# Cut-Price Plan Offered for SDI Deployment

*The program's managers have come up with a new proposal that would cut the cost of the first phase to $60 billion, but Congress and the next Administration may not buy it*

FACED WITH OPPOSITION from forces in the Pentagon and on Capitol Hill, the managers of President Reagan's Strategic Defense Initiative (SDI) have been scrambling this summer to redo their plans for deploying an initial phase of missile defenses in the late 1990s. The result is a scheme that they claim would cut the cost of deploying the first phase of SDI in half while maintaining the same capability. The new system would cost about $60 billion, they believe.

The plan will be presented this month to the Defense Acquisition Board, a top-level Pentagon panel that reviews major weapons programs. Last year, the board endorsed an initial SDI deployment concept designed to provide a limited defense against Soviet land-based missiles. It would consist of thousands of rockets based on orbiting platforms, ground-based interceptors, and surveillance satellites. But the board effectively withdrew its support in June when the costs of the system were calculated to be at least $120 billion (*Science,* 17 June, p. 1608).

The new, cut-price plan maintains all the major elements of the earlier scheme, although it would entail fewer space-based rockets and more ground-based interceptors. O'Dean Judd, the chief scientist for the SDI Organization, who played a key role in developing the new plan, said in an interview with *Science* that it "is actually a stronger system, we believe." SDI's opponents are not convinced. Ron Tammen, an aide to Senator William Proxmire (D–WI), a strong critic of SDI, scoffs that the new proposal is a "transitional concept," designed to keep the original idea of space-based defenses alive during the election season.

Whatever the acquisition board makes of the new plan, its decision will be far from the last word, for there is no guarantee that the next administration will go along. Few people expect the plans to remain unchanged. "Whoever is elected, it is likely you will see a vigorous R&D effort in the $3 billion a year range," but no push toward deployment, predicts a key congressional aide.

One official who evidently anticipates major changes is Lieutenant General James Abrahamson, who has headed the program since 1984. Last week, the Defense Department announced that Abrahamson plans to retire at the end of January to make way for fresh leadership in SDI. In a memorandum to his boss, Secretary of Defense Frank Carlucci, Abrahamson said "A new Administration will undoubtedly have different ideas or approaches to SDI. Therefore, I reluctantly have concluded that the program will best be served by allowing new leadership to represent new policy and direction."

Much of Abrahamson's last months in office are being spent in trying to keep intact a plan to deploy SDI in stages, beginning with the so-called "phase 1" system that the acquisition board initially endorsed last year. The phase 1 system would be designed to work roughly as follows:

Satellites in high orbits, called the Boost Surveillance and Tracking System (BSTS), would detect the launch of Soviet intercontinental ballistic missiles and relay information on their trajectories to a set of "garages" in low orbits that house small interceptor rockets. Sensors on the garages themselves would then track the Soviet boosters and help guide the interceptors toward them. As the interceptors approached the Soviet boosters, they would home in on the hot rocket plumes.

Those boosters that got past the interceptors would deploy a so-called post-boost vehicle containing the warheads, which would later be released toward their targets. The post-boost vehicles would also be targeted by the space-based interceptors.

Warheads would be tracked in space by a series of low-flying satellites called the Space Surveillance and Tracking System (SSTS). These would be augmented by sensors lofted into space by rockets once an attack is under way. High-acceleration ground-based interceptors would be guided toward the incoming warheads by data sent down by the space-based sensors, and they would eventually use their own infrared sensors to home in on the warheads before they entered the atmosphere.

Deployment of phase 1 would be followed by a second phase that would include additional sensors and another layer of ground-based rockets designed to destroy warheads within the atmosphere. A third phase, to follow in the 21st century, would include directed-energy weapons designed to attack Soviet boosters before they release their warheads in space.

The phase 1 concept encountered a barrage of critical reports earlier this year. The Office of Technology Assessment (OTA), for example, concluded that although the system "might be technically deployable in the 1995–2000 period," it would have limited capability, destroying "anywhere from a few up to a modest fraction of attacking Soviet intercontinental ballistic missile warheads." OTA also argued that the effectiveness of the system would be degraded if the Soviets adopted countermeasures such as fast-burn boosters and decoys designed to mimic warheads in space. Moreover, it pointed out that the space-based elements of the system would be vulnerable to antisatellite weapons, and suggested that "there would be a significant probability" that the system "would suffer a catastrophic failure" of its computer software.

