The Soviet Union has the means to destroy the United States. An attack by only a fraction of the thousands of nuclear warheads now deployed on Soviet long-range missiles and bombers would be sufficient to annihilate most Americans, to destroy our material accomplishments, and to transform our country into a wasteland. We have virtually no defense against such an attack. Our nation is vulnerable, and has been for decades.

The Soviets could also destroy a substantial portion of our military might. Land armies, surface ships, airfields, theater-based nuclear forces, and command, control, and communications facilities are especially vulnerable. Of the strategic forces, those at greatest risk are the ballistic missile submarines in port (normally about half of the SSBN force) and those long-range bombers not on alert (normally about two-thirds of the bomber force). These vulnerabilities too have been recognized for decades. The comparative newcomer to the world of vulnerability concerns is the land-based ICBM force, for it is only recently that the numbers, yields, and accuracies of Soviet ICBMs have approached the levels required to pose a meaningful threat to a large number of hardened silos. Opinions differ on whether this threat is credible in light of the substantial uncertainties inherent in predictions of the outcome of such a complex, sophisticated, unprecedented, and untestable attack. But in theory at least, a large fraction (perhaps as high as ninety percent) of America's ICBM silos could be at risk within the next few years. Heightened awareness of this potential vulnerability has been an important factor in the perception of declining American strategic power, in the rhetorical opening of the "window of vulnerability," and in the demise of SALT II.

Why, it might be asked, should one worry about ICBM vulnerability? Why should this particular instance of vulnerability deserve our attention any more than the other vulnerabilities cited previously? Some observers believe that a survivable land-based ICBM force is essential to U.S. security; others find the need less than compelling, but still substantial; and still others

---

Albert Carnesale is Professor of Public Policy and Academic Dean of the John F. Kennedy School of Government at Harvard University, and co-editor of International Security. Charles Glaser is a Graduate Student Associate of Harvard's Center for Science and International Affairs.

International Security, Summer 1982 (Vol. 7, No. 1) 0162-2889/82/010070-16 $02.50/0
© 1982 by the President and Fellows of Harvard College and of the Massachusetts Institute of Technology.
believe that America’s resources could safely (and should) be devoted to other needs, military and civilian.

The strongest points made in support of maintaining a survivable ICBM force are that such a force is needed: 1) to discourage a Soviet first strike, especially in times of crisis; 2) for prompt counterattacks against hardened targets; and 3) to hedge against unexpected degradation in the survivability or effectiveness of other components of the strategic forces (e.g., submarine-launched missiles and bombers). These arguments have merit; thus, it is not surprising that intensive searches have been made for solutions to the ICBM vulnerability problem. Equally unsurprising is the observation that every proposed “solution” is achievable only at some cost—economic, political, and/or military. Because the benefits of improved ICBM survivability must be weighed against the costs of providing that improvement, it is useful to recall the leading proposals for reducing ICBM vulnerability and to identify some of the more important costs associated with them.

Survivability Solutions and Associated Costs

Schemes for enhancing the survivability of land-based ICBMs can be divided into five categories: arms control, launch-under-attack, hardening, preserving locational uncertainty, and active defense. Elements of each approach can in general be applied separately or in combination with elements of one or more of the other approaches.

The arms control approach would depend for its success upon substantial reduction of the threat posed to the U.S. ICBM launchers by Soviet forces, especially by the Soviets’ MIRVed ICBMs. In principle, this could include reductions in the number of MIRVed ICBMs and/or in the average number of MIRVs on each ICBM, as well as constraints on missile accuracy. But verification of arms control measures such as these is likely to be extremely difficult. Moreover, negotiated substantial reductions in Soviet ICBM MIRVs almost surely would be accompanied by comparable reductions in U.S. ICBM MIRVs, and the combination might well lead to degraded rather than enhanced ICBM survivability.

