

The Terrorist Threat to World Nuclear Programs

BRUCE G. BLAIR

GARRY D. BREWER

*School of Organization and Management
Yale University*

Terrorism in the global setting has become the predominant form of confrontation between differing subcategories of societies that seek to overcome each other, regardless of size. In the case of nuclear terrorism, the consequences of failure are potentially catastrophic. While the logic of our strategic nuclear policy is clear, the same clarity does not hold for policies directed at nuclear terrorism. In the former case, a prevailing view is that the risk of nuclear war is low because the United States responds vigilantly to nuclear threats posed by other nations. In the latter case, there is no terrorist prevention doctrine, nor is there an institutional focus for preventing terrorism that is even remotely commensurate with that which exists for deterring nuclear war. We here consider the dimensions of the nuclear terrorism problem, discuss these with respect to the Minuteman Intercontinental Ballistic Missile system, consider the capabilities and objectives of potential terrorist groups, and formulate some basic recommendations for improving the current state of affairs.

THE SETTING

In this decade, terrorism has grown from an esoteric aspect of aggression and violence to a predominant means for international and intranational conflict resolution.¹ It appears likely that as the smaller nations and weaker specialized interest groups of the world acquire the technology of modern war, both conventional and nuclear, they

1. Dr. Lawrence Z. Freedman of the University of Chicago's Institute of Social and Behavioral Pathology has been extremely helpful in shaping the arguments and thoughts in this essay.

will increasingly turn to terrorism—just as the Palestine Liberation Army has done in the Middle East, as the Irgun and Stern Gang previously did against the British Empire, as guerrilla groups in various Latin American countries do, and as the nineteenth-century eastern European revolutionaries did in order to bring down autocratic governments.

It is ironic that terrorist groups have been among the first to recognize that we live together in a planetary community, rather than a conglomerate of national communities. The nearly threefold increase in the number of nations that have come into being since World War II makes this appear to be the most nationalistic of times. However, most of the newer nations are caricatures, the products of historical accidents rooted in the imperialism of the last three centuries. These new nations often have little in common, and many have no viable resources.

Nationalism was perhaps the main social, political, and historical focus of the nineteenth century, but in the twentieth century we have become one planet. The consumption of irreplaceable elements by a relative handful of the human race affects the lives of all members of the race, as it always has; however, now the relationship is known and often felt strongly. Couple this realization with the knowledge that the great powers have within their power the ability to destroy both opponents of the moment and probably all of human society and one comes quickly to the few alternatives that exist to resolve conflict.

A main alternative is terrorism. Formerly, terrorism was the prerogative of the powerless; it was a technique whereby a few determined men and women could affect the destinies of large empires. This has changed. Now we see examples of the technique being used by virtually all elements of society.

Terrorism, in this global setting, has become a predominant form of confrontation between differing subcategories of societies which seek to overcome each other, regardless of size.

This essay concentrates on nuclear terrorism throughout the world—a form of terrorism potentially so devastating that it must be considered meticulously. Even though many might treat it as a very low probability event, the margin for error is thin.

PROBLEM DIMENSIONS

Borrowing from Willrich (1975: 12), terrorism is defined as "threats or acts of violence planned, attempted, or carried out by an individual or group with a specific political intent in mind." In the case of international terrorism, the definition is modified; such acts must fall "outside the accepted norms of international diplomacy and rules of war" (Jenkins, 1975: 11).

This definition is broadly construed, and it includes the covert orchestration of surrogate warfare by nations. In other words, terrorism may be conducted by individuals or groups acting solely on their own accord to achieve self-determined political objectives; terrorism may be secretly sponsored by other groups, organizations, or nations; or terrorism may be jointly undertaken by several parties pursuing overlapping objectives. Later implications of nation-state-inspired and -financed terrorism, an important but neglected dimension of the terrorist threat, are outlined.

Of the various forms that nuclear terrorism could take in the future, governmental policy and research have focused almost exclusively on the problem of terrorists manufacturing nuclear weapons from stolen fissionable materials. There are understandable reasons why this definition of the terrorist problem has evolved.

So stated, however, the terrorist problem is narrowly misspecified. The central objective of a safeguards policy should not be solely to prevent the illicit manufacture of nuclear bombs. Rather, it should aim at preventing terrorists from acquiring a real or apparent nuclear weapon *capability*.

This improved specification enables us to identify several sorely deficient aspects of present safeguards policy and research. In particular, only modest policy attention and no publicly available research address the prospect of terrorists stealing assembled nuclear weapons from military regimes. Also, the public record suggests that virtually no consideration has been given to the possibility of unauthorized individuals acquiring an apparent or real capability to detonate nuclear weapons at their storage location, to arm and launch tactical or strategic nuclear weapons, or to direct armed forces personnel to execute nuclear strikes against other nations. (Our concern extends to all nuclear powers, not just the United States.)

The possibility of any of these events has seldom been raised. Only a handful of skeptics has questioned the adequacy of military nuclear safeguards, and seldom has any hard evidence been advanced in their support.² Krieger (1975: 28) expounds the prevailing view:

stealing an assembled nuclear weapon from a nuclear weapon nation would be the most difficult and the least likely route for terrorists to achieve a nuclear weapon capability. . . . Additionally, there are reportedly sophisticated lock systems on the weapons themselves to prevent military weapons from being utilized by other than authorized personnel.

