Policy Analysis

Cato Institute Policy Analysis No. 6: Reagan's Nuclear Defense Strategy: Myth and Reality

January 30, 1982

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Executive Summary

For nearly a decade now, every new Secretary of Defense has set out to create his own unique strategy for nuclear weapons. A press conference is called, annual "posture statements" issue forth, and op-ed pages and opinion journals debate the "new" strategic policy. And new weapons are built costing billions of dollars. It happened with Melvin Laird to a limited extent, with James Schlesinger much more so, with Donald Rumsfeld and Harold Brown after him and now Caspar Weinberger.

The essence of the Weinberger program is, in strategist's parlance, to increase the probability of "escalation control;" in other words, to make it easier to fight a protracted limited nuclear war. Its main elements are to build 100 MX missiles, put them in silos currently holding older missiles, and strengthen those silos to make them more resistant to overpressures of an atomic blast; to build 100 B-1 bombers; to build Trident II missiles for new Trident submarines; and to improve the command-control-communication (C3) systems to make them less vulnerable to nuclear attack and thus make U.S. nuclear weapons easier to control. Secretary Weinberger has estimated that the total program will cost $180 billion over the next five years alone.

Little is new in this program. All of it is a logical extension of a nuclear policy that has been in effect for 20 years. To appraise the Weinberger policy, one must first assess the much older strategic framework in which it fits.

History

A myth has flourished in recent times that, for two decades now, the United States has been operating according to a nuclear strategy called "Mutual Assured Destruction" (MAD). According to this strategy, if the Soviets attack the United States with nuclear weapons, we would strike back with an all-out blow against Soviet cities, destroying their industrial society and killing their urban population; that as long as the Soviet leaders know they would face so devastating a blow, they would never strike first. In contrast to this "punitive" strategy, the myth continues, the Soviets have been much more hard-headed. They plan to go after U.S. military targets, the traditional targets of any military campaign; in short, they plan to fight and, if they can, to win a nuclear war. Against such a determined foe, attempting to coerce and intimidate with limited nuclear blows, the simplistic MAD strategy is obviously inadequate.

In fact, however, the United States has never had a strategy designed to attack Soviet cities. It has targeted many industrial facilities located in cities, which -- given the enormously destructive power of hydrogen bombs -- amounts to the same thing. But more to the point, the vast majority of American nuclear weapons have always been aimed at Soviet military targets. And for the past 20 years, the actual U.S. nuclear targeting plan -- the Single Integrated Operational Plan (SIOP) -- has centered on a "counterforce" strategy (a strategy based on attacking enemy military

targets) that tries to eliminate "city-busting" from the target list.

During the 1950s, the war plans of the Strategic Air Command and the Joint Chiefs of Staff did depend heavily on nuclear weapons. John Foster Dulles, President Eisenhower's secretary of state, codified this policy as "massive retaliation," which meant that if the Soviet Union tried to take any territory that the U.S. considered vital to its interests, we would respond by firing virtually the entire arsenal of U.S. multi-megaton bombs in a single salvo. All military and urban-industrial Soviet, Communist Chinese and Eastern European targets were to be destroyed as quickly as possible.

Throughout this period, many strategists in the academic and think-tank communities grew increasingly disturbed by this strategy. Some thought it was immoral. The main line of criticism, however, was that it lacked credibility. Would the Communists really believe that we would launch an all-out attack on their cities upon the comparatively slight provocation of an invasion of some remote Asian nation or even of West Germany? The threat would become more unbelievable once the Soviets acquired a nuclear force of their own. Under such circumstances, nuclear attack against the Soviets would no doubt provoke a retaliatory nuclear blow against the United States and possibly Western Europe, killing millions. Surely our strategy could not be based on the near-certainty of national suicide. And yet that was just what "massive retaliation" entailed.

Many of these critics began to propose alternatives. One was a strategy of "flexible response," building up non-nuclear forces with which to repel a Soviet invasion. (This was also a strategy advocated, usually without success, by the Army in heated debates with the Air Force and Navy Chiefs of Staff throughout the decade.) But if the conventional forces failed to hold the line, nuclear weapons would have to be used. If, however, a nuclear attack was not going to provoke a devastating retaliatory blow against the United States, we first would have to knock out as many Soviet nuclear weapons as we could, to keep the damage to a minimum.