Launch-under-attack. There would be little incentive for the Soviets to attempt a counterforce strike against U.S. ICBMs if they knew that these ICBMs would be launched upon warning of the attack, or upon verification of the detonation within U.S. territory of some specified (small) number of Soviet warheads. The primary danger associated with such a launch-under-
attack strategy is the possibility of a false alarm. A faulty signal from a radar or other kind of sensor, a computer malfunction, or a garbled electronic communication conceivably could result in the launching of U.S. ICBMs and the (unintended) initiation of a nuclear World War III. There is also the danger that an actual attack on even a small number of U.S. ICBMs, either intentionally or accidentally by the Soviet Union, or by a third party, could initiate a pre-programmed massive strike against the Soviet Union. Thus, any attack on U.S. ICBMs, no matter how limited, no matter what the source, and no matter whether intentional or accidental, could lead automatically to a large-scale exchange of nuclear arsenals.

**HARDENING**—that is, strengthening the structure of ICBM launchers to make them better able to withstand nuclear attack—is the means by which ICBM survivability has been assured over the past two decades. Today’s concrete-lined underground silos could be made even harder than they are now, but even a superhardened silo would be destroyed if the impact point of the attacking warhead is very close to the silo. Given the rate at which missile accuracy has been improving in recent years, any race between concrete-pourers and accuracy-improvers is almost certain to be won by the latter, and in short order. There is one unconventional form of hardening, however, that might skirt the problem of accuracy improvement—namely, deep underground basing. In this basing mode, the ICBMs are deployed in tunnels thousands of feet down below the surface of the earth. The buried launchers and missiles would be shielded from the surface bursts of the attacking warheads by an enormous mass of shock-absorbing earth, and therefore would be better able to survive. Because it would take days or weeks after an attack to bring the surviving launchers and missiles to the earth’s surface, they would not be available for use in *prompt* counterattacks. In any event, it remains to be seen whether the deep underground basing scheme is technically and economically feasible.

**DECEPTIVE BASING.** If the Soviets would not know where U.S. ICBM launchers would be at the instance of arrival of their attacking warheads, then they could not predict whether the impact points of the arriving weapons would be close enough to the launchers under attack to destroy them. This self-evident notion is the basis for the approach to ICBM survivability known as Preservation of Locational Uncertainty (PLU). The idea is hardly new, for it is PLU upon which the other central strategic systems—ballistic missile submarines and heavy bombers—depend for their survival. The principal means available for PLU of land-based ICBM launchers are mobility (on the ground
ICBM Vulnerability | 73

or through the air) and deception. Ground-mobile launchers would deny to the Soviets knowledge of their locations by moving frequently or continuously over a large geographical area. (The area must be large enough to render a barrage attack infeasible.) It is extremely unlikely that such a force could be accepted politically in the United States in peacetime. Aircraft capable of launching ICBMs could either take off upon warning of a Soviet attack or remain airborne continuously. The "dash-on-warning" scheme shares the dominant vulnerability of the bomber force by requiring reliable and timely warning of an attack, while the continuously airborne approach would be extremely expensive. (The Office of Technology Assessment of the U.S. Congress estimates that a continuously airborne force of 75 aircraft, each carrying two MX missiles, would have a lifecycle cost of $80 billion to $100 billion, in 1980 dollars.)

Deceptive basing schemes usually involve hiding ICBMs among a much larger number of silos or other hardened launchers. (A common variant involves hiding ground-mobile launchers and missiles among a much larger number of hardened shelters.) The idea is that, because the Soviets would not know which shells contain the peas, they would have to destroy all of the shells in order to destroy all of the peas. The Multiple Protective Shelter (MPS) system proposed by President Carter and rejected two years later by President Reagan is the best known example of this type of basing mode. Among the problems encountered by proponents of MPS were these: no region of the country would willingly accept deployment of a system intended to serve as the target area for thousands of Soviet nuclear warheads, nor would it readily suffer the adverse environmental and socioeconomic effects of the vast construction project required for MPS deployment; the Soviets might well be able to deploy warheads more cheaply than the United States could build shelters, in which case a warhead-versus-shelter race would be to the U.S.'s net disadvantage economically; and effective deceptive basing may be incompatible with the kinds of verifiable arms control agreements of potential interest to the United States.