The view that military nuclear weapons are today immune from theft or misuse contrasts sharply with views held, at least in the United States, in the 1950s and early 1960s. The security and safety of nuclear weapons were controversial issues during that period, although earlier debate centered on the question whether safeguards were adequate to prevent the accidental or unauthorized use of nuclear weapons by armed forces personnel rather than nongovernmental terrorists. Such concern all but disappeared by the mid-1960s, and attention shifted to the development of safeguards for commercial nuclear power plants in the United States. Several factors contributed to this reorientation.

First, policy makers and the public received repeated assurances from military quarters that highly reliable weapons safeguards had been implemented—measures that in fact were so reliable and effective as to be “fail-safe.”³ Defense Department officials maintained that the chances of a U.S. nuclear weapon exploding were “so remote as to be negligible” (Phelps, 1961). The development of supposedly “fail-safe” designs doubtless bolstered the public credibility of the military’s risk assessment, but confirmation came from other observers as well. After completing a comprehensive study of military safeguards, Larus (1967: 42) was able to report:

2. Representative Long and Senator Pastore concluded that U.S. military weapons sites were inadequately protected against nuclear theft—mainly overseas—and rebuked the Department of Defense for not acting responsively to correct the deficiencies (Los Angeles Times, 1974). See Dumas (1976) for a treatment of other rarely aired deficiencies with the safeguards program. See also remarks of Senators Pastore and Baker (U.S. Congress, 1974a).

3. Although this term originally referred only to procedures for launching Strategic Air Command bombers, its meaning is now generic and encompasses all mechanical devices, authentication systems, and communications redundancies for ensuring command and control.

Today there is only a very slim possibility that a faulty communications signal, a mentally deranged airman, or any other mishap could trigger a Russo-American nuclear exchange.

Simultaneously, the issue lost much public visibility as Soviet allegations that U.S. military practices risked a major nuclear accident or provocation abated.

Second, a series of dramatic events shaped the reorientation. An incident that attracted great attention, and which resulted in an abrupt awakening among policy makers to the threat of nuclear theft, was the loss in 1965 of over 200 pounds of weapons-grade materials from a Pennsylvania Atomic Energy Commission (AEC) fuel fabrication plant.⁴ As a direct result of this discovery, a new AEC Office of Safeguards and Materials Management was established in 1967 and was charged with responsibility for formulating nuclear industry safeguards policy. In addition, the event led to the creation of an independent study group to assess the vulnerability of power facilities to acts of sabotage. The panel's 1967 report was the first serious consideration that terrorists might attempt to steal fissionable materials from nuclear facilities and marked the beginning of systematic research devoted to investigating terrorist threats to nonmilitary nuclear programs.

The literature since 1967 is not voluminous, but several excellent studies exist. Unfortunately, the important but rather narrow range of issues on which these studies focus has helped foster the belief that theft of raw fissionable materials is *the* nuclear threat posed by terrorism.⁵

A third influence contributing to the shift in U.S. safeguards policy was, and is, the rapid proliferation of nuclear technology. In 1965, the nuclear power industry was nascent.⁶ Today there are scores of nuclear plants in operation in the United States alone, and several hundred are planned or under construction (Gapay, 1975). As of December 1976, 229 reactors were operational or under construction outside the United States, and 240 more were planned or on order (Walske, 1977). The diffusion of nuclear technology throughout

4. The quantity of enriched uranium "lost" was enough to produce several fission explosions. The investigation of this incident concluded that the lost uranium was probably inadvertently disposed of in the form of scrap. There was no evidence of theft.

5. Apparently, it has been forgotten that, in 1967, the Lumb Report made the following recommendation: "Safeguards programs should also be designed in recognition of the problem of terrorist or criminal groups clandestinely acquiring nuclear weapons or materials useful therein." (Reprinted in U.S. Congress, Senate, 1975: 567).

6. A summary of the growth of commercial nuclear power is found in Willrich (1971), Donnelly (1972), Epstein (1976), and Willrich and Taylor (1974).

the world is accelerating, with the result that industrial safeguards are absorbing most of the public and official attention and resources.

The changing nature of nuclear technology is arousing even greater fears. If the new generation of fast breeder reactors becomes operational, the number of plutonium shipments between processing plants and reactors will increase dramatically, vastly complicating the task of transport security, which is already considered the weakest link in the present safeguards systems. According to one projection, assuming fast breeder reactors become a commercial reality, the amount of nuclear material in international transit each year will be enough to make 20,000 nuclear bombs (Gapay, 1975).

Finally, the upsurge in worldwide terrorism during the past decade affects perceptions of the threat of nuclear terror. More than the absolute level of terrorist incidents, the historical trend and the realization that terrorism is unchecked are alarming. A recent study made for the Energy Research and Development Administration (ERDA) found a sevenfold increase in terrorist incidents between 1969-1973 over the previous 1964-1968 period (HERO, 1974). A recent downturn in this trend is heartening, but one cannot feel comfortable about a situation in which the ebb and flow of terrorist activity have less to do with governmental control than with the self-restraint exercised by terrorists themselves.

Contrary to popular belief, terrorism is not confined mainly to Middle Eastern and Latin American settings. Indeed, according to ongoing work by Mickolus (1976), the Atlantic community has experienced more terrorism in terms of both incident location and nationality of victims than any other region of the world. Latin America is second, followed by the Middle East, Asia, Africa, and Eastern Europe. Although differing operational definitions of terrorism produce different results, the message is clear. Terrorism is an international phenomenon that has eluded effective governmental control.

