# An Alternative to the MX

## *The answer to America's current strategic dilemma may lie offshore*

The United States has under construction a force of nuclear missiles capable of supplying what the Reagan Administration wants: a secure and stable deterrent to Soviet attack. It would easily survive a preemptive Soviet strike, and it could then retaliate against both military and civilian targets anywhere on enemy soil. It is capable of swift reaction and could wreak enormous destruction. Yet it could not form the basis of a preemptive strike by the United States and so will reassure the Soviets about American intentions. It will, in short, enhance U.S. security while simultaneously contributing to a reduction of international tensions stemming from the nuclear arms race.

**Early this year, the U.S. land-based force of nuclear missiles became vulnerable—on paper—to destruction in a preemptive attack by the Soviet Union, which deployed a large number of highly accurate SS-18 and SS-19 missiles. The United States, in response, has proposed to complete development of a new highly accurate land-based missile, the MX, which will supposedly be protected from attack.**

**Previous articles in this series explored why U.S. officials became alarmed about missile vulnerability, how the MX might be deployed on land, and what effect the missile will have on deterrence. This article, the last, suggests that attempts to develop an invulnerable land-based missile have been misguided from the start.**

The weapon that meets these requirements is not the MX missile. It is instead the missile-carrying Trident submarine. After a long and difficult development, one Trident will begin active service later this year, and at least eight others will be in service by the end of the decade. Although few in number, each Trident carries nearly 200 independently targetable warheads. The extended range of the missiles on the Trident submarine permit it to roam an area of more than 20 million square miles—an area so vast that detection of the submarine by the Soviets will be an insurmountable problem.

The question facing the United States—how to maintain an effective retaliatory force in the face of improvements in Soviet missile capability—was initially addressed 15 years ago, under Secretary of Defense Robert McNamara. He and others decided then that the answer was an underwater long-range missile system, which evolved in the early 1970's into the Trident submarine. Now, on the eve of the Trident's completion, this costly idea is strangely regarded by some critics as a technically deficient centerpiece of U.S. deterrence.

In attempting to win the respect it deserves, the Trident faces two problems: bad press and the inertia behind the status quo. According to conventional government wisdom, what the United States needs, in response to increasing vulnerability of its land-based missiles, is another land-based missile. This view is most strongly held by the Air Force. "To redress the vulnerability problem, an advanced survivable land-based ICBM is required," says Lieutenant General Kelly Burke, the director of Air Force research and development. The problem is that no such weapon exists. As stated last year by the Townes panel, a group formed to advise the Reagan Administration on missile basing, there is "no practical basing mode for missiles deployed on the land's surface available at this time that assures an adequate number of surviving ICBM warheads." Even as blunt an assessment as that has not turned the heads of those at the Pentagon and in Congress who worry about this problem. Work is proceeding apace to find a land-based solution.

Trident submarines, an alternative, suffer from a poor image. In the context of selling a land-based missile, officials of the Carter Administration suggested that the Trident could not shoot straight, that it could not communicate well, and that it would eventually be easy prey for the Soviet Union. Similarly, various officials in the Reagan Administration say that while the Trident will be nice to have around, the strategy of U.S. deterrence cannot be married to it.

These assumptions have been challenged by a broad range of independent experts. Take for example the claim, earnestly advanced during the Carter Administration, that the submarine force might soon be vulnerable to Soviet attack. The most prominent spokesman for this view was William Perry, then the under secretary of defense for research and engineering. Perry told Congress on repeated occasions that although submarines are not now vulnerable, it is difficult to be certain that they would not be vulnerable during the 1990's. "The wisdom in our force planning has been its diversity," he said. "I would not want to give up on the land force because 10 years from now, when the land forces are survivable again, we may find that the problem is with submarines." Giving up on land-based missiles would permit the Soviets to work even harder on anti-submarine warfare capability, Perry said. General Lewis Allen, Jr., the Air Force Chief of Staff, took the same view, claiming that "a continuing weakness or vulnerability in any one element of our strategic forces, of course, permits the Soviets to concentrate their resources against the remaining elements and increases the possibility that they can be neutralized."