Ballistic Missile Defense. Last on the list of approaches to enhancing the survivability of land-based ICBMs is active defense—that is, deployment of a system capable of destroying Soviet warheads in flight. Decisions related to such defenses must be made in the context of the 1972 Treaty on the

Limitation of Anti-Ballistic Missile Systems. (The terms anti-ballistic missile, ABM, and ballistic missile defense, BMD, are used interchangeably to describe systems for active defense against ballistic missiles.) The Treaty restrictions on ABM deployment are severe—so severe that no permitted defense could contribute significantly to ICBM survivability. Moreover, the Treaty inhibits technological innovation by banning the development, testing, and deployment of ABM systems or components which are sea-based, air-based, space-based, or mobile land-based, and by excluding the deployment of ABM systems based on exotic new technologies. The Treaty is of unlimited duration, although either party can withdraw upon six months notice. To modify or terminate the treaty is to modify or terminate it for both sides, not just for the United States. The choice is between a world in which both nations can have significant BMD deployments and a world in which neither nation can have them.

Technological, economic, military, and political arguments have been raised in opposition to modifying or terminating the ABM Treaty to permit extensive defense of ICBMs. The BMD system concept most advanced in development is the Low Altitude Defense (LoAD), which is designed to intercept incoming warheads at low altitude after reentry into the atmosphere. In time, this so-called “terminal” or “exoatmospheric” defense could be augmented by another layer of defense. The “overlay” or “exoatmospheric” system is intended to conduct intercepts well before reentry. Both the LoAD and the exoatmospheric system are in the testing phase of development. It remains to be seen whether the LoAD technology conceivably could meet the challenge posed by a reactive Soviet threat to U.S. ICBMs, especially if the ICBMs were not deployed in a deceptive basing mode similar to MPS. The exoatmospheric system is at far too early a stage of development to permit informed evaluation of its potential effectiveness. Here BMD policymakers face a dilemma. Without the testing needed to acquire confidence in the potential performance of BMD systems, one would be hesitant to withdraw from the ABM Treaty; but, without withdrawing from (or modifying) the Treaty, one cannot perform the necessary testing.

Even if the technological feasibility of BMD could be established, questions about cost-effectiveness would remain. For example, how would the cost of the BMD system compare with the cost of offensive measures required to offset it. And how would the costs of offensive measures required to offset a Soviet BMD system compare with the benefits of a U.S. BMD system?
The military consequences of substantial BMD deployments could be severe. While American deployment of a BMD system to defend U.S. ICBMs would enhance their survivability, the ability of those ICBMs to penetrate to their targets would be degraded by the presence of a Soviet BMD system. Moreover, a Soviet BMD system would also degrade the penetrability of U.S. submarine-launched ballistic missiles and, indirectly, U.S. bombers and cruise missiles. (The air-breathing systems normally would be aided in penetration by precursor attacks by ballistic missiles upon the adversary’s air defenses.) Thus, enhanced ICBM survivability can be attained through BMD deployment only at the cost of some reduction in the effectiveness of the surviving weapons. Which of these effects would be the more pronounced is not at all clear. Most importantly, how confident could the United States be that a Soviet BMD system deployed ostensibly for the defense of silos did not have significant capabilities for defending large areas of the USSR against an American retaliatory attack, or that the permitted Soviet system could not serve as a base for rapid upgrading and/or expansion to provide such capabilities? Even if the area defense capability of such a deployment were not great, is it not reasonable to expect that offense-conservative analysts would see it as extremely threatening? To what extent would the United States have to expand its own offensive forces to assure confidence in the U.S.’s ability to retaliate against all targets of interest?

