures. We must recognize this time of decision, or, we will continue blindly down a suicidal path and arrive at a situation in which we will have entrusted our survival to the whims of a small group of proven barbarians. If we believe it unsafe, unwise, or immoral to gamble that the enemy will tolerate our existence under this circumstance, we must be militarily prepared to support such decisions as might involve general war.40

The final JCS position was much more calm in tone, though it too displayed "better now than later" logic. While acknowledging that official U.S. policy prohibited preventive war, JCS Chairman Radford told the National Security Council in November 1954 that "if we continue to pursue a policy of simply reacting to Communist initiatives, instead of a policy of forestalling Communist action, we cannot hope for anything but a showdown with Soviet Communists by 1959 or 1960," adding ominously that the JCS could "guarantee" a successful outcome in a nuclear war only if it occurred "prior to Soviet achievement of atomic plenty."41

Why did Eisenhower reject this line of thinking? Eisenhower clearly did not object to preventive war on moral grounds.42 Instead, his eventual rejection of preventive war appears to have been determined by his increasing belief that a preventive nuclear attack on the USSR would be too costly to the United States, even if it succeeded in the sense of preventing large-scale U.S. casualties. The political and human costs of maintaining control over a


42. In the future, he wrote in a top secret memorandum to Dulles in September 1953, the United States "would have to be constantly ready, on an instantaneous basis, to inflict greater loss upon the enemy than he could reasonably hope to inflict on us": "This would be a deterrent—but if the contest to maintain this relative position should have to continue indefinitely, the cost would either drive us to war—or into some form of dictatorial government. In such circumstances, we would be forced to consider whether or not our duty to future generations did not require us to initiate war at the most propitious moment that we could designate." Memorandum by the President to the Secretary of State, September 8, 1953, ibid., p. 461 (emphasis in original).
decimated Soviet society were appalling to Eisenhower. He told a group of officers in June 1954:

No matter how well prepared for war we may be, no matter how certain we are that within 24 hours we could destroy Kuibyshev and Moscow and Leningrad and Baku and all the other places that would allow the Soviets to carry on war, I want you to carry this question home with you: Gain such a victory, and what do you do with it? Here would be a great area from the Elbe to Vladivostok and down through Southeast Asia torn up and destroyed without government, without its communications, just an area of starvation and disaster. I ask you what would the civilized world do about it? I repeat there is no victory in any war except through our imaginations, through our dedication, and through our work to avoid it.43

PREVENTIVE WAR AMONG PROLIFERATORS

The evidence presented here does not demonstrate that the United States almost launched a preventive war on the USSR in the early Cold War period. Nor do I mean to suggest that civilian leaders could never rationally choose to launch a preventive attack.44 This evidence does strongly suggest, however, that military officers have strong proclivities toward preventive war and that nuclear optimists are therefore wrong to assume that any leader of a state will be automatically deterred by an adversary's small arsenal, or even the mere possibility of such an arsenal. While preventive nuclear strikes may be hard for some scholars to imagine, such attacks were clearly imagined, actively planned, and vigorously advocated by senior U.S. military leaders, well beyond the initial development of nuclear weapons by the USSR.45


44. Just as civilian leaders may choose offensive doctrines for rational strategic reasons, they could choose preventive war if they believed the costs were low and the probability of war in the long run was extremely high. See Scott D. Sagan, "1914 Revisited: Allies, Offensives, and Instability," International Security, Vol. 11, No. 2 (Fall 1986), pp. 151–176; and Shai Feldman, "The Bombing of Osiraq Revisited," International Security, Vol. 7, No. 2 (Fall 1982).

45. When the U.S. preventive war advocates presented their views in 1954, U.S. intelligence estimates of Soviet nuclear capabilities were highly uncertain, but nonetheless significant: estimates of the Soviet nuclear stockpile ranged from 188 to 725 nuclear weapons; and an estimated 300 Soviet bomber aircraft could be launched in a first strike, or possibly launched upon warning of a U.S. attack, "200 to 250 of which might reach their targets [in the United States]." NIE 11-4-54 (August 29, 1954). Declassified Documents Reference System, 1981, No. 283A; and Memorandum by the Acting Special Assistant to the Secretary of State for Intelligence to the Acting Secretary of State (March 1, 1954), FRUS, 1952–1954, Vol. 2, National Security Affairs, part 1, p. 634.
Without Truman’s and Eisenhower’s broader mix of moral and political objections to preventive war, the narrow military logic in favor of such an option might have prevailed.46

The “better now than later” logic of preventive war is likely to be under serious consideration whenever an existing nuclear power sees a rival developing a nuclear arsenal. Preventive war is more likely to be chosen, however, if military leaders have a significant degree of influence over the final decision. While there have not been, obviously, any nuclear preventive wars among the new proliferants, the probability of such attacks will increase since civilian control over the military is more problematic in many of these states.

Pakistan is the most dramatic case in point, since a rapid development of a Pakistani operational nuclear arsenal could create a temporary nuclear superiority over India, which apparently refrained from building an arsenal after its 1974 nuclear test.47 Military biases in favor of preventive war are highly influential in Pakistan, where the military has been in direct control of the government for more than half of the state’s history. Indeed, Pakistani military leaders have repeatedly advocated and initiated preventive war against India. In the fall of 1962, senior military authorities unsuccessfully urged President Mohammed Ayub Khan, the leader of the military-controlled government, to attack India while its army was tied down in the conflict with China.48 Three years later, in September 1965, the Ayub government did launch a preventive war on India in an effort to conquer Kashmir before the anticipated Indian military build-up was completed.49 The Pakistani attack