Those who paid close attention to such statements noted that no one specifically said that submarines would be vulnerable in 10 years. But the seeds of doubt thus planted flowered in Congress. Senator John Tower (R–Texas), the powerful chairman of the Armed Services Committee, is one who was persuaded. "The continued invulnerability of our deterrent at sea depends directly upon our ability to prevent the Soviet Union from investing a preponderance of its enormous defense expenditures on anti-submarine warfare," Tower said recently.

Several other experts say this is just not so. Richard Stubbing, an assistant provost at Duke University, until recently served as deputy chief of the national security division at the Office of Manage-


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ment and Budget, where he had access to classified data on Soviet anti-submarine warfare expenditures. "Our submarines will remain essentially invulnerable for the foreseeable future," he says. William Nierenberg, director of the Scripps Oceanographic Institution, is one of the Pentagon's top advisers on anti-submarine warfare. "I just don't see it for the foreseeable future, the next 20 years or so," he says. "I know what the oceans are like; I know what the acoustics are like. I'm talking about the ability to know where eight or ten of our subs are with certainty, all at once." Even with more money, the Soviets could not do it, he says. "The subject is not money-limited." He also says that Pentagon intelligence advisers routinely look only 10 years into the future. Consequently, assurances that submarines are invulnerable only through 1990 should not be taken as a cause for concern.

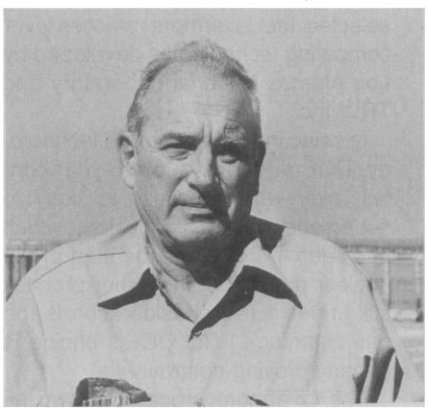
Additional evidence is supplied by a recent Central Intelligence Agency report on Soviet acquisition of Western technologies. The Soviets are so far behind the West in anti-submarine warfare, the report says, that they will attempt during the next decade to steal acoustic sensor technology and signal-processing hardware and software. "Another critical problem area to which the Soviets will direct acquisition is that of submarine quieting. Here also the Soviets lag the West significantly. As a result, not only are their submarines vulnerable to detection, but the self-generated noise reduces the effectiveness of their own sensors." Soviet anti-submarine warfare capability seems, in short, less threatening than comical.

Richard Garwin, a physicist and Pentagon consultant on anti-submarine warfare, has described the difficulties faced by an attacker. An entire submarine force can be destroyed by only three means: continuous trailing of each submarine, more distant submarine tracking combined with a general nuclear barrage of the oceans, or concerted searches of patrol areas. Trailing is impossible without alerting the submarine being pursued, which could then use both operational and electronic countermeasures to elude detection. Long-distance tracking capabilities are spotty owing largely to the ocean's difficult acoustic environment. Sensors can be confused by jamming, by deployment of noisy decoys, or by the detonation of an underwater nuclear blast, which would resonate for many hours. Concerted area searches are slow, costly, and obvious, and would lead to attrition of the force over many weeks at best.

R. Jeffrey Smith

**William Perry**

*Submarines might be vulnerable by 1990.*



R. Jeffrey Smith

**William Nierenberg**

*Submarines are safe for "the foreseeable future."*

Experts both inside and outside the Navy agree that Soviet detection efforts today are completely unsuccessful. In 10 years or more, the Soviets may have sufficient technology to detect existing U.S. submarines after a concerted search of limited patrol areas. By then, however, the U.S. submarine force will be composed primarily of Tridents, or older submarines with long-range Trident missiles, which can be deployed over an area ten times as great as patrol areas now. The Tridents are bigger, but they are also quieter and faster, can dive more deeply, and have more advanced equipment for electronic countermeasures, should a chance Soviet detection occur.

