A Doomsday Plan for the 1990's

Two missiles in every bunker, and a tunneling machine in each garage

Mr. President, I would not rule out the chance to preserve a nucleus of human specimen. It would be quite easy at the bottom of some of our deeper mine shafts. Radioactivity would never penetrate a mine some thousands of feet deep.—Dr. Strangelove*

The launch of Soviet missiles would trigger warnings at a mesa in Colorado. In numerous bunkers buried far below the surface, crews of several hundred people would be alerted to prepare for the impending attack. Some would step from the bunkers into adjacent tunnels and activate power generators. Enormous earth-boring machines would be maneuvered into position. Stacks of nuclear missiles would be arranged to withstand vibration.

Within minutes, dozens of Soviet warheads would explode on the mesa's surface in a futile attempt to rupture the tunnels, eliminate the crews, and destroy the missiles. When the attack had diminished, crews would use the boring machines to carve through the mesa's hard rock and the rubble created by nuclear blasts. Within anywhere from a day to a week, paths would be cleared to the surface. The missiles would be transported outside, hoisted vertically, and—as a weapon of last resort—fired at any remaining traces of military power or civilian life in the Soviet Union.

"It sounds bizarre. Maybe it is bizarre, a lot bizarre," says Eugene Sevin, a scientist at the Defense Nuclear Agency on the outskirts of Washington, D.C. Sevin and many others have been examining this script at the request of President Reagan, who is convinced that the United States must find new ways to protect its land-based missiles from Soviet attack. One idea, of three being considered for construction by 1990, is to hide the missiles so far beneath the earth's surface that the Soviets could have no hope of destroying them, and would therefore never try.

Although the idea seems simple enough, it could easily become a technical nightmare and a financial albatross. A host of new technologies—ranging from tunnel-boring machines to fuel cell power plants in one concept, and from sand fluidization to explosive drilling in another—would be allied for the first time in an environment where repair is awkward and the failure of any one item could be crucial. If the underground sites are unmanned, as some weapons analysts have proposed, it would be difficult to assure that the missiles could be raised to the surface after an attack. On the other hand, if the underground sites are manned, the system would be extremely costly—perhaps as much as $50 billion. Even after such an enormous expense, the military would find it hard to guarantee that the system could not be defeated. Yet the Pentagon feels anxious enough about the threat to its missiles to leave no rock unturned. The so-called "deep underground" missile-basing method is being examined for a year and a half at a projected cost of $150 million.

The concept has so far attracted little attention, despite its highly unusual qualities. Funds for its examination were approved by the House and Senate Armed Services committees after a minimal amount of discussion. About the only place where its potential failings are understood is the Air Force, where deep underground systems in one form or another have been considered and rejected at least 9 times in 20 years, and where there is little enthusiasm for another look. Under its "Brimstone" plan in the late 1960's, for example, the Air Force pondered placing missiles at the bottom of extended brimstone mines. Under another scheme, it considered placing them in shallow tunnels carved through hard rock. The intent was the same each time: to confer invulnerability. But the Pentagon leadership concluded either that the missiles would be vulnerable, that construction would be impossible, or that the system would simply cost too much. Some Air Force officials refer to deep underground missile basing by the acronym, DUMB.

Secretary of Defense Caspar Weinberger is intrigued by the idea's promise. He first became interested last summer, after reading the report of the Townes panel, a group of experts appointed to provide missile-basing advice. According to Charles Townes, a physicist who chaired the panel, the concept was viewed as a means to provide "a strategic reserve—the capability to pose a threat to the Soviets after an initial exchange."

Critics correctly point out that this capability is now furnished by missile-carrying submarines and by cruise missiles deployed on long-range bombers, each capable of surviving a preemptive strike. But advocates of the deep-basing scheme envision a strategic reserve that would last much longer than bombers and subs in a postwar environment. "No one really knows how long we need to survive in a postattack environment," says Colonel Randall McDonald, a military assistant in the branch of the Pentagon responsible for deep underground systems. "But we need a period of survival and endurance long enough to ensure that we will have a large chip to play in that environment, in order to prevent coercion by the enemy." He estimates that a strategic reserve should be capable

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. The Air Force has worried about this problem for a long time, searching high and low for a better place to put both the existing, silo-based missiles, and a new missile, the MX.