46. Although advocacy of preventive war diminished within the U.S. military in the late 1950s, common organizational proclivities continued to influence military thinking about nuclear war. Goal displacement was especially pronounced in the early integrated war plans that enabled the JCS to argue, as late as 1961, that the United States would “prevail in the event of general nuclear war,” even if the USSR struck first. “Prevail” in this context did not mean avoiding massive U.S. casualties, however; it simply meant achieving the damage expectancy war aims set out in the guidance given to war planners. See Scott D. Sagan, “SIOP-62: The Nuclear War Plan Briefing to President Kennedy,” International Security, Vol. 12, No. 1 (Summer 1987), p. 36.
47. Estimates of the size and status of the Indian and Pakistani weapons arsenals are very uncertain. India claims it has not built actual weapons, though it has significantly more weapons-grade plutonium and could develop a larger arsenal over time if a decision to deploy weapons is made. Pakistani authorities, however, suggest that Pakistan has already constructed, or could rapidly assemble, a small number of weapons. See David Albright, “India and Pakistan’s Nuclear Arms Race,” Arms Control Today, Vol. 23, No. 5 (June 1993), pp. 12–16; and “Pakistani Quoted as Citing Nuclear Test in ‘87,” New York Times, July 25, 1993, p. A-12.
49. On the preventive motivations for Pakistan’s 1965 attack see ibid., p. 139; Gowher Rizvi, “The Rivalry Between India and Pakistan,” in Barry Buzan and Gowher Rizvi, eds., South Asian
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on India in December 1971 was also strongly influenced by the parochial biases and organizational interests of senior army and air force leaders since, as Richard Sisson and Leo Rose have stressed, the ruling military viewed threats to Bengal as “threats to their image, threats to the welfare of the military in a successor state, and threats in the way of charges that the military was prepared to barter away Pakistani sovereignty.”50 Finally, unconfirmed reports that Pakistan’s Air Force made initial preparations for a nuclear first strike during the May 1990 crisis over Kashmir are alarming not only because of the potential for miscalculated escalation, but also because Pakistani Prime Minister Benazir Bhutto was reportedly cut out of the dangerous crisis decision-making.51 Later in 1990, the Bhutto regime was ousted by the Pakistan military, after she attempted to place her own loyal candidate as Army Chief of Staff.52 There is, unfortunately, little reason to assume that future Pakistani governments, even if nominally democratic in nature, will be entirely resistant to parochial military pressures.53

The possible maintenance of a nuclear arsenal by Ukraine is a second example that should raise fears of the possibility of preventive war. From a broad organizational perspective, it is very worrisome that Ukraine has yet to develop stable civil-military relations and that officers in Kiev, alarmed over their loss of status and decreasing living standards, have repeatedly threatened “to resort to extreme measures” if their social demands are not satisfied.54 Given the vast Russian military superiority over Ukraine, how-


ever, the great uncertainty about future Russian civil-military relations is also alarming. Soon after the breakup of the Soviet Union, Russian papers reported that Russian President Yeltsin privately discussed the idea of a "preventive nuclear strike" against Ukraine, but ruled against any such attack.55 If future Russian-Ukrainian relations ever deteriorate to the point where armed conflict is seriously considered, military pressure on the Russian government to attack any nuclear weapons remaining in Ukraine, before they could be readied for possible use by the Kiev government, could be significant.

Nuclear optimists dismiss this possibility. John Mearsheimer, for example, maintains that "military calculations alone should suffice to deter the Russians from launching a preventive war." He writes: "The probability of Ukrainian nuclear retaliation would be small, but the Russians could never be sure that Ukraine would not launch some nuclear weapons back at them, causing catastrophic damage, even if the retaliation was ragged."56 Barry Posen is similarly sanguine about what would occur if the Ukrainians tried to seize all the nuclear weapons on their soil: "This would be a novel kind of nuclear crisis, but it would probably be enough of a crisis to produce the prudent behavior among nuclear powers that existed during the Cold War."57

Leaving aside the question of whether the superpowers always exhibited "prudent behavior" in Cold War crises, there are several reasons to be concerned about whether a future Russian government would be deterred from preventive attacks under all circumstances. First, because of its previous custody of the Soviet arsenal, Moscow would know the location of Ukrainian weapons, and the operational details of their alerting procedures and command and control networks.58 Second, the evidence from the only historical precedent—the discussions held in Moscow in 1969 on whether to launch a preventive strike on Chinese nuclear forces—is hardly reassuring, since the minister of defense reportedly favored a preventive attack despite the existence of a small Chinese nuclear arsenal. Preparations for a possible strike went as far as a country-wide air force alert and operational military exercises, including mock bombing runs against targets designed to resemble Chinese

58. See Miller, "The Case Against a Ukrainian Nuclear Deterrent," p. 73.
nuclear facilities, but the Politburo did not approve of an attack, in part because the United States made it clear that it would strongly oppose such action. Finally, military involvement in politics has increased significantly since the breakup of the USSR, as the Russian military seeks to protect its organizational interests in Russia’s ongoing crisis. If the reform movement fails in post–Cold War Russia, and senior military officers continue to enter the political arena in a conservative successor government, their political influence would grow even greater. A likely consequence is more direct military influence on major Russian foreign policy decisions, including future decisions about preventive war in crises.

The key point is that military views on preventive war often differ significantly from the views of leading civilians. I cannot predict the exact strength of such preventive war pressures nor the timing of serious threats of war between future nuclear states. Nevertheless, because civilians will not be in firm control in all future proliferators, there are sufficient reasons to fear that military biases in favor of preventive war will be more likely to prevail than was the case with the superpowers during the Cold War.

**Interests, Routines, and Survivable Forces**

The second operational requirement of deterrence is that new nuclear powers must build invulnerable second-strike nuclear forces. The United States and the former Soviet Union developed a large and diverse arsenal, including long-range bombers, intercontinental ballistic missiles, and submarine-launched missiles, and a complex network of satellite and radar warning systems, to decrease the risks of a successful first strike against their arsenals.

Waltz addresses this issue with two related arguments. First, only a very small number of nuclear weapons are necessary for successful deterrence:


since each nuclear warhead contains so much destructive power, "not much is required to deter."61 Second, no rational nuclear power would permit all of its forces to be vulnerable to an enemy first strike:

Deterrent forces are seldom delicate because no state wants delicate forces and nuclear forces are easily made sturdy. Nuclear weapons are fairly small and light. They are easy to hide and to move.62

In short, Waltz is confident that any state will create the minimum deterrent of an invulnerable second-strike nuclear arsenal. “Because so much explosive power comes in such small packages, the invulnerability of a sufficient number of warheads is easy to achieve and the delivery of fairly large numbers of warheads impossible to thwart, both now and as far into the future as anyone can see.”63

It is puzzling, however, for a theory that emphasizes the rationality of actors, to note that both superpowers during the Cold War believed that deterrence required much larger forces than the minimum deterrence requirement. Waltz insists that the belief that such large forces were necessary was the result of “decades of fuzzy thinking” about nuclear deterrence:

The two principal powers in the system have long had second-strike forces, with neither able to launch a disarming strike against the other. That both nevertheless continue to pile weapon upon unneeded weapon is a puzzle whose solution can be found only within the United States and the Soviet Union.64

Yet, if “fuzzy thinking” at the domestic level can cause a state to spend billions of dollars building more forces than are necessary for rational deterrence, could “fuzzy thinking” not also lead a state to build inadequate forces? This is clearly possible if one assumes that organizational factors strongly influence state behavior.