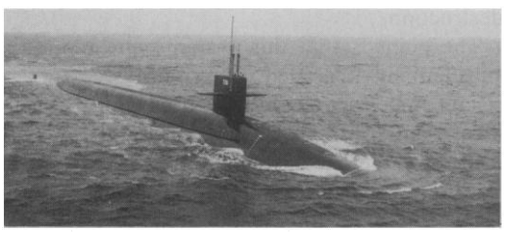
A second commonly stated drawback to submarines is the difficulty of reaching them rapidly after a nuclear war has begun. Harold Brown, the Secretary of Defense during the Carter Administration, recently wrote that "Lacking the relative ease of communications to ICBMs, our [submarines] might well not be able to retaliate promptly, and could not respond as accurately on the U.S.S.R. or its forces." Submarines on alert maintain contact with commanders on shore through a network of vulnerable very-low-frequency transmitting towers, located in Maine, Hawaii, Maryland, Washington State, the Panama Canal, and Australia. Each of these would be destroyed rapidly in a general nuclear exchange. Backup communications are conducted through some planes on constant patrol over the oceans and some that would be launched on warning of an attack. The planes can take hours to get within transmitting range, however, and they are vulnerable to the effects of an electromagnetic pulse (EMP) from atmospheric nuclear blasts over the oceans. Satellites that communicate with submarines might eventually be vulnerable to destruction.

The point is that this system can be substantially upgraded. New, EMP-resistant planes are already under development. Satellites can be made more numerous or deployed in higher orbits. And a variety of new communications devices could be constructed at modest cost, such as a small satellite that submarines could launch themselves, or a small communications "fish" that submarines could deploy nearby and retrieve after using it to transmit or receive (a suggestion of Garwin's). A retired Naval admiral, who asked to remain anonymous, says this is not a problem. "There are many alternatives for communicating with submarines that are not on any list," he says. "Signals can be relayed by surface ships, or sent by ham radio operators. These informal means would have to be authenticated, of course, but our procedures for that are well established."

Eventually, in a limited nuclear conflict extended over weeks or months, both the submarines and systems of communicating with them would be vulnerable to destruction. But many believe such an extended war is unlikely. And the problem is shared by all other strategic weapons systems. Land-based missiles could survive only days without an outside supply of electrical power, and bombers would survive only a few hours or days at most.

It is true that submarine missiles are not as accurate as missiles based on land, owing to uncertainty about the submarines' precise location at the time a missile is launched. The Trident I missile, now being deployed, overcomes this problem in part by fixing its location from stars after it leaves the earth's atmosphere. Additional accuracy improvements are planned for the Trident II missile, which will be completed by the end of the decade. But the usefulness of precise accuracy in submarine missiles is suspect. The Trident I is already

capable of attacking a range of Soviet military targets, such as airfields, submarine ports, utilities, troop formations, armaments plants, and some command links. The Trident II, which costs $15 billion (or half as much as Carter's plan for deploying the MX missile), has the sole additional capability of attacking Soviet silos and superhard command posts. As Representative Thomas Downey (D–N.Y.) states, this accuracy, plus a relatively short flight time, will make the Trident II "the most destabilizing first-strike weapon ever built, far more than the MX." The Soviets would be



U.S. Navy

***The Trident submarine***

*Its equipment for electronics countermeasures can be continually updated.*

less threatened and a superpower crisis would be less harrowing if the Trident II was scrapped.

William Perry says that the question about Trident II should be addressed as follows: "If you're going to be, in a sense, depending on subs for primary deterrence, what do you do that minimizes the attractiveness of the surprise attack? If I were the Soviet planner, I would be deterred from acting even by Trident I, although I don't know the calculus that goes on in that planner's head. I'm not persuaded by the argument that it is necessary to have a capability to kill hardened targets, although it is certainly true that you would be on the safer side to have it. Moreover, it is relatively easy to get." Excessive conservatism and technological wizardry are behind the decision for a Trident II, and the strategic implications are unsettling.

Once the technical objections to submarines—their inaccuracy and supposed vulnerability—are swept aside, there remains a less-stated but perhaps more significant objection. It is that moving from observable land-based missiles to invisible sea-based forces would diminish the political power of America's nuclear weapons. As Harold Brown recently wrote, "Abandonment of the land-based ICBM would signal a retreat in the face of a Soviet buildup of just those forces—a retirement from the competition, a major political-military defeat for the United States, and a very bad precedent,

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## Livermore Wins Laser Battle

In a decision that could influence billions of dollars of investment, the Department of Energy (DOE) has narrowed the choice for the next generation of uranium enrichment technologies. On 30 April, DOE announced that it will build a demonstration enrichment plant based on a laser separation process developed at Lawrence Livermore Laboratory in California. It selected the Livermore process over competing technologies developed by Los Alamos National Laboratory and TRW Inc.