The political consequences of modifying or terminating the ABM Treaty to permit extensive BMD systems also would be important. The Treaty remains the principal enduring accomplishment of over a decade of Strategic Arms Limitation Talks (SALT), and its termination probably would signal the end of the SALT process. More difficult to assess are the likely effects of attempts, either successful or unsuccessful, to modify the Treaty to permit defense of silos. A frustrated amendment attempt could be followed by a return to the conditions—legal and political—prevailing before the attempt was made, but it might instead lead to withdrawal from the Treaty by the frustrated party. An amendment proposal also might lead to modifications to the Treaty far different from those originally proposed—a phenomenon not unheard of in international negotiations. And if an amendment to allow limited hard point defense were successfully negotiated, it could be the first step toward the demise of the ABM Treaty. Overlay technologies, if permitted, would necessarily provide some area defense capability. Moreover, any change which would permit the Soviets to deploy BMD at levels substantially higher than
now permitted by the Treaty almost certainly would be viewed with alarm by the United States' British and French allies, for it could threaten the ability of their independent strategic nuclear forces to penetrate to targets in the Soviet Union. The utility of the People's Republic of China's nuclear deterrent vis à vis the Soviet Union also could be threatened by an expanded Soviet BMD deployment. Would that be in the U.S. interest?

While the foregoing discussion of approaches to solving the ICBM vulnerability problem raises far more questions than it answers, it demonstrates at the same time that all of the proposed solutions have important deficiencies. The direct military, political, and economic costs of the more promising remedies are high, and the adverse side effects associated with them may be great. Rather than too hastily to select and administer a costly and questionable nostrum, it would be wise to reexamine the ICBM patient to verify the nature, extent, and seriousness of the vulnerability disease.

Why the Need for Invulnerability?

Three lines of argument are used in support of the need for invulnerable ICBMs as part of the mix of U.S. strategic forces:

— the current vulnerability would allow the Soviets to gain a coercive position by initiating a counterforce exchange (and therefore, encourage them to strike first);
— ICBMs possess capabilities that are necessary to maintain U.S. security and that do not exist in the other legs of the triad; and
— the strategic triad must be maintained to hedge against technological advances that might threaten the survivability or effectiveness of one or two components of the force.

Each of these arguments is examined below.

COUNTERFORCE AND COERCION
The first argument is based upon calculations which show that the current balance of forces is such that the Soviets, by starting a counterforce exchange, would increase their strategic advantage as measured by the difference in the post-exchange throw-weights available to each side and the ratio of these post-exchange throw-weights. It is assumed in this argument that the initial exchange is exclusively counterforce; that is, the United States responds to the Soviet attack by striking at Soviet forces rather than at Soviet cities,
knowing that the latter form of retaliation would invite a subsequent Soviet response in kind. It is maintained that throw-weight, though only a gross indicator of capability, is the appropriate measure of the residual forces since after the counterforce exchange the targets of interest will be soft. The Soviet goal in initiating the counterforce exchange would be to produce an asymmetry so great that the Soviets would gain a coercive position. The post-exchange throw-weight advantage combined with the effectiveness of Soviet civil defense efforts is presented as evidence that the Soviets can achieve this goal.2

There are weaknesses in this argument. While it is possible that the U.S. would respond by attacking Soviet reserve forces, it is by no means a sure thing. Millions and probably tens of millions of Americans would die as the result of a Soviet attack on U.S. ICBMs, bombers, and ballistic missile submarines in port. The level of destruction would be difficult to assess in the period immediately following such an attack. The American president would have to decide upon a response under conditions of poor information, unprecedented destruction, and probably damaged command, control, and communications (C3). No Soviet leader could confidently assume the U.S. would respond with a purely counterforce attack. Thus, uncertainty about the nature of the response, combined with the unacceptable cost of miscalculation, should be a powerful deterrent to Soviet attack. While the counterforce exchange scenario is possible, the likelihood of its occurring is very low, and the conclusions that follow from its consideration should be weighted accordingly.