Why would professional militaries not develop invulnerable nuclear forces if left to their own devices? Four reasons emerge from the logic of organizational theory. First, military bureaucracies, like other organizations, are interested in having more resources: they want more weapons, more men in uniform, more pieces of the budget pie. This could obviously lead to

62. Ibid., p. 15.
larger-than-necessary nuclear arsenals. Yet programs for making nuclear arsenals less vulnerable to attack (for example building shelters or missile-carrying trains) are expensive, and therefore decrease the resources available for the military hardware, the missiles or aircraft, that the organization values most highly. Second, militaries, like other organizations, have favored and traditional ways of doing things and therefore maintain a strong sense of what Morton Halperin calls organizational "essence." Since efforts to decrease the vulnerability of nuclear forces often requires new missions and weapon systems—and, indeed, often new organizational units—one would expect that the existing organizations would be resistant. Third, if organizational plans for war and conceptions of deterrence do not require invulnerable forces, militaries will not have incentives to pursue them. Thus, if military officers believe that they are likely to engage in preventive war, preemptive attacks, or even launch-on-warning options, then survivability measures may simply be perceived as unnecessary. Fourth, even if the technical requirements for survivability exist, organizational routines could impede invulnerability. Poorly designed standard operating procedures could completely undermine what might otherwise appear to be a survivable military force.

EVIDENCE FROM THE U.S. CASE
The history of U.S. nuclear weapons programs strongly supports these organizational arguments. The United States eventually developed invulnerable second-strike forces, but only after civilian authorities forced reluctant military organizations to deploy new weapons systems and change traditional operational practices. The influence of such factors can be seen in the history of three major weapons developments: the creation of a survivable basing system for strategic bombers in the United States; the development of the submarine-launched ballistic missile (SLBM); and the construction of the intercontinental-range ballistic missile (ICBM).

The first case in point is the development of a survivable basing system for Strategic Air Command (SAC) bombers in the mid-1950s. SAC war plans at the time, based on routines developed during World War II when the Air

Force had not faced threats of air strikes against their long-range bomber bases, called for sending the nuclear retaliatory force to bases on the periphery of the Soviet Union in crises.\textsuperscript{66} These overseas bases, however, were highly vulnerable to a surprise Soviet first strike and, making matters even worse, Air Force regulations required SAC to concentrate the facilities at individual bases to minimize the peacetime costs of utilities, pipelines, and roads.\textsuperscript{67} When civilian analysts at the RAND Corporation pointed out how unwise such plans were, as Bruce Smith has shown, narrow organizational interests produced significant resistance to change. SAC’s autonomy was threatened, since “elements within SAC began to fear that the study could be used as an opening wedge for the Air Staff to interfere with internal SAC operations and responsibilities.” Moreover, officers feared that “the Air Force could also be embarrassed before Congress” and that “the study could undermine the confidence and morale of their units.”\textsuperscript{68} The basing study led to radical changes in SAC operational plans, including U.S. basing and in-flight refueling, only after independent civilian RAND analysts did a successful “end-run” around the system, bypassing layers of opposition in SAC and briefing senior Air Force leaders directly.\textsuperscript{69}

The U.S. SLBM force has been the least vulnerable component of the strategic arsenal for over thirty years, yet it is important to note that this weapons system was developed against the wishes of the U.S. Navy leadership. The major impediment to development of the Polaris missile system was, as Harvey Sapolsky notes, “the Navy’s indecisiveness about sponsoring a ballistic missile program.”\textsuperscript{70} Senior naval officers were concerned in the early 1950s that, given the Eisenhower administration’s budget cuts, spend-


\textsuperscript{68} Ibid., pp. 222–223.

\textsuperscript{69} As Smith notes, “it is doubtful whether an Air Force officer, an ‘in house’ advisory group made up of Air Force career personnel, or even a civilian advisory group attached to a unit within the normal chain of command, would have the same opportunity or incentive to by-pass immediate superiors and press for the adoption of controversial ideas at higher levels.” Ibid., p. 226.

\textsuperscript{70} Harvey M. Sapolsky, \emph{The Polaris System Development} (Cambridge: Harvard University Press, 1972), p. 15.
ing on missile programs would come at the expense of more traditional navy programs, and insisted that the Strategic Air Command should pay for sea-based missiles. Even navy submariners were unenthusiastic since “in their view, submarines were meant to sink ships with torpedoes, not to blast land targets with missiles.”

The program’s supporters within the Navy eventually were forced to go to a group of civilian outsiders, the Killian Committee, to get endorsement of the program. Without continued high-level civilian intervention, it is not clear whether or when a large-scale SLBM force would have been constructed.

Similar organizational resistance to innovation can be observed in the early history of the U.S. ICBM force. Why did the U.S. Air Force take so long to develop strategic missiles, eventually producing the perceived missile-gap crisis? In his compelling study of the missile program, Edmund Beard concludes that “the United States could have developed an ICBM considerably earlier than it did but that such development was hindered by organizational structures and belief patterns that did not permit it.”

Devotion to manned aircraft, and especially the manned bomber, led to a prolonged period of neglect for ICBM research and development funds. As late as 1956, General Curtis Lemay placed the ICBM as the Air Force’s sixth-highest priority weapon, subordinate to four new aircraft and a cruise-missile program; even within the Air Force’s guided missile branch, air-to-air and air-to-surface missiles (which were to be used to help bombers penetrate to their targets) were given higher priority than intercontinental-range surface-to-surface missiles. Again, civilian intervention was critical: not until Killian Committee

71. Ibid., pp. 17–18. Opposition also existed because another Navy tradition—that ships should only have one commanding officer—was also challenged by the development of ballistic missile submarines, which used two commanders and crews so that replacements could take over immediately after a lengthy patrol at sea. Ibid., p. 35.
73. Indeed, in its 1961 and 1962 budget requests, the Navy budgeted for only three Polaris submarines, after which the Kennedy administration increased the number to ten. The Navy then requested that the funds should not come out of the Navy budget. See Halperin, Bureaucratic Politics and Foreign Policy, p. 34.
report recommended that ICBMs also be made a national priority, and civilian Pentagon officials threatened to create a separate agency to oversee the program, did the Air Force put adequate funds into ICBM development.76

ORGANIZATIONAL IMPEDIMENTS TO SURVIVABILITY IN NEW PROLIFERANTS

This evidence demonstrates that there are strong organizational reasons to expect that professional militaries, if left on their own, will not necessarily construct an invulnerable nuclear arsenal. Although these organizational constraints may be overcome over time, since survivable forces are clearly in the interests of state leaders, organization theory would predict that the transition to a secure retaliatory force would be especially prolonged in time and imperfect in implementation in states in which civilian control over military organizations is problematic. Although organizational impediments to survivability are likely to take somewhat different forms in different states, evidence does exist that suggests that parochial organizational interests and rigid routines have impeded the development of secure retaliatory forces in the developing world.