In selecting the Livermore technology, DOE put an end to a 5-year contest over which process is likely to supersede gaseous diffusion, which has been in use since the start of the nuclear age. (The only other process still under active consideration is the gas centrifuge.) But DOE's choice is already proving controversial.

The Livermore process, known as atomic vapor laser isotope separation (AVLIS), was chosen after a 7-month review by top officials at DOE. Last year, however, the Energy Research Advisory Board, DOE's highest level advisory committee, recommended that a decision be put off until 1983 because, it argued, the technical basis does not yet exist to make a choice between competing technologies. It reiterated that conclusion in a second report earlier this year. Richard Garwin, a senior scientist at IBM and a member of the advisory board, last week called the decision "premature." Donald Gaston, a DOE official in charge of the program, says, however, that DOE cannot afford to carry on supporting three competing programs and "elected to take the risk" by choosing now.

In essence, the Livermore process involves subjecting a stream of atomic uranium vapor to a series of very finely tuned laser beams. Energy is absorbed only by atoms of uranium-235, which eventually lose an electron. The resulting uranium-235 ions are then collected by passing the stream through a strong magnetic field, which deflects the ions while the neutral uranium-238 atoms pass straight through.

In contrast, the Los Alamos process, which is now being phased out by DOE, would have subjected uranium hexafluoride molecules to finely tuned infrared and ultraviolet lasers. Ultimately, those molecules containing uranium-235 would be stripped of a fluorine atom. And the TRW process, which will still get a small amount of research money "subject to availability of funds," involves the use of radio-frequency energy to selectively excite uranium-235 ions.

The plan now is to build a $150 million demonstration plant at Livermore by 1987. At that point, according to DOE officials, it should be possible to make a choice between the laser separation process and gas centrifuge technology. (A pilot centrifuge plant is now under construction in Portsmouth, Ohio.)

The Energy Research Advisory Board said in its report last year that it expects the laser process to be more economical than the centrifuge process. This expectation, says Garwin of IBM, should have led DOE to make a different choice. It should have dropped the gas centrifuge program and continued supporting the three competing laser technologies.

***—Colin Norman***

## Union Carbide Quits Oak Ridge After 40 Years

The Union Carbide Corporation revealed on 3 May that it intends to end its nearly 40-year-old association with the Oak Ridge National Laboratory in Oak Ridge, Tennessee. It has already asked the Department of Energy (DOE) to find another contractor to manage the facilities that spawned the first atomic bomb. The news came as "a great surprise to most of the people here," said DOE spokesman Jim Alexander.

The impact of the change is not yet clear, but as Alexander said, the contractor that replaces Union Carbide will certainly want to bring in new people to take over supervisory positions. Thus, the laboratory and associated weapons facilities at Paducah, Kentucky, are due for a shake-up.

Some have speculated that Union Carbide may have pulled out because some stockholders have objected to its involvement in the nuclear weap-


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encouraging the Soviets to try to repeat the process in other technical/military areas." Others might counsel that it would demonstrate American shrewdness. But many officials, including those in the present Administration, believe that power is influenced more by the *appearance* of strength in nuclear weapons than it is by *genuine* strength, such as that to be supplied by submarines. In this distorted way of thinking, the principal attribute of submarines—their invisibility—becomes their primary drawback. Having missiles based on land, where they can be observed by both friend and foe alike, is seen to project more power, even though land-based forces are inherently subject to destruction in an attack and submarines are not.

The problem is illustrated by Perry's description of his desire at one point during the Carter years for a missile that might be used in both land-based silos and on submarines. "I personally was a strong advocate of that common missile for quite a long time," Perry says, largely because it would have saved several billion dollars in production funds. The problem with a common missile was that it could measure no more than 83 inches in diameter, the maximum space possible in a Trident missile tube. The MX, in contrast, was 92 inches in diameter, the maximum possible in an existing silo. "The larger missile, the MX, was selected for two reasons," Perry says. "One, the perception that big is better than small. It made us seem more serious. And two, the MX was the biggest missile possible under the SALT treaty. There were other arguments, but they were less significant." The reason that a larger missile was preferred, Perry says, is that the Soviets had just deployed the SS-18, a missile twice the size of its American counterparts, and a larger American missile was thought to help redress this "imbalance." The United States decided, in short, to build a missile that would cost billions of dollars more primarily because it was 9 inches wider in diameter.