Some critics, especially those at the RAND Corporation, an Air Force-sponsored think tank in Santa Monica, developed a more sophisticated, coercive strategy. In this nuclear strike, the United States would keep its attack confined strictly to the Soviet nuclear forces, going out of its way to avoid hitting any Soviet cities. We would then use the many nuclear weapons we would have left over in a reserve force as a bargaining lever. We could tell the Soviets: "Don't retaliate or we'll use this remaining force to destroy your cities, which up to now we have scrupulously avoided touching." Nobody could reliably foretell where the conflict would go from there; but some analysts reasoned that unless the Soviets wanted to commit suicide themselves, they would at least avoid hitting American cities, if they retaliated at all.

This strategy was variously dubbed "counterforce," "warfighting," and "no-cities." Many thought that with this strategy the U.S. could, if it had to, use nuclear weapons in some politically rational fashion, and thus could face down enemy aggression and "prevail" in nuclear war.

In the early days of the Kennedy administration, this strategy appealed to Secretary of Defense Robert McNamara and quickly became policy. This wasn't too surprising since many of McNamara's "whiz kids" had come directly from the RAND Corporation and in fact included some of the analysts who had originally devised the strategy. In May 1961, McNamara directed the Joint Chiefs of Staff to revise the SIOP, to create new targeting options for the war plan that would emphasize "counterforce operations carefully avoiding major enemy cities while retaining U.S. ready residual forces to threaten these [cities]." One year later, McNamara told a session of the NATO defense ministers in Athens:

The United States has come to the conclusion that to the extent feasible, basic military strategy in general nuclear war should be approached in much the same way that more conventional military operations have been regarded in the past. That is to say, our principal military objectives, in the event of nuclear war. . . should be the destruction of the enemy's military forces while attempting to preserve the fabric as well as the integrity of allied society. Specifically, our studies indicate that a strategy which targets nuclear forces only against cities or a mixture of civil and military targets has serious limitations for the purpose of deterrence and for the conduct of general nuclear war.

One month later, in June 1962, McNamara said essentially the same thing in a speech at the University of Michigan at Ann Arbor.

Shortly thereafter, however, McNamara found himself boxed in on the counterforce question. The Air Force was using his statements as justification for requesting more weapons, which McNamara did not think the military needed. In reaction, McNamara began to use "assured destruction" as the criterion for assessing the adequacy of the strategic nuclear forces -- the ability to kill 25 percent of the Soviet population and destroy half of their industries, even after absorbing a Soviet first strike. Yet the actual U.S. targeting policy continued to concentrate on Soviet strategic military targets.

In the early 1960s, this obfuscation was never questioned. The Soviets had very few strategic weapons. A Special National Intelligence Estimate, released by the CIA in September 1961, revealed that, contrary to all expectations of a "missile gap," the Soviets had only four intercontinental ballistic missiles (ICBMs). For the next few years, they would not have many more, and all would be "soft" targets, standing unprotected above the ground. Their bombers were not on alert. There were few submarines, which had to surface before firing, were noisy and easy to locate, and with missiles on board that were only short range.

So it did not take many additional weapons beyond those needed for "assured destruction" to execute an effective counterforce strategy. And since the Soviet military facilities were not hardened to resist blast, the weapons did not need to be highly accurate. What could destroy cities could almost as easily destroy air bases or missile sites.

As the decade progressed, however, the Soviets built up a much larger ICBM force and emulated our example of encasing them in blast-resistant underground silos. In response, the U.S. put multiple warheads (MIRVs) on hundreds of its Minuteman ICBMs, enabling the same number of U.S. missiles to cover an expanding number of Soviet targets. The U.S. also began to improve the accuracy of the inertial guidance systems inside these missiles. Since the shock wave of an explosion dissipates with distance, getting closer to the target would improve the chances for destroying it, even if it were hardened to resist blast.