The influence of organizational biases on strategic weapons deployments can perhaps best be seen the People’s Republic of China.77 China tested its first nuclear weapon in 1964, yet did not develop a confident and secure second-strike capability until the early 1980s, when initial deployments of ICBMs (1981–83), SLBMs (1982–83), and mobile and concealed IRBMs were instituted (1980).78 Why did China, which developed the atomic and hydrogen bombs very quickly, take so long to develop invulnerable missile-basing modes? The absence of perceived strategic threats is not a plausible answer, since the clashes along the Sino-Soviet border and the subsequent nuclear threats from Moscow occurred in 1969. Indeed, in 1970, U.S. intelligence agencies predicted that China would deploy ICBMs by 1975, and its failure to do so promptly has been described as “a major enigma in the PRC’s strategic weapons effort.”79

While both technical problems and the political turmoil of the Cultural Revolution clearly played roles in the delay of development of Chinese strategic missiles, professional military biases also appear to have had an impact in two specific areas. First, it is important to note that the military officers of Second Artillery Division, who controlled the operational missile forces in the 1970s, consistently argued for larger arsenals, but did not independently pursue the survivability measures needed for the existing land-based missiles. Only in 1975, after Mao Zedong approved a weapons institute report recommending that advanced deception measures be used to make China’s medium-range ballistic missiles less vulnerable to Soviet attacks, were successful camouflage and cave-basing deployment methods developed. As was the case in the United States, high-level intervention by civilian authorities was necessary to encourage operational innovation. Second, the strong bureaucratic power of traditional People’s Liberation Army interests in the party and weapons institutes appears to have slowed the development of the Chinese navy’s SLBM force. The SLBM and ICBM programs were started at the same time, but land-based systems were consistently given higher priority: the reverse-engineering of SLBM missiles supplied by the Soviets was abandoned in 1961, while similar land-based missile programs continued; and in the late 1960s the DF (ICBM) program was considered a “crash effort,” while “the JL-1 [SLBM] designers did not feel an immediate or compelling urgency.” Thus, while China eventually developed a diverse set of survivable forces, it was a very vulnerable nuclear power for a longer period of time than can be explained by the rationalist assumptions of proliferation optimists.

The influence of parochial organizational interests need not be entirely negative in this area, however, since in some circumstances interservice rivalry could lead to improvements in arsenal survivability. In Pakistan, for example, the army rather than the air force has operational control of missile development and deployments. The Pakistan Army therefore has strong institutional interests in deploying nuclear-capable missiles in order to de-

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81. See ibid., p. 12 and p. 27. The continuing low operational readiness rates in the Chinese submarine fleet may also reflect lower priority, as represented by operational budgets, given to the Chinese Navy. See James Fitzgerald and John Benedict, “There is a Sub Threat,” U.S. Naval Institute Proceedings, Volume 116-8-1,050 (August 1990), p. 58.
crease the prestige and political power currently given to the Pakistan Air Force as the only service capable of delivering nuclear weapons against India. If such missiles are eventually acquired and deployed in a survivable basing mode, they could reduce the vulnerability of a small Pakistani arsenal.

This is not, however, a small “if.” For even if adequate forces are deployed, survivability is not ensured unless appropriate operational practices are developed. An illuminating example of how poor design of organizational procedures and routines can produce “unnecessary” force vulnerabilities can be seen in Egyptian Air Force operations in June 1967. Given the balance between the Egyptian and Israeli air forces at the time (Egypt had over a 2-to-1 advantage in bombers, fighter-bombers, and interceptors), Egyptian authorities had strong reasons to believe that their ability to retaliate against any Israeli air attack was secure. Indeed, President Nasser publicly emphasized that the Israeli “fear of the Egyptian Air Force and bombers” was a deterrent to war when he ordered that the Gulf of Aqaba be closed.

Two organizational routines of the Egyptian Air Force, however, created a severe vulnerability for what was “objectively” a sufficient retaliatory force. First, during the crisis, the air force lined up most of its aircraft wing-tip to wing-tip on the runways, making them easier to launch in a first strike, rather than dispersing them to reduce their vulnerability to an Israeli attack. Second, the Egyptians always placed an interceptor force into defensive air patrol positions and held a “stand-to” alert at air bases at dawn, when they believed an Israeli strike was most likely. Both these operations routinely ended at 7:30 am, and, having observed these organizational practices, the Israelis attacked at 7:45 when the planes had landed and the pilots and crews were having breakfast. What had appeared to be an invulnerable force was thus virtually destroyed in the first hours of the war.

85. Edgar O’Ballance, The Third Arab-Israeli War (Hamden, Conn.: Archon Books, 1972), p. 65. This is not a uncommon problem. Despite assurances to the contrary, U.S. aircraft at bases in Florida were discovered to be deployed wing-tip to wing-tip at the height of the Cuban missile crisis. See Allison, Essence of Decision, p. 139; and Chronology of JCS Decisions Concerning the Cuban Crisis, Historical Division, Joint Chiefs of Staff, December 21, 1962 (Washington, D.C., National Security Archives), pp. 31–32 and pp. 40–41.  
86. O’Ballance, The Third Arab-Israeli War, p. 63; and Safran, From War to War, p. 321.
It should be acknowledged that some nuclear optimists do recognize that the spread of nuclear weapons to very small powers may be destabilizing since these states might not have the financial resources to procure hardened ICBMs or ballistic missile submarines, and may lack the territorial space to maintain mobile missiles. This certainly is true. An organization-level argument, however, leads to an even more pessimistic appraisal: even if the economic resources and geographical conditions for survivable forces exist, a state may not develop a secure second-strike capability if organizational biases and inflexible routines of the professional military dominate its behavior on this issue.

Organizations, Accidents, and Proliferation

The final operational requirement for stable deterrence is that nuclear arsenals not be prone to accidental or unauthorized use. Waltz believes that any such dangers are temporary and can be easily fixed:

All nuclear countries must live through a time when their forces are crudely designed. All countries have so far been able to control them. Relations between the United States and the Soviet Union, and later among the United States, the Soviet Union, and China, were at their bitterest just when their nuclear forces were in early stages of development, were unbalanced, were crude and were presumably hard to control. Why should we expect new nuclear states to experience greater difficulties than the old ones were able to cope with?