Security problems posed by a burgeoning nuclear power industry are cause for genuine societal concern. However, as policy makers intensify the search for solutions with a view to shaping safeguards policy around a single prospect—terrorist theft of fissionable materials and construction of home-made nuclear devices—concern for safeguarding a large and ever-growing stockpile of the world's nuclear weapons continues to fade.⁷ In our view, a thorough reexamination of the security of those weapons is long overdue.⁸

7. This exceptional view is articulated by Iklé (1973), who regularly injects concern for weapons safeguards into discussions of American deterrent capability.

8. Pursuant to the 1971 "Agreement on Measures to Reduce the Risk of Outbreak

This recommendation stems in part from an evaluation we made of the technical and procedural safeguards for what may be the Western world's most well-protected nuclear weapons program—the Minuteman Intercontinental Ballistic Missile (ICBM) force in the United States. After presenting a brief overview of the Minuteman security program, major findings are summarized, and several recommendations are advanced. These findings are based on conditions which existed in the very recent past and which have recently undergone review by the U.S. Air Force and the Department of Defense. We have been apprised that appropriate action has been taken to correct any safeguards weaknesses. Although it is our position that general assertions of safeguards effectiveness are not sufficient, and that the burden of proof must be on those who assert the adequacy of remedial steps, the reader is cautioned against drawing specific inferences about the present situation from the evidence presented. In developing a case which underscores the need for a policy of continuous and thorough safeguards evaluation, we make no claims concerning the workings or weaknesses of current Minuteman safeguards. However, we do share the grave concern evidenced in the following remarks made in March 1976 by Congressman Ottinger:

From classified material I have seen, as well as from unclassified briefings I have received from former high-ranking Defense Department personnel, all of which I hope this committee will take the time and trouble to explore thoroughly, I have every reason to believe that the protections are inadequate against catastrophe by way of theft, sabotage, unclear and overextensive delegation of authority, incompetence or incapacity of authorized personnel, unauthorized use, weakness of communications and command and control. [U.S. Congress, House, 1976: 13]

From what was publicly known as late as March 1976, it appeared quite possible that strategic nuclear weapons could be compromised in various ways.

MILITARY SAFEGUARDS: MINUTEMAN

The Minuteman is a three-stage, solid-fuel missile with an intercontinental range, capable of carrying a one-megaton payload, and of Nuclear War between the U.S.A. and the U.S.S.R.," an official review is obligatory. Article I of this Agreement states: "Each Party undertakes to maintain and to improve, as it deems necessary, its existing organizational and technical arrangements to guard against the accidental or unauthorized use of nuclear weapons under its control" (U.S. Arms Control and Disarmament Agency, 1972).

housed in a protected, concrete and steel underground silo.⁹ A silo is also protected by an elaborate security system, consisting primarily of a fence surrounding the perimeter of the silo, combination locks to gain access to the underground silo, and sensitive electronic instruments. Under normal conditions, when all security systems are functioning properly, physical intrusion that "breaks" the silo perimeter either above or below ground is registered by instruments and transmitted via cable to a computer visual display and readout located in an underground Launch Control Center (LCC) several miles away.¹⁰ In this manner, two-man LCC crews monitor the security status of a ten-missile flight simultaneously. Security violations reported by the crew result in the dispatch of armed security police who inspect the site and silo for intruders and evidence of unlawful entry.

There are five flights, hence five two-man LCCs, in a 50-missile squadron. Since all missiles and LCCs are electronically interconnected, the "normal" launch of any or all missiles in a squadron requires the cooperation of only two crews—no more, no less. One LCC crew can launch any or all of a squadron, but in this "abnormal" situation the launch is delayed substantially, i.e., the missile lift-off reaction time is increased from about eight seconds to a matter of hours.¹¹ The primary reason for this built-in delay is to allow adequate time to "inhibit" an illicit launch command generated by a single aberrant LCC. Indications of such an attempt are automatically relayed via cable and computer to each LCC in the squadron, and each LCC crew is trained and responsible for instructing the squadron's missiles, through a computer command, to disregard the unauthorized command.

Located in each LCC are two launch keys, one for each member of the crew, and the codes needed to authenticate presidential launch directives. Only the launch keys, not the codes, are *physical* prerequisites for generating valid launch commands, the purpose of the codes being exclusively that of authenticating an execution directive.¹² Contrary to popular belief, there are no mechanical "Permissive

9. None of the information contained in this discussion is classified. It is *entirely* within the public domain.

10. Military police are assigned to guard any silo that is not secure; a site is not secure if any security measure malfunctions.

11. This system capability enables one crew to execute their element of the strategic plan (SIOP) in the event that all other LCCs in the squadron are destroyed.

12. If an LCC crew is ever directed to execute the SIOP, the verification procedure involves checking the execution message against the codes they possess and then verifying that another LCC received a valid and authentic message.

Action Links" (PAL) installed at LCCs to prevent cooperating crews from launching missiles without presidential authority. The implementation of a version of PAL (called the "Permissive Enable System") is underway, but there is only a meager store of evidence on which to define the program's scope and purpose and to base an appraisal of its quality.

Other sensitive information found in each LCC includes lock combinations to missile sites which are passed to authorized personnel on site for silo maintenance, targeting information for missile sorties in the squadron, and codes and message formats used to validate directives of various kinds, including war termination orders.