MIRVed missiles and improved guidance systems were developed for a number of reasons, including a technocratic zeal for more elaborate hardware, but the main strategic rationale was maintaining SAC's counterforce power. Throughout the 1960s, only a few hundred nuclear weapons, out of several thousand, were ever aimed at Soviet cities, all the talk of MAD notwithstanding. The rest were aimed at airfields, submarine ports and missile sites. The American nuclear buildup over the past two decades has been aimed mainly at continuing a counterforce strategy in the face of a growing and more strongly protected Soviet strategic force. (One might speculate the same to be true of the Soviet build-up.)

The MX Missile

Much of the Reagan-Weinberger strategic plan must be seen as merely the latest chapter in this much-obscured historical saga. This is especially true of the MX missile. In 1973, when top Air Force officials first expressed a need for a new land-based ICBM, they listed as their requirements heavier throw-weight, more warheads, a higher explosive yield per warhead and greater accuracy -- exactly the ingredients needed to destroy a larger and better Soviet strategic arsenal.

At this point, the Air Force was not interested in digging holes across a state and shuttling the missile from one to another. In fact, since at the time the Navy was advertising its new Trident I submarine-launched ballistic missile (SLBM) as a possible replacement for the Air Force Minuteman ICBM, the Air Force publicly disputed the notion -- common in Navy analyses -- that the ICBMs were vulnerable at all. One of the most detailed rebuttals of the vulnerability claim was printed in Air Force magazine and was titled "Why ICBMs Can Survive a Nuclear Attack."

It was only in 1976, when Congress and the secretary of defense insisted that any new ICBM must not be placed in fixed silos, that the Air Force adopted the concept of "ICBM vulnerability," seeing it as the more effective rationale for getting their new missile.

In 1979, after reviewing numerous basing schemes, the Carter administration decided that 200 MX missiles should be built and deployed in multiple shelters. Each MX would be shuttled from one shelter to any of 23 others situated along a complex of roads. The idea was that the Soviets would not know which hole actually contained the missile, so they would have to fire at all of them in order to carry out a successful first strike. Two hundred missiles and 23 shelters for

each made 4600 targets, requiring them to fire off at least as many warheads.

There was one problem with this plan: the Soviets could almost certainly deploy enough warheads to saturate every shelter, and probably before the MX system would be completed (estimated to be 1989). Moreover, the Air Force had calculated that the Soviets could keep building additional warheads more cheaply than the U.S. could keep digging extra shelters to accommodate them. It seemed like a losing race from the start.

Another set of technical questions was raised. Some began to wonder whether ICBMs really could be accurate enough to endanger missiles in hardened silos located half-way across the globe. In tests, the U.S. fires its missiles on an east-west trajectory from Vandenberg Air Force Base in California to the Kwajalein Islands in the Pacific; the Soviets test theirs on a west-east flight path. But in a real nuclear war, both sides would send their missiles over the North Pole, a flight path never before tested. The earth is not a perfect sphere; there are variations in gravity along every path around or across the planet. This is particularly true over the Borealis region of the North Pole. Missiles could be thrown off course to an unexpected degree and in unanticipated directions.

The wind also presents complex problems. As a missile reenters the atmosphere, it passes through eight or nine different layers of constantly changing density, wind velocity and wind direction. At this point the missile is free-falling; actually, it is unguided long before it reaches its apogee. It would surely be buffeted by these winds -- perhaps being thrown off course by 1000 feet or more.

When many defense analysts predict that the Soviets will soon be able to destroy 90 percent of U.S. Minuteman missiles, they assume Soviet missile accuracies of 600 feet. Someday they may come within that distance of their targets on the test range, but even there they will have become so accurate only after repeated testing over the same trajectory, with engineers making continual adjustments on the missile's guidance system. Every time a new guidance system or some other component has been put inside an American missile, or the same missile has been put on a slightly different angle of travel, it lands much farther away from the target than anticipated, requiring more adjustments. And this is just for a few minor changes in the computer software or a few degrees of difference in latitude and longitude. The errors produced by a 90-degree shift -- from east-west to north-south -- are enormous, with a completely different set of gravitational pulls and atmospheric disturbances.

In short, not only did a warhead-shelter race seem senseless, it also could be unnecessary if these theories about inherent inaccuracy -- or, as many have called it, "bias" -- were remotely true.