Waltz answers his own rhetorical question with a rationalist assumption. It is presumably in the interests of proliferating states to do keep their forces under strict control; therefore, they will do so. As he puts it:

We do not have to wonder whether they will take good care of their weapons. They have every incentive to do so. They will not want to risk retaliation because one or more of their warheads accidentally strikes another country.

Other nuclear optimists agree that we should not worry about accidental uses of nuclear weapons in specific proliferating states. “Even if Ukraine were destabilized, the likelihood of nuclear use should not increase substan-

88. Waltz, The Spread of Nuclear Weapons, p. 16.
89. Ibid.
tially, ” Mearsheimer insists, since “the costs of nuclear war are so great, and so obvious, that all sides in a domestic dispute would have powerful incentives to keep the nuclear arsenal safely stowed away.”  

Stephen Van Evera is similarly confident about nuclear weapons safety in Germany since “it has the resources needed to develop an invulnerable deterrent secure from accident and terrorism.”

What does organization theory say about the likelihood of nuclear weapons accidents? If one assumes that organizations are highly rational, then they might be able to achieve extremely high reliability in managing hazardous technologies, avoiding serious accidents by following three basic strategies: construct highly redundant systems with numerous back-up safety devices; use trial and error learning to fix organizational problems when they emerge; and develop a “culture of reliability” through strong socialization and discipline of the organization’s members. If one assumes that organizations are only boundedly rational and that they contain political conflicts over goals and rewards, however, then a far more pessimistic appraisal is warranted. This approach raises doubts about whether any state can build a large nuclear arsenal that is completely “secure from accident,” even if such strategies are followed.

Charles Perrow’s Normal Accidents argues there are inherent limits to the degree to which any large organization can understand the technical systems it creates to manage hazardous technologies, such as nuclear power plants, petrochemical industries, advanced biotechnology, and oil tankers. If organizations were omniscient, they could anticipate all potential failure modes in their systems and fix them ahead of time. Perrow argues, however, that boundedly rational organizations in the real world will inevitably have serious system accidents over time whenever they exhibit two structural char-

91. Van Evera, “Primed for Peace,” p. 54 (emphasis added).
acteristics: high interactive complexity (systems containing numerous interrelated, yet unplanned, interactions which are not readily comprehensible) and tight coupling (systems with highly time-dependent and invariant production sequences, with limited built-in slack).

My own book, *The Limits of Safety*, adds a more political dimension to "normal accidents theory," which combines with Perrow's structural arguments to produce even greater pessimism about the likelihood of organizational accidents. Conflicting objectives inevitably exist inside any large organization that manages hazardous technology: top-level authorities may place a high priority on safety, but others may place a higher value on more parochial objectives, such as increasing production levels, enhancing the size of their subunit, or promoting their individual careers, which can lead to risky behaviors. Such a focus on the political manner in which conflicting goals are chosen and pursued is necessary to explain both why systems with such dangerous structural characteristics are constructed and why organizational learning about safety problems is often severely limited.94

Normal accidents theory suggests that each of the three basic strategies used to improve organizational safety is highly problematic. From a structural perspective, adding redundant back-up systems can be counterproductive, since redundancy makes the system both more complex and more opaque and therefore can create hidden common-mode errors. A political perspective notes, however, that organizations often continue to add layers of redundancy to complex systems, in large part because increased redundancy is in the narrow interests of subunits since it can enhance their size, resources, and autonomy. The politics of blame inside organizations also reduces trial-and-error learning from accidents because organizational leaders often find operators at lower levels in the hierarchy at fault, both because this absolves them from responsibility, and because it is usually cheaper to fire the operator than to change accident-prone procedures or structures. Knowing this, however, field-level operators have great incentives not to report safety incidents whenever possible. Finally, from a "normal accidents" perspective, strong culture and socialization can have negative effects on organizational reliability since they encourage excessive concern about the organization's reputation, disdain for outsiders' and internal dissenters' opinions, and even organizational coverups.

THE U.S. NUCLEAR SAFETY EXPERIENCE
From the perspective of normal accidents theory, there are strong reasons to expect that the safety of modern nuclear arsenals is inherently limited: large-scale arsenals and command systems are highly complex, by necessity, and are tightly-coupled, by design, to ensure prompt retaliation under attack; the military organizations that manage them are inevitably politicized, with numerous conflicting interests between commands and the broader society and within the organizations themselves. How serious were the dangers of U.S. nuclear weapons accidents and even accidental war during the Cold War? The available evidence now demonstrates that there were many more near-accidents than previously recognized. Moreover, the U.S. military’s reaction to these safety problems shows how only limited degrees of organizational learning took place.

New information on dangerous military operations during the October 1962 Cuban missile crisis demonstrates these points. At the start of the crisis, the Strategic Air Command secretly deployed nuclear warheads on nine of the ten test ICBMs in place at Vandenberg Air Force Base and then launched the tenth missile, on a prescheduled ICBM test, over the Pacific. No one within the responsible organizations fully considered the risks that Soviet intelligence might learn of the nuclear weapons deployment and the alert at Vandenberg and then, in the tension of the crisis, might misinterpret a missile launch from that base. A second safety problem occurred at Malmstrom Air Force Base in Montana at the height of the crisis, when officers jerry-rigged their Minuteman missiles to give themselves the independent ability to launch missiles immediately. This was a serious violation of the Minuteman safety rules, but when an investigation took place after the crisis, the evidence was altered to prevent higher authorities from learning that officers had given themselves the ability to launch unauthorized missile attacks. A third incident occurred on October 28, when the North American Air Defense Command (NORAD) was informed that a nuclear-armed missile had been launched from Cuba and was about to hit Tampa, Florida. Only after the expected detonation failed to occur was it discovered that a radar operator had inserted a test tape simulating an attack from Cuba into the system, confusing control room officers who thought the simulation was a real attack.