Carefully selected and highly trained crew members are the only personnel authorized to perform various ICBM system operations, and the security of the operation depends heavily on their professional integrity. Technically, crew members can launch a nuclear attack with or without approval from higher authority. Unless PAL or its equivalent forecloses this option, as many as 50 missiles could be illicitly fired. Moreover, unless adequate precautions were instituted, an even more drastic option would be available. Crew members could conspire in the formatting and transmittal of strategic strike directives, deceiving the full contingent of Strategic Air Command (SAC) LCCs, as well as higher authorities, into reacting to a spurious launch directive as if it were valid and authentic. Or they could render the U.S. strategic force virtually impotent by formatting and transmitting messages invalidating the active inventory of presidential execution codes. Finally, crew members could aid accomplices in stealing thermonuclear warheads from missiles on active alert. Such weapons are many times more destructive than any atomic bomb that might be constructed from stolen fissionable materials.

The public's abiding confidence in the probity of the professional officer corps assigned LCC responsibilities *is* well deserved; however, the margin for error for the proper functioning of the launch network is not as great as one might believe. Without stringent safeguards, a single aberrant individual could "unsafe" the arming mechanisms of an entire Minuteman squadron, or facilitate the theft or sabotage of nuclear warheads. Other acts of terror, except for the physical launch of ICBMs, would require the collaboration of only two individuals (one person in each of two separate SACLCCs). Four individuals (two persons in each of two separate LCCs in the same squadron)

acting in concert could succeed in mechanically launching one or more missiles.¹³

If these nontrivial risks were ignored or inadequately addressed, the terrorist problem would be compounded in the case where access to the launch network is not stringently controlled. Given the enormous discretionary power held by *whoever* has LCC control, effective measures for denying LCC access to individuals or groups bent on carrying out an act of nuclear terror are self-evident security requirements.

In the recent past, such safeguards were poor or nonexistent. Military personnel, e.g., maintenance airmen, and civilian contractors who possessed minimal security credentials were granted LCC access, and annually thousands of visitors holding no clearance whatsoever were permitted access to operational LCCs. In the interest of public relations, the Air Force permitted ready access to the Minuteman launch network by practically anyone desiring it.

Requests for visitor access were routinely processed and approved. The requesting party had only to provide a name and social security number, and authentication checks were not usually made. As a matter of course, checks of individual backgrounds or motives for requesting LCC access were not made either. Furthermore, within wide bounds, access was scheduled at the convenience of the requesting party, and the number of individuals in a party was limited only by the capacity of an LCC—about eight persons.

Once military personnel and civilians are allowed inside an LCC, responsibility for them falls squarely on the shoulders of on-duty crew members. The present situation parallels that which existed several years ago in the area of airlines security. Aircraft flight personnel are manifestly incapable of curbing hijacking incidents, and not until major changes in airport security were implemented was the incident rate reduced to tolerable levels. LCC crews are no more capable of thwarting launch network seizures than unassisted flight personnel are capable of foiling hijack attempts. Added to all this are the facts that no acknowledged procedures or rules exist to prevent or prohibit groups of military personnel and/or civilians from gaining simultaneous access to LCCs in the same squadron, and procedures, i.e., technical orders for arming and launching missiles are unclassi-

13. Three authorized LCCs cannot cancel an unauthorized launch command generated by any two LCCs acting in concert. It is possible, though much less likely, that a single unauthorized LCC could succeed in launching a missile squadron. For that to happen, it would require simultaneous technical failures, or negligence, in the four remaining LCCs.

fied and can be readily performed, especially if rehearsed in advance.

One must also recite the obvious point that silos and launch control centers are located in desolate reaches of the heartland. Reaction times to mount a counterterror offensive pinpointed at one or a few of these facilities would be measured in hours, not minutes or seconds.

Although the unfolding scenario contains all the ingredients of a nuclear disaster, the seizure of one or more LCCs would not necessarily lead to nuclear violence. Even if the most serious loopholes were not closed by newly implemented changes in security, terrorists might be unable or unwilling to consummate the nuclear options potentially at their disposal. But the mere seizure of control and the acquisition of a possible nuclear weapon capability would greatly enhance the credibility of any threats they might make. In responding to the threats of terrorists whose nuclear capability is even remotely plausible, authorities may feel compelled to accede to their demands as if the alleged capability were real.

Elaborate lock systems, personnel screening, e.g., crew security clearance and human reliability programs, and "no-lone-zones" notwithstanding, **there is little reason to have confidence that Minuteman safeguards are inviolable.** If this component of America's nuclear force, so often hailed as epitomizing reliable command and control, has been or continues to be far less than "fail-safe," then America's nuclear force as a whole is implicated. As noted earlier, it was just March 1976 when Congressman Ottinger was able to voice serious concern about the safeguards for all nuclear weapons programs—both strategic and tactical:

Let us now turn to tactical weapons. The situation with respect to safeguards against theft, sabotage, seizure, dangerous delegation of authority, unauthorized use, incapacity or incompetence of those authorized and ineffective communications, command and control is many times worse with tactical than with strategic weapons—and we should bear in mind that the differentiation between tactical and strategic weapons today is mostly a matter of mission—many weapons classified as tactical have destructive power many times that of the bombs we dropped on Hiroshima and Nagasaki. [U.S. Congress, House, 1976: 13]

TERRORIST OBJECTIVES AND CAPABILITIES

Corrective action is required to shore up commercial *and* military nuclear safeguards. But the question remains, what programs

should have priority and how much improvement is needed? The answers lie not only in identifying security defects, but in understanding terrorist objectives and capabilities.