President Reagan's strategic program calls for building 100 MX missiles and eliminating the multiple-shelter scheme. First, Secretary Weinberger appeared to realize the futility of the warhead-shelter race; and some inside sources report that he was also dissatisfied with the Air Force for not coming up with a satisfactory response to all the news stories about bias. Second, Reagan, with the commonsense approach of the layman, had always thought there was something a bit madcap about the multiple-shelter idea. Third, the system as planned might have cost as much as $100 billion, too expensive with the new emphasis on austerity. Fourth, the U.S. Senate was beginning to scorn the multiple-shelter idea, especially two of the Senate's most hawkish members, Senator Jake Garn (R-Utah) and Senator Paul Laxalt (R-Nev.), the latter being among Reagan's closest friends and political advisors. The two states in which the multiple shelters would be built happen to be Utah and Nevada.

The decision against multiple shelters is wise. Since missiles might not be accurate and, therefore, not so vulnerable, shuttling them from one shelter to another would simply be unnecessary. Or if they are accurate and therefore vulnerable, or if someone perceives that they are, the system could not deal with the problem anyway.

However, Secretary Weinberger has put himself in something of a box. On one hand, he continues to talk about the strategic "window of vulnerability" that faces the United States over the next few years; but his MX decision conveys the impression of not doing anything to correct this ostensibly serious problem. He has decided to strengthen further the MX shelters to enable them to resist blast overpressures of 5000 pounds per square inch. (The current Minuteman IIIs are hardened to resist 2000 psi.) But there are problems with this idea as well.

First, 80 percent of these new MX silos could still be destroyed if the Soviets fired two warheads at each that landed an average of 520 feet from the target. If the administration believes that the accuracy of inertial guidance systems

reflects a missile's accuracy in wartime, then it would have to believe that the Soviets could achieve this degree of accuracy within a decade or so. (If it doesn't believe missiles could be so accurate, there may be no need for a new ICBM.)

Second, no one really knows how to build a silo that resists 5000 psi. The Pentagon's reason for picking that number is that U.S. intelligence estimates claim that the Soviets have 5000-psi silos, and if they have been able to do it, so should we. According to knowledgeable sources, however, those intelligence estimates make guesses over a vast range about possible Soviet silo hardness, the low end of which is considerably below 5000 psi.

Third, when the Defense Department tests silos for hardness, it explodes a conventional high-explosive bomb over it and measures the atmospheric overpressures that the silo can resist. (The limited test ban treaty prohibits the testing of nuclear weapons in the atmosphere.) Yet a nuclear bomb produces not only a short-term wave of over-pressure, but also a dynamic shock wave that lasts for several seconds. This causes the ground beneath the explosion to shift laterally by several feet and then to shift back again, in a matter of milliseconds. The Minuteman ICBMs are currently mounted on springs and surrounded by concrete so the lateral shift in the ground does not cause the missile to fall off its launch pad. But the MX missile has a very delicate guidance system; that, theoretically, is what makes it so accurate. When plans still called for the MX to be moved about from one shelter to another very slowly on trucks, technical experts reported that the missile could not be moved perhaps for days, until the gyroscopes in the guidance system had stabilized once more. The shock of extremely quick movement back and forth, caused by the shock wave of a nuclear bomb, will jar the MX guidance system much more so than moving it ever so carefully on a truck. If the missile has to be fired within a few minutes or even hours, the guidance system would have difficulty steering the missile's warheads toward the right city, much less the right Soviet missile silo. That being the case, the alleged virtue of the MX -- its great accuracy -- is negated, even if a 5000-psi shelter can be constructed and one rejects theories about bias.

The conclusion, then, seems clear. The rationale for the MX has been that the nation needs a "survivable" land-based missile that also has counterforce capability. Yet if President Reagan and Secretary Weinberger are just putting the MX in a fixed silo, if the plan to harden the silos to 5000-psi is unworkable, if Soviet and American missiles are not accurate -- and all of this says nothing of the thousands of warheads that will, in any case, survive on board mobile submarines and bombers -- then the question must be posed: Why build the MX missile at all?