Another weakness in the argument is that throw-weight differentials and ratios are not the measures which best reflect the deterrent value of the surviving forces: it is the absolute rather than relative level of the forces that determines the amount of damage that could be inflicted. If the U.S. residual forces could respond after a counterforce strike at a level which is still unacceptably high to the Soviets, then the Soviets would not have gained a coercive position. Given the existing balance of forces, if the initial exchange were to remain counterforce, the American residual force would be large and would pose an enormous threat to the Soviet population, industry, military instal-

lations, and other facilities of value to them. The Soviets' ability to blackmail the United States would not be increased by a counterforce exchange.

A final weakness in the throw-weight residual argument is that it does not lead to the conclusion that the United States requires an invulnerable ICBM force. If the criteria for force planning are that a counterforce exchange cannot improve the Soviet advantages in throw-weight ratio or differential, and that after such an exchange U.S. forces should still possess enormous throw-weight, then large missiles on submarines or airplanes would be adequate replacements for ICBMs.

ICBM: NECESSARY CAPABILITIES AT RISK?
The second argument supporting the need for survivable ICBMs focuses on the capabilities that are possessed by ICBMs and not by other legs of the triad. Secure communications, high accuracy, and the speed of ballistic missiles enable the ICBMs to perform missions that require reliably prompt counterforce attacks in either a controlled and limited strike or in a massive response. The reliable promptness makes possible attacks on time-urgent targets. Reliability results from the ability to give commands at the desired moment and of the necessary complexity, while promptness results from the short flight-time of ballistic missiles. The air-breathing components of the strategic force (i.e., heavy bombers and cruise missiles) may be reliable, but, because of their long flight-times, they are not prompt. The submarines have neither the reliable communications links nor the missile accuracy required for hard-target counterforce capability. The Trident II missile, currently in the development stage and programmed for deployment by the end of the decade, will provide the missile submarines with silo-killing capability. This will not affect doubts about their ability to launch attacks quickly after a U.S. decision to do so. It is possible that this communications inadequacy could be eliminated if the U.S. were to consider it necessary.

But assuming that ICBMs are the only strategic system that can perform reliably prompt counterforce missions, it is still necessary to identify situations which would require this capability. The countervailing strategy enunciated by the Carter Administration requires that the United States be able "to respond at a level appropriate to the type and scale of a Soviet attack." 3 This includes responses which range in size from a small number of nuclear

weapons to large attacks against military, economic, and political control targets. The designers of the strategy believed that this flexibility would strengthen deterrence and increase the potential for controlling the escalation of conflicts that begin as limited exchanges. Secure communications are necessary to provide the flexibility to respond at any level and against varied target sets. The countervailing requirements can be challenged, but if it is assumed that the United States needs to be able to perform these controlled and reliably prompt counterforce missions, then survivable U.S. ICBMs are required. For low- and medium-level conflicts, where flexibility is likely to be most important, a substantial fraction of the ICBM force will remain unattacked, so survivable, reliably prompt counterforce capability is assured. It is only in the event of a successful Soviet first strike against virtually all of America’s ICBMs that our reliably prompt counterforce capability is in question.

The air-breathing leg of the triad can attack counterforce targets in the Soviet Union in approximately eight hours; the ICBMs take only half an hour. Thus, time-urgency distinguishes between targets that must be destroyed in the first half-hour and in the first eight hours after the initial Soviet attack. The targets which are often considered time-urgent include Soviet ICBMs in reserve and reloads, C3, political and military leadership, and submarine bases, airfields, and certain conventional forces. Under what circumstances following a full-scale attack against the U.S. land-based forces would it be necessary to attack these targets so quickly?