Not much is known about these subjects, and even less is known about them in relation to the commission of *nuclear* terror, since the terrorist manufacture or detonation of nuclear weapons has never occurred. Given the present state of knowledge and the potential consequences of failure, one could assume that some fraction of the terrorist population, however minute, will seek a nuclear capability. On purely assumptive grounds, upgrading ill-protected or ineffectual security programs is justifiable.

The type of safeguards systems most appropriate for deterring or subduing terrorists should be designed with the following factors in mind:

- Likely tactical objective, e.g., achieving a credible nuclear launch capability, weapons theft, force degradation.
- Likely strategic objectives, e.g., punishment, concessions, fear and alarm, publicity.
- Terrorist capabilities.
- Pervasiveness of groups disposed to committing nuclear terrorism.

With respect to historical precedents relevant to the latter two categories, researchers are finding that: terrorists and terrorist groups are growing in number and widening the scope of their activities, they are well-financed and well-educated, there is an unprecedented extent of international cooperation, attacks against targets of wider variety and complexity are being mounted, more ingenious means of gaining access to and escape from these targets are being devised and used, and more sophisticated conventional weapons than ever before are being relied on.¹⁴

The relevance of these trends for nuclear terrorism is speculative. While terrorists may not cross the nuclear threshold in the near future, that eventuality is difficult to assess. Whatever the motive or unforeseen circumstances, little stands in the way of terrorists acquiring a nuclear capability should they

14. HERO (1974) and Mickolus (1976) contain more detailed accountings of known terrorist activities and trends.

TABLE I
Strategic Objectives

Surrogate Warfare	Terrorism
<i>Actual Use of Nuclear Weapons</i>	<i>Actual Use of Nuclear Weapons</i>
<ul style="list-style-type: none"> o Punish the U.S. or other nations o Destroy détente o Elevate the military or economic power of other nations o Eliminate opposing armed forces o Destroy morale; create fear and alarm o Initiate a catalytic war^a 	<ul style="list-style-type: none"> o Punish the U.S. or other nations o Destroy morale; create fear and alarm
<i>Threatened Use of Nuclear Weapons</i>	<i>Threatened Use of Nuclear Weapons</i>
<ul style="list-style-type: none"> o Create fear and alarm 	<ul style="list-style-type: none"> o Create fear and alarm o Gain concessions o Publicity o Provoke repression o Build morale within terrorist movement

a. By the mid-1960s, the catalytic war thesis was no longer seriously entertained because it was believed that the nuclear superpowers would be able to identify accurately the source of nuclear attack, or at least would restrain from retaliating until determining the source. This thesis requires close reexamination in an era of accelerating proliferation and possible nuclear terrorism.

choose to do so. Certainly in the case of surrogate warfare, the benefit of a national resource base would expand terrorist capabilities to high and unprecedented levels.

If gaining nuclear capability is possible, what political ends might be served? Bearing in mind the speculative nature of this question, some preliminary "scenario sketching" might prove useful and insightful. If, for example, terrorists could surreptitiously acquire control of part of the Minuteman launch network, the strategic objectives listed in Table I might hold.

Of course, this list is not exhaustive. Furthermore, some of these objectives may be achieved through other means, including nonnuclear ones. For example, the theft of the warhead or guidance system of an ICBM might enhance the military status of another nation or some political faction, but it would do so at the risk of severe military or economic repercussions. It would not affect détente (unless the Soviet Union were believed

responsible), and it certainly would not trigger a catalytic war or eliminate opposing armed forces. Finally, accomplishing a tactical objective may advance several strategic objectives simultaneously, and in other instances it may conflict with others.

Even this rough sketch of objectives reveals some important distinctions. First, with respect to the example scenario, the achievement of surrogate warfare objectives is facilitated by the actual use of nuclear weapons.¹⁵ Threatened use of nuclear violence appears to produce few if any advantages.

In contrast, other forms of terrorism can be symbolically meaningful or produce instrumental benefits without recourse to actual detonation of nuclear weapons; in fact, the latter appears counter-productive. Actual use of nuclear force may serve as a punishment or fear-inducing objective, but it would not promote terrorist aims if social structures of potential value to them were destroyed. Unless the indigenous terrorist is a complete nihilist,

total indiscrimination is not desirable, for the insurgents will wish to concentrate their attacks on specific targets of intent, social structures, and symbols, to achieve economy of effort and ensure the maintenance of those structures that are of potential value to them. They must therefore determine which structures are to be preserved, which structures are the most vulnerable to attack, and which are the most crucial in holding together the fabric of society they wish to split. Certain compromises will inevitably have to be made, but the optimum targets are clearly those that show the highest symbolic value and are dominated by symbols that are most vulnerable to attack. [Thornton, 1964: 81]

This position is less tenable in the case of international terrorism, where the destruction of social structures of target nations may be irrelevant or perhaps even desirable.

15. This proposition also applies to industrial nuclear programs. For example, a recent study conducted for the Nuclear Regulatory Commission (NRC) concluded that any fading of détente could make the Soviet Union more likely to attempt sabotage of U.S. atomic power plants (Wall Street Journal, 1975).