The B-l Bomber and Cruise Missiles

In June 1977, President Carter scrapped the B-l bomber because he thought that it would be vulnerable to Soviet air defenses by the time it was deployed in large numbers. He also felt that it was too expensive and that air-launched cruise missiles (ALCMs), which could be attached to existing B-52 bombers, would be cheaper and more effective. Now President Reagan and Secretary Weinberger have revived the B-l as an airplane that would both fire ALCMs and drop gravity bombs. The rationale is that the B-52s are getting old and that the new "Stealth" bomber -- with its design that minimizes radar detection -- won't be ready for production until 1989.

Yet the B-l is now estimated to cost about $300 million each, not including the cost of the weapons on board, or the considerable cost to operate and maintain the aircraft for several years. In procurement cost alone, 100 B-1s mean $30 billion. Yet the B-1s won't be ready until 1986, just three years before the estimated date of Stealth's arrival. It would be fallacious to suppose that the "window of vulnerability" between 1986 and 1989 will be severe enough to warrant spending $30 billion or more -- $10 billion a year -- to fill in the gap.

President Carter was correct to cancel the B-l, but mostly for the wrong reasons. Soviet air defenses, in fact, are poor. Even Secretary Weinberger's 99-page booklet, "Soviet Military Power," which was designed to justify the Reagan defense budget by making Soviet armed might seem as powerful as possible, admits that "Soviet [air] defenses characteristically have fallen short of being able to handle fully the tasks they face."

Even if Soviet surface-to-air missiles (SAMs) were highly capable, it is doubtful that they would impose much attrition on a one-time strategic strike force. During the Vietnam war, when American B-52s were flying at altitudes that were almost perfectly matched to maximize the performance of North Vietnam's SAMs, the highest attrition rates were not much higher than two percent. This was considered very high in tactical combat, where the bombers had to return for

more sorties. But for a strategic attack, where the plane comes in, drops its load and heads back, an attrition rate 10 or even 20 times as high would still be considered acceptable.

The point is not that the B-l will be vulnerable; it will simply be superfluous.

The cruise missile, once the object of much excitement, is proving to be a disappointment. The appealing feature of the ALCM is its Terrain Contour-Matching (TERCOM) guidance system, which promises to deliver the missile as close as 100 meters away from the target. Inside the missile is a tiny computerized map of the ALCM's complete route. Also on board is a radar altimeter that scans the ground 100 feet or so below. The TERCOM guidance would, as its name suggests, match the data from the radar altimeter to the maps programmed on the computer; if the missile began to stray, TERCOM would steer it back on course.

ALCM tests have been very inaccurate, and the critical shortcomings seem to be inherent in the technology. First, the maps cannot be exactly accurate; yet even the slightest errors begin to compound themselves. Second, changes in the terrain between the time the map was made and the time the missile flies over the territory -- due even to minor phenomena of nature, such as heavy snow -- also cause TERCOM to get lost.

Third, the radar altimeter is an active radar seeker. If it is left on, it serves as a beacon for enemy air defense systems. (The ALCM would be much easier to shoot down than a bomber, if detected and tracked, because it travels a straight and level course, in contrast to the bomber, which can be maneuvered.

Because it is vulnerable, the Air Force plans to turn on the altimeter only occasionally, relying on inertial guidance for most of the journey. This will make it more inaccurate, however, for the same reason that ballistic missiles are less accurate than in theory -- atmospheric turbulence, high winds and stormy weather. (The ALCM flies only in the atmosphere, at very low altitudes, possibly making it more susceptible to these disturbances.) Consequently, when the radar altimeter goes on, it might not be able to find the missile and match its flight path to the computer map.

Trident II Missiles

The Trident II missile is not new; the Carter administration had plans to produce it as well. Compared with the existing Trident I's, the II's will be bigger, carry larger warheads and, most importantly, be as accurate as an ICBM. Currently, SLBMs are less accurate because the submarine commander cannot precisely know his location when he launches his missiles. And because the missile's starting point is slightly inaccurate, its touchdown will fall farther from the mark than its land-based counterparts. For some years, the Navy -- with active support from the Office of the Secretary of Defense -- has been working on a program to correct the navigational errors to allow a submarine to "know" its location more precisely and to deploy a series of 18 or 24 Navstar Global Positioning Satellites. These satellites could, in effect, communicate with the missile as it travels along its flight path, providing a constant reference point and updating its course along the way, until reentry into the atmosphere.