"As nearly as I can determine, sitting here as a serious engineer, it [larger size] doesn't buy us a thing," Perry says. He adds that 9 inches can play a role in international politics. "I have observed firsthand the political power of it, primarily in discussions with our allies. Everywhere that I've gone, the discussions started off with Exhibit A: the Soviets have more powerful strategic forces. You'd be amazed at how the models showing the relative size of U.S. and Soviet rockets spoke to people. Here are the big Russian missiles and little tiny American missiles."

The kicker is that this nonsensical idea—that a missile's appearance, weight, or size reflects its strategic power—has been broadcast primarily in the United States. As Perry acknowledges, "We have inflicted these problems on ourselves by the way we have advertised them. We have shot ourselves in the foot." U.S. allies merely echo the foolish claims of congressmen and government officials at home.

This problem lies at the heart of the Administration's nuclear weapons buildup. Most experts agree that the United States and the Soviet Union each have a capability to wreak enormous destruction on the other in a retaliatory strike, although the two countries may possess a different amount of overkill. But it is appearance that matters more than this reality. Secretary of Defense Caspar Weinberger said recently in congressional testimony that "The Soviets will continue to have a substantial lead in most of the customary measures of strategic forces—total number of systems, total number of ballistic missiles and total destructive potential [megatonnage]."

Unlike Weinberger, who has no scientific training, William Shuler is a physicist who has spent the last 13 years designing nuclear warheads at Lawrence Livermore National Laboratory. He is now the director of MX warhead development work there. "People tend to look at gross throw-weight, gross megatonnage, and other gross measures of a weapon's capability. Our allies perceive things that way," Shuler says. "From my point of view as a technologist, it doesn't fly. These things don't matter as much as whether a weapon can do what you need it to. But there are people who take these things as a measure of power." The reason, he says, is that "people don't tend to peel the onion very far."

The MX, stripped bare of its skin, offers nothing of real strategic importance that is not already supplied by the Trident I. The Trident, in fact, is clearly more attractive by virtue of being both invulnerable and some distance from the American land mass. If the U.S. abandoned both the MX and existing land-based Minuteman missiles, the Soviets would be deprived of targets they could hit, and would be motivated to scrap some of their missiles.

The U.S. military should stop building weapons whose only distinctive use is to impress leaders abroad and its citizens at home. It should begin immediately the far more delicate but far less costly task of educating the citizenry and those leaders that big missiles are not better and big arsenals are not better, when small missiles and small arsenals are enough.—R. JEFFREY SMITH

## Why SUM Didn't Add Up

A major alternative to basing the MX nuclear missile on land was devised in 1978 by physicists Richard Garwin and Sidney Drell. Their idea, known as the shallow underwater missile (SUM), was to deploy the MX on the side of small, specially constructed diesel electric submarines, operating off the East and West coasts of the United States.

Despite an aggressive sales campaign, Garwin and Drell were unable to elicit interest in their idea from either the Carter or the Reagan Administrations. Members of the Townes panel, which studied the question of missile basing last summer, agreed with the U.S. Navy that the idea "would be neither as cheap nor as quick as its proponents claimed," according to panel chairman Charles Townes.

R. James Woolsey, a former under secretary of the Navy who served on the panel, adds that SUM was disliked by the Pentagon because, as a complement to Trident, it would require substantial expansion of the Navy's strategic responsibilities, threatening its role as a force in conventional conflicts. "Crew manning on submarines is short already," Woolsey says, and SUM would have taxed the Navy's resources even more. Another panelist notes that existing shipyards would have had difficulty building the necessary submarines quickly.

Although the specific Garwin-Drell idea appears dead, proposals for building smaller submarines remain alive. Senator Mark Hatfield (R–Ore.), a backer of the SUM idea and chairman of the Senate Appropriations Committee, is still pushing for inexpensive small subs, and the Navy has been asked to report to Congress on their feasibility.—R.J.S.