Previous articles in this series examined why U.S. officials became alarmed about missile vulnerability; the genesis of a short-term plan to put more missiles into silos; and the Air Force's continuing opposition to a plan for missiles on constantly roving aircraft. This article examines an alternative basing mode now under investigation. Subsequent articles will explore additional ideas.

*From the film, *Dr. Strangelove or How I Stopped Worrying and Learned to Love the Bomb.*

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of existing for at least a year after the start of a nuclear war. The system might be used at any moment during the year, but probably not until other weapons had been decimated.

To believe that a cache of nuclear weapons might be useful a year after a general nuclear war requires considerable imagination. Millions of people would be dead or dying, and most useful industries would be destroyed. The surface of the earth might even be uninhabitable. "Deep underground basing for ICBM's has a perceptible doomsday flavor to it, even in the doomsday world of strategic force planning," concedes R. James Woolsey, a former under secretary of the Navy who served on the Townes panel. "Nonetheless, it may contain some interesting possibilities to enhance survivability."

I think we ought to look at this from the military point of view. Supposing the Russkies stashed away some big bombs, and we didn't. When they came out in 100 years, they could take over.—General Buck Turgidson, in *Dr. Strangelove*

Two principal underground systems are being analyzed in depth by the Reagan Administration. One, conceived in 1972, would operate without human assistance and would permit the missiles to be retrieved fairly quickly, in a matter of hours not days after a decision had been made by the President or his successors to use them. As explained by Lieutenant Colonel Carl Rule, the Air Force's director of advanced missile basing, "Slow reaction time has always been a drawback of the deep-basing method." A capability for quick missile retrieval permits the military to react swiftly to the latest battlefield developments, he says.

The fast-reaction idea calls for missiles to be placed inside buoyant canisters, which are lowered into narrow holes 3000 to 5000 feet deep, and then covered with a lot of sand. After an attack, the sand would be saturated with water from a container buried alongside the hole, and the canisters supposedly would rise automatically, pressing their way to the surface before opening to release the missiles. A variation of this idea calls for the canisters themselves to be enclosed in long steel tubes, pointed at the top and filled with water, providing additional protection against the effects of nuclear blasts. On command, compressed gas would force the water out of the tube and into the sand, and canister and tube would rise together for 2000 feet to the surface. Scientists at the Defense Nuclear Agency and the Lawrence Livermore National Laboratory have dubbed this variation the "pencil pusher" concept because of the action of the tube against the sand.

Tunneling out

Missile crews would use machines similar to this one, made by the Robbins Company of Seattle. It works by gripping the sides of a tunnel and propelling itself forward, while the entire face of it rotates against the rock. Spoil is collected automatically and moved to the back by a conveyor belt. It can advance at a rate of 7 feet per hour.

The scheme's advantages are the speed with which the missile could rise, and the fact that it is unmanned, making it relatively inexpensive as deep underground systems go, roughly $100 million for each missile. The Defense Nuclear Agency has conducted sufficient underground tests to feel confident that a missile buried in such a manner would survive an attack. But whether it would rise to the surface is another question. The sand saturation idea has not been tested, and might prove infeasible. It would be difficult to guarantee that the pencil's buoyancy could defeat the cratering and debris caused by an extended attack. Weapons experts have considered putting a drill on the pencil's tip, or attaching a machine that automatically stuffs small explosives into the rock ahead, blasting away repeatedly to clear space for the pencil's climb. Eugene Sevin points out that this only adds to the system's complexity and reduces its reliability. He says that the concept is not the better of the two deep underground systems being examined, and consequently is unlikely to be accepted. Nevertheless, the government is considering an elaborate test of this concept later this year at the Nevada nuclear test site. Conventional explosives will be detonated atop a mountain in an attempt to recreate the pressures on a deeply buried missile caused by a large-megaton nuclear blast.