95. For details on these and other nuclear weapons safety incidents during the Cuban crisis see ibid., pp. 53–155.
Learning from these incidents was minimal: the relevant military procedures and routines were not altered after each of these incidents. In each case, the existence of serious safety problems was not reported to or was not recognized by higher authorities. Each one of the accident-prone nuclear operations was therefore repeated by U.S. military commands in October 1973, during the brief U.S. nuclear alert during the Arab-Israeli war.96

The history of SAC's B-52 monitor mission at Thule, Greenland, provides a useful example of how adding redundant safety devices to a complex system can inadvertently cause the accidents they are designed to prevent.97 The U.S. responded to the Soviet development of an ICBM force in the late 1950s by building the Ballistic Missile Early Warning System (BMEWS) radars and developing plans to launch the vulnerable strategic bomber force upon warning. SAC, however, faced a serious problem: if the radar links went dead, would it mean that communications had failed or that a Soviet nuclear attack had started? To make sure that such ambiguity was clarified, NORAD placed radio-equipped "bomb alarm" sensors at the Thule BMEWS base. Yet, SAC wanted to be absolutely sure that it got accurate warning (and wanted to control the means of that warning itself), and therefore also placed a B-52 bomber in a continual orbit over the Thule base, where it could determine whether or not a Soviet attack had begun. The bombers, on what became a routine monitor mission, were, however, part of the airborne alert force and therefore had thermonuclear weapons on board. No one in the Pentagon or SAC headquarters imagined the possibility that the plane might crash and that an accidental detonation would occur, which would have produced false confirming evidence that a Soviet nuclear attack had occurred.98 The risks of such an accident were not negligible, however, and even after a series of B-52 bomber crashes led civilians to cancel the airborne alert program in 1968, SAC continued to plan to fly nuclear armed B-52s above the Thule BMEWS base in future crises.

PROLIFERATION AND NUCLEAR WEAPONS SAFETY
Waltz asked: why should we expect new nuclear states to experience greater difficulties than the old ones? The evidence of the number of near-accidents

96. Ibid., pp. 219–222.
97. Ibid., pp. 156–203.
98. Communications from the Thule radar would go dead, the bomb alarm would report a detonation, and efforts to contact the B-52 would not succeed.
with U.S. nuclear weapons during the Cold War suggests that there would be reason enough to worry about nuclear accidents in new proliferant states even if their safety difficulties were "only" as great as those experienced by old nuclear powers. Unfortunately, there are also at least six reasons to expect that new nuclear states will face much greater risks of nuclear accidents.

First, some emergent nuclear powers lack the organizational and financial resources to produce even minimal mechanical safety devices and safe weapons design features. Although all countries may start with "crude nuclear arsenals," in Waltz's terms, the weapons of poorer states will likely be more crude, and will remain so for a longer period of time. Evidence for this prediction can be found in the case of the Iraqi nuclear weapons program, as UN inspectors discovered soon after the 1991 Persian Gulf War:

The inspectors found out one other thing about the Iraqi bomb [design]—it is highly unstable. The design calls for cramming so much weapon-grade uranium into the core, they say, that the bomb would inevitably be on the verge of going off—even while sitting on the workbench. "It could go off if a rifle bullet hit it," one inspector says, adding: "I wouldn't want to be around if it fell off the edge of this desk."99

Second, the "opaque" nature of nuclear proliferation in the contemporary world exacerbates nuclear weapons safety problems. Fearing the international diplomatic consequences of a public crossing of the nuclear threshold, most new proliferants have developed weapons capabilities in a covert manner. Israel, South Africa, Pakistan, and possibly North Korea fit this pattern. There are, however, both organizational and technical reasons to believe that this opaque path to nuclear weapons status is inherently less safe: the tighter compartmentalization of such programs means that there is likely to be less thorough monitoring of safety efforts; the lack of public debate about nuclear issues in such states increases the likelihood that military organizational interests will not be challenged; and the inability to have full-scale nuclear weapons tests will inhibit safety design efforts.100

Third, accident-prone nuclear operations will be more prevalent in states with volatile civil-military relations because military officers, who have organizational biases in favor of maintaining high readiness for war, will be

100. See Avner Cohen and Benjamin Frankel, "Opaque Nuclear Proliferation," Journal of Strategic Studies, Vol. 13, No. 3 (September 1990), p. 34; and Feaver, "Proliferation Optimism and Theories of Nuclear Operations," pp. 175–178.
less constrained by safety-conscious civilian authorities. Pakistan is the most worrisome case in point. The Pakistani Air Force plans to use U.S. F-16 aircraft in nuclear weapons delivery roles if necessary, and yet in 1992 former Director of Central Intelligence Robert Gates suggested that Pakistan had not perfected the electrical mechanisms necessary for safe maintenance, transportation, and delivery of weapons by F-16s. The existence of such safety problems makes the reports that the Pakistani Air Force, without informing Prime Minister Bhutto, loaded nuclear weapons on its F-16 aircraft during the 1990 Kashmir crisis even more alarming than previously recognized.

Fourth, the tight-coupling problem will be significantly worse between most new proliferants at the beginning of their experience in managing nuclear weapons, since they are in closer proximity to their expected adversaries than was the case between the United States and the Soviet Union. At the start of the Cold War, the superpowers had many hours to determine whether a warning was real or false during the strategic bomber era; later, in the 1960s, they had approximately 30 minutes to react to reports of ICBM attacks; and only after many years of experience with nuclear arsenals did they face less than 10 minutes of warning time once missile submarines were deployed off each other's coasts in the 1970s. New and potential future nuclear rivals—Russia and Ukraine, India and Pakistan, North and South Korea—will immediately have very small margins of error at the outset of nuclear rivalries, since they have contiguous borders. Moreover, the poorer of these states are likely to have less reliable warning systems trying to operate successfully in this more challenging environment.

101. Peter Feaver makes an important counter-argument: when civil-military relations are volatile in a proliferating nation, civilian authorities have increased incentives to put a highly "assertive" (as opposed to a "delegative") control system in place. While such incentives may exist, it is by no means clear that civilians in such states would have the political power to order that assertive control systems be imposed on the military or that the system would be fully implemented if so ordered. See Peter D. Feaver, "Command and Control in Emerging Nuclear Nations," International Security, Vol. 17, No. 3 (Winter 1992/93), pp. 176–178.


103. Seymour Hersh quotes an unidentified U.S. intelligence source as follows: "They had F-16s prepositioned and armed for delivery—on full alert, with pilots on the aircraft. I believed that they were ready to launch on command." Hersh, "On the Nuclear Edge," p. 65.
Fifth, although organizational learning about safe nuclear weapons operations was far from perfect in the United States and the USSR during the Cold War, it is likely to be even worse in states that inherited a full-scale nuclear arsenal without going through the incremental process of tests, exercises, and deployments. The emerging problems of nuclear safety in the Ukraine appear to be the product of its unusual status as an "instant" nuclear power. In September 1993, Major General Vitaly Yakovlev of the Russian Defense Ministry reported that a squad of Russian nuclear warhead specialists had been sent to the Ukrainian nuclear ammunition depot at Pervomaisk (170 miles south of Kiev) because of increased radiation levels discovered inside the base. According to Moscow press reports, a subsequent investigation by Russian nuclear scientists determined that "Ukrainian storage depots were filled over capacity, necessary maintenance was not being carried out, rules for transporting warheads were being ignored and up-to-date safety systems were absent."\textsuperscript{104} In October 1993, Colonel General Yevgeny Maslin, chief of the Russian General Staff’s nuclear ammunition department, reported that two nuclear warheads emitting dangerous levels of radioactivity had been kept for two weeks inside a railroad car on the Ukraine-Russian border, because Ukrainian custom officials demanded payment for any nuclear weapons taken to Russia for dismantlement.\textsuperscript{105} Such nuclear safety problems may be the first signs that serious dangers of nuclear weapons accidents are looming in the Soviet successor states.