It is this ability to retaliate against Soviet ICBM forces in a time-urgent manner that receives the most attention. This focus could be anticipated, for the most obvious effect of the Soviet attack would be to create an asymmetry in ICBM capabilities. One rationale for possessing a time-urgent response capability is the belief that the U.S. president should have the option to redress the imbalance as quickly as possible. While the desire to respond by attacking Soviet ICBMs in reserve and reloads might be the natural reaction of a president, the choice of a U.S. response should take into account the ways in which ICBMs might affect the expected outcome of the conflict.

Whether the U.S. attacks with ICBMs or with bombers and cruise missiles, the Soviets could launch the reserve ICBMs on warning. Launch-on-warning is usually considered in the context of responding to a first strike, in which case it is technically demanding because extremely high confidence in the early warning information is required—a false alarm would be disastrous. For the initiator of an exchange faced with launching the third strike, launch-
on-warning poses a far less demanding problem. After attacking the United States, the Soviets would have good reason to believe information that suggested a retaliatory missile attack had been launched and, because this reaction would be anticipated, there would be more than enough time to launch the reserve missiles before the American warheads arrived.

Since promptness cannot in itself prevent launch-on-warning, it is necessary to see if there exist scenarios in which the Soviets would not launch on warning if the U.S. retaliatory attack were to arrive in half an hour rather than eight hours. If the original Soviet strike were undertaken to limit damage during a crisis in which war looked imminent, then the Soviets might be willing to lose their ICBM reserves, believing that their SSBNs at sea would constitute an adequate reserve to deter attacks on their cities. In this case the time difference between the arrival of the American ballistic and air-breathing components is not likely to affect the Soviet response. In an alternative scenario—the one frequently used to argue that the United States needs a prompt counterforce capability—the Soviets would launch a preemptive strike in the hope of achieving a coercive advantage. But one can hardly imagine a situation in which the Soviet decision on whether or not to launch their reserve ICBMs would depend on the promptness of the U.S. retaliation. Is it likely that the outcome of any bargaining situation could hinge on such a small difference in bargaining time? No. Moreover, no militarily meaningful action which the United States would take during these eight hours would be irreversible; consequently, regardless of any U.S. actions, the Soviets could not be assured that their demands, whatever they might be, would be met.

The countervailing strategy calls for targeting the political and military leadership to improve deterrence. Once a full-scale attack on American ICBMs has taken place, it seems unlikely that a prompt retaliatory attack is the key to destroying the Soviet leadership. Before launching a massive attack, the leaders would have dispersed to hardened command posts, and therefore their vulnerability would not depend on the quickness of the U.S. response.

The arguments about whether C³ should be attacked are familiar: attempts to decapitate or severely damage the adversary’s C³ can reduce the enemy’s ability to use effectively the weapons that remain, but they can also preclude the option of further negotiation. Obviously, if it is decided that C³ should not be attacked in retaliation, then the question about time-urgency is moot. Assuming that a decision is made in favor of attacking C³, it is necessary to
determine if it is important whether the attack is accomplished in 30 minutes rather than in eight hours. Suppose, for example, that the Soviets avoided giving the United States strategic warning of their initial attack by not increasing the number of missile submarines on patrol. In that case, it is likely that they would rush to get their SSBNs out of port as soon as they launched their ICBMs, but the orders to do so could be issued well before the United States could detect the initial Soviet attack, perhaps days earlier. Thus, the submarines themselves might be time-urgent targets, but the communication links to them are not. Command, control, and communication for tactical nuclear and conventional operations raises more complicated issues, many of which depend on the specifics of the scenario, e.g., the stage of a war in Europe. But in most reasonable situations the commands that are important could be communicated before the United States could destroy Soviet C3. The order could have been given before the strike or at the same time.

Submarine bases and airfields could be time-urgent targets in the unlikely event that the Soviet attack is a “bolt from the blue.” Considering the large number of warheads in the Soviet ICBM reserve, however, it is unclear that destroying Soviet submarine bases and airfields quickly would have a significant effect on the outcome of the war. Furthermore, it is likely that enough American ICBMs would survive a Soviet first strike to be able to retaliate effectively against submarine bases and airfields. On the other hand, if the Soviet strike were to take place during a crisis, the Soviets could have increased the percentage of submarines on patrol and bombers on alert, in which case the relative promptness of the U.S. response would be of little importance.