The other concept under consideration could be more reliable, although it would mean a longer delay before the Air Force could use its missiles. Known as the "mesa/tunnel" concept, it is similar to the plan proposed by President Carter to shuffle missiles among garages in the Southwest, except that everything would be hidden underground in an enormous outcropping of rock somewhere in the West. Garages would be replaced by bunkers, each of which could have its own crew, power supply, tunneling machine, and missiles. The bunkers would be connected by a tunnel several hundred miles long, about 3000 feet below the surface. Missiles could be transported in the tunnel on long, narrow trucks, so as to confuse the Soviets and survive a focused attack.

A partially dug tunnel would extend from each bunker to the outer slope of the mesa. Tunnel-boring machines, measuring perhaps 15 to 20 feet across and 75 to 100 feet in length, would be used to complete the path to the surface and clear away debris from the blasts. Spoil could be carried by conveyor to pre-dug cavities inside the mesa. Presumably radiation will have diminished by the time the crews reach the outside. But the scene there would be one of vast devastation. Fallout from the surface detonations would have eliminated all life within hundreds of miles.

President Murphy: *Wouldn't the nuclear survivors be so grief-stricken and anguished that they would envy the dead and not want to go on living?*

Dr. Strangelove: *Well, sir, when they go down into the mine everyone would still be alive. There would be no shocking memories and the prevailing emotion will be one of nostalgia for those left behind, combined with a spirit of bold curiosity for the adventure ahead.*

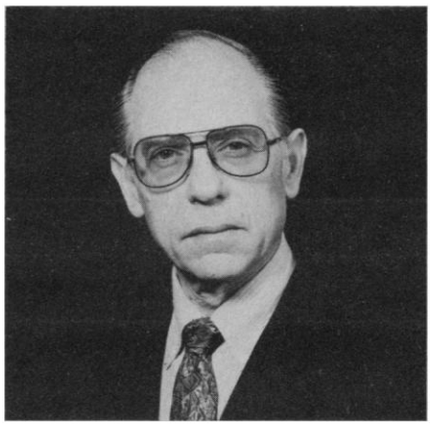
The requirement that the inhabitants of the bunkers be able to survive for a year after a general nuclear war imposes substantial strains on available technology. Enormously powerful fuel cells—of

the type used in spacecraft—must be constructed for each bunker. An efficient system for disposing of waste heat underground must be devised. A long-lasting, reliable system of filtering and replenishing air must be used. A substantial store of food will have to be maintained in a small area. Even if these problems can be solved, there remains the task of selecting compatible crews and finding interesting tasks for them to perform during their entombment. "The one-year goal is meetable," says Sevin. "The biggest problem is keeping the people inside from going up the wall. You need a well-motivated crew."

The chief advantage of the mesa concept is that missile retrieval is reasonably assured. Although tunneling machines of the type needed are a fairly recent invention, they have been successfully used in construction of the Washington, D.C., subway system and the Chicago sewer system. Presumably the missile crews could repair them on the spot in the event of a malfunction. The Air Force has already received inquiries from Bechtel, Inc., Boeing Co., Inc., Martin Marietta, and a handful of other firms involved in either aerospace design, oil drilling, or construction. Lieutenant Colonel Rule recently briefed an industrial workshop at the Colorado School of Mines. He has also sought advice from the National Academy of Engineering's committee on tunneling technology, which is due to report back this week. Sevin believes that "a good demonstration would probably consist of locking up a crew and then letting them dig their way out."