Sixth, serious political and social unrest is likely in the future in a number of the nuclear proliferants, which will significantly increase the risks of accidental and unauthorized weapons detonations. Waltz, in contrast, insists that domestic instability in new nuclear powers will not be a problem:

What is hard to comprehend is why, in an internal struggle for power, any of the contenders should start using nuclear weapons. Who would they aim them at? . . . One or another nuclear state will experience uncertainty of succession, fierce struggles for power, and instability of regime. Those who


\textsuperscript{105} "Two Leaky Nuclear Warheads Cause Worry as Ukraine, Russia Bicker," \textit{The San Diego Union-Tribune}, October 20, 1993, p. A-12.
fear the worst have not shown with any plausibility how those expected events may lead to the use of nuclear weapons.106

This exclusive focus on deliberate uses of nuclear weapons is misleading, however, since severe domestic instability can produce accidental detonations under many plausible scenarios. If a civil war in a new nuclear state leads to a fire fight between rival military factions at a nuclear weapons base, the danger of an accidental detonation or spreading of plutonium would be severe.107 If domestic unrest leads to severe economic hardships at military bases, disgruntled operators are more likely to engage in acts of sabotage which could inadvertently or deliberately produce accidents. An example of the type of dangerous incident one should anticipate in future proliferators occurred in early 1992 at the Ignalina nuclear plant in Lithuania, where a programmer reported that he had found a virus in the computer that ran the safety systems for the plant. Investigators later believed, however, that he had placed the virus there himself in order to receive a pay bonus for improving safety.108 Finally, domestic political unrest can increase the risk of nuclear weapons accidents by encouraging unsafe transportation, exercise, or testing operations. If warheads are moved out of unstable regions in haste (as occurred in the USSR in 1991) or if weapons tests are rushed to prevent rebellious military units from gaining access to the weapons (as occurred in Algeria in 1961),109 safety is likely to be compromised. The most dramatic example of risky actions induced by domestic crises is Marshal Nie Rong-zhen’s decision to launch a test missile 800 kilometers across China with a

107. Indeed, even the safety systems of the most advanced nuclear weapons in the U.S. arsenal have not been designed and tested to withstand the effects of being hit simultaneously by numerous bullets or multiple pieces of shrapnel. See Sidney D. Drell, Testimony on Nuclear Weapons Testing before the Defense Nuclear Facilities Panel of the House Armed Services Committee, March 31, 1992, p. 2; and John R. Harvey and Stefan Michalowski, Nuclear Weapons Safety and Trident: Issues and Options (Stanford: Center for International Security and Arms Control, 1993), pp. 26-27.
live nuclear warhead onboard in October 1966 in the middle of the Cultural Revolution. Nie was apparently fully aware of the risks involved in such an unprecedented test, but believed that the nuclear weapons program needed a dramatic and public sign of success as part of his “strategy of siding with the radicals to fend off radical penetration of the program.”

In short, while there have been no major nuclear weapons accidents in the new proliferators yet, there are good reasons to anticipate that the probabilities will be high over time. Any serious nuclear weapons accident will have tragic consequences for the local community, and if an accidental detonation, false warning, or unauthorized use of a weapon leads to “mistaken retaliation” and accidental war, the consequences would be even more catastrophic. As long as would-be proliferators choose not to cross the final threshold of “weaponization” by actually deploying fully assembled nuclear weapons and launchers, these safety problems will largely remain dormant. Once these states begin to deploy arsenals, however, such organizational safety problems are likely to emerge with a vengeance. The current safety record is likely to be the lull before the storm.

Conclusions: Bringing Organizations Back In

The nuclear optimists’ view that the spread of nuclear weapons will produce stable deterrence is based on a rationalist assumption that new proliferators’ behavior will reflect their interest in avoiding nuclear war: new nuclear powers will avoid preventive nuclear wars, develop survivable nuclear arsenals, and prevent nuclear weapons accidents because it is in their obvious national interests to do so. I have argued, in contrast, that the actual behavior of new proliferators will be strongly influenced by the powerful military organizations within those states and that the common biases, rigid routines, and parochial interests of these military organizations will lead to deterrence failures and uses of nuclear weapons despite national interests to the contrary. The concepts behind this more pessimistic vision of proliferation are well-grounded in the rich theoretical and empirical literature on complex organizations. My theory makes less heroic assumptions about the rationality of states. It provides useful insights into U.S. nuclear history during the Cold War and points to key civilian interventions as a critical factor in creating the

requirements of nuclear deterrence during the long peace. Although the jury of history is still out on the consequences of further nuclear proliferation, and will be for some time, the emerging evidence from the proliferating world unfortunately supports this more pessimistic view.

**BRINGING ORGANIZATIONS BACK INTO INTERNATIONAL RELATIONS**

By assuming that all nuclear states will behave quite rationally and will therefore take all the necessary steps to fulfill the requirements of deterrence, Waltz and other nuclear proliferation optimists have confused prescriptions of what rational states should do with predictions of what real states will do. This is an error which the classical American realists rarely committed: Hans Morgenthau and George Kennan believed that states should follow the logic of balance of power politics, but their whole enterprise was animated by a fear that the United States would fail to do so. 111 This is also an error which Waltz avoided in *Theory of International Politics*, where he noted that “the theory requires no assumptions of rationality . . . the theory says simply that if some do relatively well, others will emulate them or fall by the wayside.” 112 Adding this element of natural selection to his theory of international relations put less of a burden on extreme rationality assumptions. My approach is consistent with this vision. Many proliferators may well behave sensibly, but some will not and will then “fall by the wayside.” Falling by the wayside, however, means in this case using nuclear weapons and thus has very serious implications for the whole international system.

“Realist theory by itself can handle some, but not all the problems that concern us,” Waltz correctly noted in 1986. “Just as market theory at times requires a theory of the firm, so international-political theory at times needs a theory of the state.” 113 Understanding the consequences of nuclear proliferation is precisely such a case. To predict the nuclear future, we need to utilize ideas, building upon the theory of the firm, about how and when common organizational behaviors can constrain rational reactions to the nuclear revolution.