In addition to the strategic nuclear targets considered above, there are conventional force targets that are often considered time-urgent. It is argued that if the Soviets were to invade Western Europe, the United States might want to attack troop concentrations, transportation routes, and other military targets in the Soviet Union and Eastern Europe as quickly as possible, in an effort to interrupt the Soviet battle plan. For this reason, the Soviets, in an attempt to reduce the U.S. ability to interfere, might attack the U.S. ICBMs before the invasion. The problem with this scenario is that the risks incurred by the Soviets are incommensurate with any plausible Soviet objective. The target set in the United States would have to go beyond ICBMs alone if the Soviets’ intention were to keep the U.S. out of a European war. The American response to a massive attack on its homeland is unlikely to be limited. And even ignoring the probability of the escalation to general war, it is hard to
see how the outcome of a war in Europe could depend on whether conventional military targets were attacked in half an hour or in eight hours.

In sum, it appears that there would be few, if any, time-urgent targets following a massive attack against the U.S. ICBMs. Scenarios which require prompt second strikes are incredible and unlikely. This insight leads to the conclusion that the special characteristic of the ICBMs, reliably prompt counterforce, does not in itself require that the ICBM force be invulnerable.

**INSURANCE AGAINST TECHNOLOGICAL BREAKTHROUGH**

The third argument in favor of an invulnerable ICBM force is that an invulnerable triad is more resistant to increased Soviet threats than an invulnerable diad. Since Soviet capabilities can be expected to continue to grow, it is prudent for the United States to maintain the invulnerability of all components of its strategic forces. This approach guarantees that no single technological breakthrough could leave the entire strategic force vulnerable to a Soviet attack. Furthermore, the diversity of the triad will force the Soviets to spread their research and development efforts and force deployment resources across the wide spectrum of U.S. offensive capabilities. Conversely, once the ICBMs have become "satisfactorily" vulnerable, the Soviets could increase their efforts in anti-submarine warfare and air defense. Not only would more resources be available for improving these capabilities, but the strategic value of increased capabilities would be greater.

That an invulnerable triad provides valuable insurance against unforeseeable breakthroughs is the most convincing of the arguments for restoring the survivability of the ICBMs: a survivable strategic force is a basic requirement for strategic stability and should not be compromised. Yet, since all the solutions to the vulnerability problem are costly, the triad argument itself is not sufficient to conclude that the ICBM leg should be made more survivable.

In addition, two factors make less important the need to possess an invulnerable ICBM force as insurance against a Soviet technological breakthrough. First, the introduction of air-launched cruise missiles (ALCM) and sea-launched cruise missiles (SLCM) into the U.S. strategic force during the 1980s will expand the triad to a pentad. The greater diversity will increase the survivability of the total force. The pre-launch survivability of the SLCMs will be comparable to that of the SLBMs, and defending against these sea-based components would require both air defenses and ballistic missile defenses. Furthermore, increasing the number of submarines carrying nuclear weapons will make the Soviet strategic anti-submarine warfare (ASW) mis-
sion all the more difficult. The ALCMs will increase the penetrability of the air-breathing leg. Cruise missiles are expected to be able to penetrate Soviet air defenses well into the 1990s due to their small radar cross-sections, the large number that will be deployed, and their flexible and low-altitude flight paths.