One of the crew's biggest problems will be the maintenance of communications with the outside world. Wires leading from the surface to the bunkers would be highly vulnerable in an attack, unless there were so many that they could not be destroyed. One idea is to send antennas to the surface quickly after an attack, in a manner similar to the "pencil pusher." Another is to construct surface devices that could transmit low-frequency communications through rock without a wire, and then deploy a lot of them. Sevin says that data have been transmitted in this way during underground nuclear tests. But further study and development are necessary.

If communications can be assured, the tunnels can be dug, the bunkers can be supplied with sufficient oxygen and power, and the crews do not go mad, the remaining uncertainty is whether the Soviets could somehow defeat the whole system. They might, for example, build weapons of considerably greater yield



Eugene Sevin

"Maybe it is bizarre, a lot bizarre."

and attach them to streamlined, weighted, and armored warheads that would detonate after burrowing 30 yards or so into the mesa's crust. Both Sevin and Michael May, an expert on warhead design at Lawrence Livermore, say that Soviet efforts would fail if the deep underground system were properly designed. Successive blasts would not create a deeper crater because the debris largely falls back into place. No matter how big an enemy's warheads, May and Sevin say, its planners would have low confidence in destroying the missiles underground.

The biggest problem will arise as the missiles are brought to the surface for firing. Enemy satellites might be able to detect the heat and vibration of tunneling below the surface. Warheads aimed at that tunneling would perpetually frustrate efforts to get out. Sevin is not convinced that this is a fatal flaw. "A fair amount of war fighting will have occurred by the time the deep underground system comes into play, and Soviet satellite detection capability would be diminished, if not destroyed," he says. But Richard Garwin, a scientist at IBM and a consultant to the Defense Advanced Research Projects Agency, has thought of an ingenious and possibly foolproof method for defeating the system. All the Soviets need to do, he says, is send over "nuclear weapons of no particular accuracy descending on parachutes to the surface of the deep underground basing area, and [wait] until sensors in the warheads detected the unmistakable sound of rocket engines firing. A nuclear explosion would have a great effective range of destruction against the U.S. ICBM in its launch phase and would destroy the missile without destroying other nuclear mines lying in wait for other MX missiles to be launched."

Sevin says that, "operationally, it would work. You could soft-land them. You might also be sensed coming out. The idea is, however, a little fanciful. It doesn't sound like an Achilles heel. The periphery of the tunnel system could be 100 miles in length. The exit points wouldn't necessarily be known. You could send troops—possibly from within the mesa—to sweep the area and dispose of the mines. This is more like a debating point than anything worrisome."

Yet the idea is plausible enough to warrant consideration. If the mines were designed so that they could not be disarmed or if a great number were used, the United States would have to resort to countermeasures, such as the deployment of machines that *simulated* the noise of a missile launching, causing false detonations. And the enemy would craft an appropriate response.

An apparently straightforward plan is thus complicated in reality. Its potential flaws would put the United States on the slippery slope of measure-countermeasure, which seems antithetical to the notion of a permanently invulnerable retaliatory force.

If all of these problems can somehow be resolved at a reasonable cost—which is not likely—a system for basing missiles underground is somewhat attractive. It has in theory the potential to eliminate the military's concern that successive nuclear attacks would leave the United States incapable of adequate response. Made to work as promised, it could provide by itself a sufficient and satisfactory deterrent to nuclear conflict. Existing nuclear missiles based in shallow silos would become irrelevant and could be dismantled, as might the force of long-range bombers. Submarines could fulfill any need for prompt nuclear attack from a secure position.

In the end we could not keep up with the expense involved in the arms race, the space race, and the peace race. . . . Our doomsday scheme cost us just a fraction of what we've been spending on defense in a single year.—the Soviet ambassador, in *Dr. Strangelove*

No one at the Pentagon is suggesting the dismantling of existing land-based missiles and bombers in favor of missiles buried deep underground. Consequently, the idea seems costly and irrelevant. Its capability—the extinction of life in the Soviet Union—would not be needed until other U.S. weapons had already been expended and U.S. civilization had been turned to dust.

—R. JEFFREY SMITH