112. Kenneth N. Waltz, *Theory of International Politics* (New York: Random House, 1979), p. 118. In his 1986 essay Waltz similarly argued that “the international system is a competitive one in which the less skillful must expect to pay for their ineptitude. The situation provides enough incentive to cause most of the actors to behave sensibly.” Waltz, “Response to My Critics,” p. 331 (emphasis added).
If this analysis is correct, there is a great need for more research and writing at the organizational level of analysis in international relations. This approach was strongly represented in the 1970s, when Graham Allison, John Steinbruner, and Morton Halperin made their seminal contributions. With the exceptions of studies of nuclear command and control\textsuperscript{114} and weapons procurement,\textsuperscript{115} however, the field languished in the 1980s and the study of international relations became dominated by neorealist structural theorizing. Indeed, perhaps the most influential book utilizing organization theory in security studies in the mid-1980s, Barry Posen's *Sources of Military Doctrine*, was at least in part a critique of organizational-level analyses, arguing that neorealist "balance of power theory is a slightly more powerful tool than organization theory for the study of doctrine" in Britain, France, and Germany between the wars.\textsuperscript{116}

In the 1990s, however, a new wave of scholarship has used and contributed to organization theory in an effort to understand major problems of international security.\textsuperscript{117} Yet many important questions remain unanswered. What is the eventual effect of nuclear weapons and other weapons of mass destruct-


\textsuperscript{116} Posen, *Sources of Military Doctrine*, p. 239. In my view, however, this conclusion was largely determined by Posen's selection of cases, since the late 1930s was a period that saw major innovations in doctrine, and balance of power theory predicted innovation, while stagnation was predicted by Posen's use of organizational theory. Ibid., p. 41.

tion on civil-military relations in new states that acquire such technologies? Can military organizations in the developing world learn vicariously from the experience of other professional militaries, or will they have to learn from their own successes and mistakes? Under what conditions will military organizations accept downsizing, preferring to maintain their "essence" with smaller forces on traditional missions; and under what conditions will they actively seek out new non-traditional missions, such as peace-keeping, disaster relief, and international drug control, in order to enhance their size and power in a new security environment? What is the impact of organizational rigidities and interests within the state on the diffusion of international norms concerning the acquisition and use of highly destructive weapons? Theoretical and empirical research on such organizational level issues will be critical to understanding international security in the post-Cold War world.

BRINGING ORGANIZATIONS INTO COUNTER-PROLIFERATION POLICY

What are the policy implications of a more organizational approach to nuclear proliferation? First, and most obviously, this approach suggests that the United States is quite correct to maintain an active nuclear non-proliferation policy. A world with more nuclear-armed states may be our fate, but it should not be our goal. It is highly unfortunate, in this regard, that a growing number of defense analysts in proliferant nations read the arguments of the U.S. nuclear optimists and now cite that literature to legitimize the development of nuclear arsenals in their nations.118 It is fortunate, however, that U.S. government officials have not been convinced of the merits of the optimists' views, and there is little evidence that U.S. policy is going to move away from its strong opposition to the further spread of nuclear weapons.

Second, a more effective approach to nuclear proliferation would add a larger dose of intellectual persuasion to our current policy efforts, which are aimed primarily at restricting the supply of materials and providing security guarantees to potential proliferators. There are ongoing debates—often in secret, sometimes in the open—about the wisdom of developing nuclear weapons in many would-be proliferators. To influence such debates, non-proliferation advocates need to develop better understandings of the percep-

tions and interests of the domestic organizational actors involved. Decision makers in potential nuclear powers do not need to be told that proliferation is not in the U.S. interests. They need to be convinced that it is not in their interest. Civilian leaders, military leaders, and wider publics alike in these states need to be reminded that development of nuclear weapons will make their states targets for preventive attacks by their potential adversaries, will not easily lead to survivable arsenals, and will raise the specter of accidental or unauthorized uses of nuclear weapons. Just as importantly, they also need to be persuaded that nuclear proliferation may not be in their narrow self-interest as civilian leaders seeking political power, as militaries seeking autonomy, or as citizens seeking safety.

Finally, an organizational approach offers a valuable, but pessimistic, perspective on efforts to manage proliferation if it occurs despite U.S. attempts to prevent it. At one level, an implication of an organizational perspective is that the United States should cooperate with new proliferators, sharing knowledge of organizational structures, technology, and experience, to reduce the dangerous consequences of the spread of nuclear weapons. At a deeper level, however, the most disturbing lesson of this analysis is that, for organizational reasons, such cooperative efforts are not likely to succeed.

This is true with respect to all three of the requirements of deterrence. The most important step the United States could take to reduce the likelihood that military biases might lead to preventive war in the new proliferators would be to encourage sustained civilian control of the military in those states, with appropriate checks and balances. Such efforts are unlikely to be completely effective, however, simply because strong military organizations are unlikely to give up their current positions of significant decision-making power in many potential nuclear states. Efforts to improve civil-military relations are therefore likely to be most effective precisely where they are least needed.

To enhance survivability of new nuclear forces, the United States could also consider cooperating with new proliferators, sharing information on delivery system technology, operational practices, and advanced warning systems, to help them create invulnerable forces.119 This policy, however, is also unlikely to be widely implemented. Not only will U.S. policy-makers

fear that such cooperative efforts would signal to additional proliferators that the United States is not really opposed to the further spread of nuclear weapons, but the leaders of new proliferators, and especially the leaders of their military organizations, will also not want to discuss such sensitive issues in detail, fearing that it will expose their own nuclear vulnerabilities and organizational weaknesses to the United States.

Finally, the risk of nuclear accidents suggests that the United States may want to share information on such subjects as electronic locking devices, weapons safety design improvements, and personnel reliability programs. Such efforts, however, could be highly counterproductive if they led new proliferators to believe that they could safely operate large nuclear arsenals on high states of alert. Indeed, an organizational perspective on nuclear safety suggests that we need a paradigm shift in the way we think about managing proliferation. The United States should not try to make new proliferators become like the superpowers during the Cold War, with large arsenals ready to launch at a moment’s notice for the sake of deterrence; instead, for the sake of safety, the United States and Russia should try to become more like some of the nascent proliferators, maintaining very small nuclear capabilities, with weapons components separated and located apart from the delivery systems, and with civilian organizations controlling the warheads. If my theory is right, the U.S. defense department should be telling proliferators, loudly and often, that there are inherent limits to nuclear weapons safety. If my theories are right, however, the U.S. defense department will not do this, because this would require it to acknowledge to others, and itself, how dangerous our own nuclear history has been. The important and difficult task of persuasion will therefore fall largely upon those outside the organizations that have managed U.S. nuclear weapons.