There are two problems with this approach. First, reentering the atmosphere is still a major obstacle. Scientists who have studied the missile-inaccuracy problem say that wind turbulence and adverse weather are likely to throw a missile off its course even more than gravitational pulls .

Second, communications between the Navstar satellites and the missile can be disrupted or jammed. The military long ago moved to inertial guidance because of possible interference with external sources of guidance. It is ironic that they now have turned back to what was previously dismissed as vulnerable.

The Trident II may be as superfluous as the MX and for the same reason: Claims of greater accuracy (and, therefore, greater counterforce power) cannot be substantiated.

Command-Control-Communications

The Weinberger program of command-control-communications (C3) is an acceleration of Carter administration programs that had resulted from ideas conceived many years before that. This aspect of the program makes sense.

Surprisingly, the links connecting presidential command and nuclear weapons are tenuous. Early-warning satellites transmit information to only a few ground stations, which could be sabotaged or destroyed; communications with submarines, the most "survivable" portion of the strategic forces, are not completely secure and maintaining control over nuclear weapons, once fired, requires the endurance of other communications facilities that are also extremely fragile in a "nuclear environment."

Certain aspects of the C3 program try to deal with these problems: hardening equipment to resist the pressures of electromagnetic pulse (EMP), which otherwise burns up communications circuitry; improving the TACAMO airplane that communicates with nuclear-missile submarines; deploying many small, mobile stations that can receive beams transmitted from early-warning satellites; and installing very-low-frequency transmitters and receivers inside bombers. These programs seem to be a fairly sensible investment.

However, the administration should not harbor illusions about the effectiveness of such efforts. Several Pentagon officials want to spend several billion dollars more to deploy new C3 sensors and satellites that might allow us to fight a nuclear war for weeks or even months. No matter how EMP-resistant communications systems might be made, or how dispersed or hardened C3 equipment is generally, there still must be antennae and other inherently fragile components that could not, for any long period, survive the intense blast, heat, radiation, electromagnetic interference and possible firestorms caused by the bursting of thousands of nuclear weapons on the ground and in the atmosphere. Improving the chances that C3 survive a first-strike is a reasonable order. Keeping it flexibly responsive after several volleys of nuclear combat is impossible.

Conclusion

As noted earlier, the nuclear arms race has been largely propelled by the desire -- certainly on the U.S. side and probably with the Soviets -- to maintain a strategy of counterforce. As the Soviets built more ICBMs, we built MIRVs; as they hardened their missiles, we made ours more accurate: and so on.

But for some years now, missile silos have been made so resistant to blast that not many could be destroyed, except by chance, by intercontinental missiles.

There are limits to missile accuracy. They are far too inaccurate to "kill" silos hardened to resist overpressures of 2000 psi, the current "hardness" of U.S. Minute-man III missiles.

It is a technically marvelous achievement to design an inertial guidance system that, over a particular well-rehearsed test range, might send a missile halfway across the globe and land it within 600 or 700 feet of a target 50 percent of the time. But the painstaking effort matters little if uncontrollable factors such as the shape of the earth's gravity belt or changes in the wind and weather can change the course of the missile by two or three times that distance.

For better or worse, the desire to maintain an ability to launch successful counterforce strikes against missile silos has become a fanciful notion. And most of the new strategic weapons in the Reagan program -- and probably many in the Brezhnev program -- are equally unrealistic.

Two important distinctions, however, must be made. First, the weapons, however ineffective, cost billions of dollars. Second, if both superpowers really believe that they have effective counterforce power, if they are led to believe that the accuracy measured on a particular test range reflects a weapon's likely performance in an actual nuclear war, then these new weapons could prompt the ultimate calamity. If both sides think that their ICBMs are both their most accurate and -- because of the accuracy -- their most vulnerable weapons, then this perception could create a hair-trigger situation. If a serious international crisis gets out of hand? one side may feel tempted to launch first, believing that the other side may have the same temptation.

Merely thinking about successful counterforce strikes or flexibly controlled nuclear wars lasting for months on end is a harmless sort of daydream. Believing the notion to be true, and building weapons and seriously designing strategies to support it, may cause the daydream one day to become a nightmare.