RECOMMENDATIONS

MINUTEMAN AND OTHER WEAPONS SYSTEMS

The deficiencies identified indicate that basic changes in Minuteman safeguards are required, changes that may also pertain to other strategic and tactical weapons systems. The following recommendations do not exhaust the creative possibilities, but they appear to be promising and deserving of further consideration and evaluation. They are listed in what we believe to be an order of comprehensiveness and probable effectiveness. Similar assessments are also needed of *all* nuclear weapons systems, and these assessments would doubtless evince similar lists of recommendations for improved security.

1. *Install Permissive Action Links (PAL).* In 1953, the installation of an electro-mechanical system called Permissive Action Link (PAL) was proposed for Polaris submarines, but it was never implemented. The time is now right to reconsider PAL's use in all tactical and strategic nuclear systems under U.S. control, including the Minuteman program (Panofsky, 1973). A U.S. initiative and demonstration of concern could set the pace for safeguards reform among allies and adversaries alike. (We must stress again the worldwide implications of the latent terrorist threat to such weapons.)

A PAL-type system would prevent the generation of execution commands unless a set of codes are previously inserted. These releasing codes would be known only at some level of command that is positive and secure, e.g., the National Command Authority (NCA) level, would constitute a *physical* prerequisite to weapon use, and would be transmitted along-with presidential execution directives should a nuclear war erupt.

Although it would not reduce the risk of LCC seizures, in the Minuteman case, PAL would eliminate the possibility of unauthorized weapons launch and detonation by terrorists or aberrant military personnel, including crew members. PAL would also obviate the necessity for developing safeguards against the illicit formatting and transmittal of deceptive and spurious, but authentic-appearing, execution directives.

The risks of nuclear theft, possible unauthorized weapons arming, or strategic degradation would not be affected, however. Other more

modest disadvantages of the proposed design include the cost of developing and installing mechanical devices and revising command and control procedures, and the limitations it might impose on the attainment of maximum readiness and reliability of the *weapon system*. The limitations appear minor. However, inasmuch as "military personnel and weapons engineers are reluctant to accept complicated and elaborate systems of safety control" (Larus, 1967: 31), the suggested system will encounter strong resistance from defense quarters unless high standards of readiness and reliability are met. Meeting such standards demands elaborate testing of both the mechanism itself and its human factors effects.

A potentially major problem with the proposed system is the effect it might have on the reliability of the *command system* which links higher authority with dispersed elements of the strategic force. If the authority to order a nuclear attack were vested only at the NCA level, a well-executed Soviet strike could possibly neutralize the NCA and, with it, all retaliatory capability. Clearly, an optimal balance must be struck between weapons safeguards and weapons usability. If existing organizational and physical safeguards reflect the degree to which nuclear authority is decentralized or ambiguous, then policy has leaned too far in the direction of priming weapons for ready use.

The locus of nuclear authority ought to be vested as high up the chain of command as possible without placing the command system itself in jeopardy. Having fixed the level of command at which discretion with respect to nuclear weapons is sanctioned, all subordinate levels of command should be fully protected against any risk of nuclear terrorism. Finally, since the vesting of authority at any level below the NCA would blur the distinction between political and military control of nuclear operations, the public should be made aware of this fact and encouraged to debate whether a compromise of constitutional authority is permissible and, if so, under what circumstances.

2. Expand preaccess screening of military personnel and extend the principle to nonmilitary personnel. Preaccess screening might incorporate more rigid clearance standards, improved physical and procedural identification techniques, physical or electronic search procedures to prevent concealment of arms, and so forth. The obvious model is the airport security program. Among these possibilities, the expansion of investigatory requirements will be the most expensive in the long run. Also, any form of preaccess screening of civilians, especially involving information storage systems like data banks, has potential for abuse and warrants close scrutiny.

3. *Suspend visitor access.* This measure could be easily and inexpensively implemented and would *reduce* defense outlays. However, its impact on civil-military relations could be judged to be detrimental. The military is interested in enhancing public relations programs, not cutting them back. Likewise, the public generally wants information about military operations to remain as unfettered as possible. Since no classified information is compromised during civilian visits, a curtailment of visitor access might be interpreted as undue secrecy and suppression of the public's right to be informed.

The dilemma clearly reveals a distinction between categories of information dissemination. Sole reliance on classification is an exhausted form of protection, and the need exists to develop better methods for safely disseminating unclassified information.¹⁶

4. *Create and improve procedures for damage limitation resulting from nuclear terrorism.* One such procedure might be the creation of an international forum for sharing knowledge and presenting proposals concerned with war termination.¹⁷ This concern certainly falls under the purview of the U.S. Arms Control and Disarmament Agency (ACDA), which would logically represent the United States in communicating and negotiating substantive issues such as war termination. At the national level, a "no-first-use" declaratory policy might assist in rendering suspect any terrorist-originated launch directive.¹⁸

THE CITIZEN'S ROLE

Secrecy has probably engendered more public ignorance of the risk of illicit nuclear weapons detonation than of security problems arising in connection with the growth of commercial nuclear power. In either case, public input in the development of nuclear safeguards policy is effectively limited by classification's ubiquitous stamp.

5. *Improve public debate about nuclear safeguards.* We need to generate and evaluate alternative ways of structuring public debate

16. U.S. Arms Control and Disarmament Agency (1976) offers one promising vehicle for this initiative. Stockholm International Peace Research (SIPRI, 1975) is another.