Second, and probably more important, the threat to the survivability of SLBMs remains highly theoretical. Unlike the case of the ICBMs, in which the nature of the emerging threat to survivability was obvious (i.e., opposing ICBMs with multiple warheads and increased accuracy), the nature of an effective anti-submarine threat is unknown. Whereas ICBM vulnerability was anticipated for more than a decade, no serious threat to the sea-based leg of the triad is expected to emerge in the foreseeable future. Furthermore, while it is not incredible that an ASW threat will develop, it is incredible that the threat would develop quickly. Anti-submarine warfare is a multi-faceted mission that requires many different components working together in an integrated manner. A breakthrough in any single area does not lead automatically to a breakthrough in overall capability. Rather, major advances would have to be made in many components before the ASW threat would improve dramatically. If such a threat begins to develop, then there should be time for the United States to restructure its land-based forces and to try to counter the ASW capability.

Conclusion

This examination of the vulnerability of ICBMs reveals that the liability is far less significant than is generally assumed. Contrary to oft-repeated arguments, it appears that the Soviets cannot gain a meaningful coercive advantage by initiating a counterforce exchange, that the United States does not need a survivable capability for prompt large-scale counterforce attacks, and that invulnerable ICBMs are not a necessary component of a diverse and redundant strategic force. We conclude that the costs of each of the potential solutions to the ICBM vulnerability problem outweigh the benefits that might be provided and, therefore, that none of these solutions should be adopted at this time.

It should be emphasized that a decision not to pursue now a program intended to enhance ICBM survivability is quite different from a decision to do away with the U.S. ICBM force. Maintaining the ICBMs confers important advantages. First, the Soviets’ estimate of the degree of success they might
achieve in a first strike is shrouded by enormous uncertainties. Even if a destruction level as high as ninety percent were the expected outcome of an attack on U.S. silos, many outcomes less damaging to American forces would be possible. Moreover, an attack of ninety-percent effectiveness would leave as survivors about one hundred ICBMs bearing about two hundred nuclear warheads—a retaliatory force unlikely to be viewed as negligible by a Soviet decision-maker. Second, the existence of the U.S. land-based ICBMs makes a Soviet first strike difficult, and perhaps impossible, to orchestrate. The launching of Soviet ICBMs in an attack on U.S. ICBMs would provide the U.S. with tactical warning time sufficient to get most of its heavy bombers into the air. Third, as indicated previously, the ICBMs provide a reliably prompt counterforce capability that does not exist in the other legs of the strategic force. In the wake of anything less than a massive Soviet attack on the American homeland, U.S. ICBMs would remain available for the execution of prompt counterforce missions. Finally, by keeping the ICBMs, the United States avoids any political cost that might be incurred by appearing to have let the Soviets “force the U.S. out of the ICBM business.” Some strategic theorists would argue against preservation of any vulnerable weapons, maintaining that such weapons invite preemptive attack in time of crisis; however, since ICBMs by most measures constitute only about a quarter of the U.S. strategic force and carry fewer warheads than the ballistic missiles on the submarines routinely at sea, the increase in the Soviets’ incentive to preempt would be marginal at most. The crisis instability argument is overwhelmed by the far more powerful arguments favoring retention of the ICBM force.

That none of the proposed solutions to ICBM vulnerability merit adoption at this time does not imply that the problem should be ignored. The time may come when corrective treatment is called for, and the United States should be ready to take such action if and when it is needed. To prepare for this contingency, the U.S. should:

—proceed vigorously with improvements in the capabilities and survivability of space-based and earth-based sensors and C3 equipment in order to provide a credible option for launch-under-attack with minimum risk of false alarm;
—continue to examine alternative basing modes designed to enhance the survivability of ICBMs; and
—pursue within the context of the ABM Treaty programs directed toward the development of effective ballistic missile defense systems.
Most importantly, it must be recognized that ICBMs are not simply invulnerable or vulnerable: the degree of vulnerability and the ability of the United States to reduce it depend upon the nature and extent of the Soviet threat. Restraints on that threat—that is, restraints on the counterforce capability of Soviet offensive forces—can help to check the vulnerability problem and thereby to reduce the magnitude of the challenge facing those searching for solutions. It may well be that meaningful arms control is an essential ingredient of any cure for the vulnerability disease.