17. Iklé (1971) and Kecskemeti (1958) supply the intellectual underpinnings for this concern. Kreiger (1975) discussed the issue from the perspective of nuclear terrorism. And Foster and Brewer (1976) synthesize current thought on war termination issues and difficulties.

18. The arguments for and against a "no-first-use" declaration are discussed in Russett (1976) and in U.S. Congress, House (1976).

so that safeguards issues are revealed as matters of political choice open to democratic control. What constitutes an acceptable safeguards posture is a political as well as an empirical question "that should not be decided in our society by any group of experts, no matter how well informed or intentioned" (Willrich, 1975: 15). Naturally, we must take into account the possible effects that a changed public role might have on the nature of the threat itself.¹⁹

6. Facilitate a variety of policy research initiatives from concerned but independent analysts. In addition to creating public unawareness of the need for safeguards reform and contributing to distorted priorities,²⁰ secrecy hinders independent research and evaluation by nongovernmental institutions and scholars. A major premise of this report is that classification and technical complications do not constitute an insuperable impediment to either analysts or terrorists; otherwise there would be little cause for concern over the purported terrorist threat. Ironically, the analyst who is not privy to classified information is at a marked disadvantage, because terrorist intelligence gathering is often more sophisticated and almost always less bound by ethics and law, i.e., the terrorist perhaps can and will penetrate the classification barrier. This might be especially true in the case of surrogate warfare, where state-sponsored terrorists possess certain classified information about the target country which is denied the well-intentioned analyst.

Secrecy also discourages the well-informed outsider from attempting to effect changes in safeguards procedures. The Committee for Economic Development (CED, 1974: 42) observes that

[the outsider] is subject to being intimidated, if not discredited, by the allegation that there exists decisive information that contradicts him but to which he may not have access.

19. There are numerous contradictory views on this issue to reconcile. For example, in a comment pertaining to shortcomings in nuclear weapons security, Senator Pastore expressed concern over "the effect public discussion of a matter of this nature would have upon those who might be stimulated in activities of terrorism" (Los Angeles Times, 1974). In contrast, Willrich and Taylor (1974: 3) assert that secrecy "assumes that criminals are no more perceptive than the general public about [nuclear] opportunities."

20. The distorting effects of secrecy are cause for the following observation by De Volpi (1974: 30): "Nuclear reactors are being subjected to proper and necessary review [while] tens of thousands of nuclear weapons in the world have proliferated without significant public debate or environmental review."

Perhaps more common, but equally effective, are refusals to confirm or deny assessments made by outsiders. This, at least, has been our experience. Although repeatedly assured that "appropriate actions" have been initiated as a result of our critique of Minuteman security, no substantive and comforting response on ameliorative procedures implemented has been forthcoming because of "the sensitivity of the information."

THE NEED FOR INSTITUTIONAL FOCUS

Because nuclear terrorism is rapidly becoming more practical and legitimate, we need to go beyond examining the efficacy of safeguards in the context of terrorist capabilities and objectives. We also need to look closely at the organizational, political, and economic factors that determine the shape of terrorist prevention policy more generally.

7. *Rationalize programmatic responsibility for safeguards.* U.S. nuclear programs possessing the problem dimensions defined in the beginning of this report include (1) nuclear *weapons* programs, including research and development, under Department of Defense and Energy Research and Development (ERDA)²¹ jurisdiction and to a lesser extent monitored by several committees of Congress, and (2) nuclear *power* programs under the primary direction and supervision of private industry but regulated by the Nuclear Regulatory Commission (NRC), ERDA, and the Congress.

Other significant but less comprehensive responsibilities which overlap both categories of nuclear programs belong to the Department of State, FBI, CIA, Arms Control and Disarmament Agency (ACDA), and the Government Accounting Office (GAO).²² But, so far, no agency has been formed to deal exclusively with the terrorist threat to U.S. nuclear programs, although several recommendations have been made to this effect.²³ The only government body whose sole responsibility is terrorist crime prevention is the Cabinet Committee

21. Safeguards pertaining to unclassified aspects of nuclear power operations are NRC's responsibility. Responsibility for classified aspects of military weapons and industrial safeguards programs is charged to ERDA.

22. GAO has been active primarily in the area of industrial security. See U.S. General Accounting Office (1973) and *Nucleonics Week* (1974).

23. These proposals pertain only to nuclear power programs. See Willrich and Taylor (1974) and U.S. Congress (1974a: S6621). The Senate Committee on Governmental Operations has been and will continue to be concerned with structuring programmatic safeguards responsibilities. This committee has assembled a very useful compendium on a broad range of issues bearing on nuclear terrorism (U.S. Congress, Senate, 1975).

to Combat Terrorism established by President Nixon in 1972. In the words of Hoffacker (1974), who chaired the Working Group under the committee: "This body is directed to coordinate interagency activity for the prevention of terrorism, and, should acts of terrorism occur, to devise procedures for reacting swiftly and effectively."²⁴

Despite the considerable overlap of oversight responsibilities and the plethora of agencies involved to some extent in developing safeguards policy, terrorism remains "a major policy problem without an institutional focus anywhere in the U.S. government" (Willrich and Taylor, 1974: 100). This condition stems in part from the bureaucratic disorganization and lack of resolve that characterize nuclear energy policy generally (Symington, 1977).

International programmatic responsibility is also not well assigned. Since the United States has offered to subject its nuclear industry to International Atomic Energy Agency-administered regulations, IAEA may eventually become involved in domestic safeguards programs. To date they have not. Indeed, the IAEA had but 67 inspectors in 1976 to cover the entire stock of the world's nuclear power plants; less than one-third of its budget, or about \$37 million in 1975, went for inspections and other regulation efforts (Brewer, 1977: 353).

Part of the problem has to do with incentives. Insofar as traditional concerns of the military, weapons invention and acquisition, vie with terrorist prevention programs for attention and resources, then one should expect the latter to be slighted. Similarly, to the extent that the traditional concern of the nuclear power industry, production of energy, vies with terrorist prevention (and safety) programs for attention and resources, then one should also expect the latter to be slighted.²⁵ Both cases characterize the current state of affairs.²⁶

Therefore, we should identify and remove conflicts of interest within and among agencies presently charged with safeguards responsibilities and, if necessary, establish an independent and capable locus of supervision and decision for all nuclear activities bearing on terrorism.

The terrorist threat to world nuclear programs is not obviated simply by eliminating military vulnerabilities, because the threat to commercial nuclear programs may persist, and vice-versa. Moreover, solutions

24. The committee is chaired by the Secretary of State, and includes the Secretaries of Defense, Treasury, and Transportation, the Attorney General, the U.S. Ambassador to the United Nations, the Director of the FBI, and Presidential Assistances for National Security and Domestic Affairs.

25. For attitudinal differences among key actors involved in commercial safeguards reform, see the rigorous study by Brady and Rapoport (1973).

26. The topic is treated extensively in Brewer (1977).

directed exclusively at correcting deficiencies in one area may actually increase the threat to the other. Other things being equal, terrorists would likely challenge the least effective or reliable security network, and improvements made in one network might simply reorient, rather than reduce, terrorist activity. This complex interrelationship, if it exists at all, is best dealt with through central direction and coordination. At the present inchoate stage of terrorism scholarship, not much light has been shed on the relative attractiveness of military versus commercial nuclear targets. But it is important to register the likely existence of a complex relationship and to begin to think about what organizational arrangements would most sensitively balance military and commercial safeguards priorities.

RESEARCH NEEDS

8. *Stimulate general scholarship on terrorism in all its aspects.* We know less about all of this than we should. Basic research is needed to better understand the causes and functional forms that terrorism has taken historically and will likely take in the future. We need, for instance, to consider the common structural features of the act of terrorism: audience, terrorist, sponsor, victim, media, spectator, authorities, allies, and sanctuaries. We should also examine the separate phases of the terrorist act, which include the play of the game, preparation, execution, climax, and dénouement. Such a structural framework, or its equivalent, could serve the very useful purposes of organizing much of the existing, fragmented case study literature on terrorism and of understanding terrorism's many forms and processes so that appropriate and effective preventative and ameliorative policies and procedures might be developed.

CONCLUSION

Although concern is mounting over the increasing vulnerability of every society to terrorism, public policy in this field is emerging piecemeal and in some respects not at all. Unfortunately, unlike some other policy problems, there is no latitude for experimentation and little comfort in the hope that effective safeguards policy can be developed through a process of trial and error or by "muddling through." In the case of nuclear terrorism, the consequences of policy failure are catastrophic.

Admittedly, the probability that various agents, foreign or domestic, will soon resort to tactics of nuclear terror is low. Even though the

likelihood of nuclear war erupting between the United States and its adversaries is also low, we continue to devote a substantial share of our national income to minimizing that risk. The logic of our strategic nuclear policy is clear. The prevailing view is that the risk of nuclear war is low because the United States responds vigilantly to nuclear threats posed by other nations.

The same logic does not appear in our policy response to possible nuclear terrorism. There is no terrorist prevention doctrine in effect comparable to strategic deterrence doctrine, nor is there an institutional focus for preventing terrorism that is in any respect commensurate with that which exists for deterring nuclear war. If the likelihood of nuclear terrorism is remote, it is not because anyone has made a comprehensive effort to prevent it.

As smaller and smaller groups of extremists and disaffecteds acquire more and more power to disrupt and destroy, governments are becoming harder pressed to counter them without resorting to numerous, oppressive restrictions and affronts to the general citizenry. The emerging world is an unstable collection of nations, ministates, autonomous ethnic substates, governments in exile, national liberation fronts, guerrillas, and shadowy but destructive terrorist organizations. We have not, on a national or international scale, come to realize this basic fact.

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Bruce G. Blair is presently completing his graduate studies in Yale University's School of Organization and Management and is, during the academic year 1977-1978, a Brookings Institution Fellow in national security policy. Formerly an air force officer attached to the Strategic Air Command, he is deeply involved in understanding and improving analytic methods and theoretical perspectives used in national security studies and decision-making.

Garry D. Brewer is an Associate Professor of Administrative Sciences and Political Science in Yale University's School of Organization and Management and Department of Political Science. His interests are varied, and include continuing efforts to develop and apply operational modeling and gaming techniques in the urban, developmental, and national security areas. He edits the journal Simulation & Games and was the former editor of the journal Policy Sciences. Among other publications, The War Game: A Critique of Military Problem Solving (with Martin Shubik, forthcoming) is most directly related to the issues addressed in the article.