Scott Davis, DOD

**James Abrahamson.** *Will step aside next January to enable the next Administration to give SDI new leadership.*

An influential report by the Defense Science Board also recommended a more gradual approach to SDI deployment, beginning with a ground-based system that would be in compliance with the Antiballistic Missile Treaty.

The most serious political problem encountered by the phase 1 plan was its cost, however. SDI officials told Congress that the system would cost between $75 billion and $150 billion, and estimates presented to the Defense Acquisition Board are said to

have been in the $120-billion range. Faced with these estimates at a time when the Pentagon's budget was under severe pressure, Carlucci asked the acquisition board to review the program again. In June, the board recommended that the phase 1 plan be reassessed.

According to Judd, the chief changes to the original plan are these:

■ The garages carrying the space-based rockets would have smaller sensors, while the rockets themselves would be faster and have larger sensors. This would greatly simplify the garages and reduce their cost substantially, and the interceptors would have greater independent capability. There would, however, be fewer interceptors on each garage, and fewer garages. Judd declined to say how many interceptors would be in the system, but other sources say the number has shrunk from 3000 to about 1000 and the number of platforms has been reduced from about 300 to 150.

■ The SSTS would have smaller sensors. To compensate, more of the burden of tracking warheads in space would be placed on sensors lofted into space during an attack by ground-based rockets. One advantage is that the SSTS would require less power, which means that it could be operated with solar cells rather than a small nuclear reactor that has yet to be developed. The BSTS would not change much from the original plan, but it, too, would be powered by solar cells, Judd says.

■ The number of ground-based interceptors would be increased.

■ All the space-based elements of the system could be launched with existing rockets. This means that deployment of phase 1 would not have to wait for the development of a new heavy-lift launcher, and some expense could be deferred. However, says Judd, a new launcher would be required for later phases.

The new proposal is unlikely to win over critics of the earlier plan. Because the basic architecture of the system is not much different, OTA's concerns, for example, will not be diminished. Moreover, one source intimately familiar with the program argues that the decrease in the capability of the SSTS would cause serious problems for the ground-based interceptors because it would not be powerful enough to discriminate between decoys and real warheads. This means, he says, that the ground-based system would be easily overwhelmed. In addition, because only a fraction of the space-based interceptors would be in range of Soviet missiles at any one time, the small number now planned would be incapable of handling launch of more than a few missiles.

■ COLIN NORMAN

# EPA: Ozone Treaty Weak

The treaty hammered out by countries participating in the United Nations Environment Program (UNEP) a year ago does not go far enough to protect the stratospheric ozone layer that shields the earth's excessive levels of ultraviolet radiation. Lee Thomas, head of the Environmental Protection Agency (EPA), said 26 September that studies now indicate that chlorofluorocarbons and halons have damaged the ozone layer to a greater extent than previously thought. Thomas said halving the emissions of these compounds as proposed in the treaty no longer appears adequate to protect human, animal, and plant life. He said a complete phaseout of these chemicals is necessary.

The Montreal Protocol, as the treaty is known, was endorsed by 45 nations a year ago and calls for a 50% reduction by 1998 in worldwide production of chlorofluorocarbons (CFCs) and imposes limits on some halons. The treaty is expected to go into effect early next year—as soon as the European Community, Japan, and the Soviet Union ratify the pact. Eight other nations, including the United States, already have given it their final approval.

New analyses released in the past 7 months, however, suggest that production of most CFCs and bromine-based compounds must be virtually eliminated. Otherwise, the stratospheric ozone layer will continue to erode rapidly. UNEP member countries are slated to meet in mid-October in the Netherlands to discuss the treaty and substitutes for CFCs.

When the protocol treaty was drafted, it was expected that a 50% reduction in CFC production might be sufficient to limit the rise in the stratospheric chlorine concentration from a level of 2.7 parts per billion (ppb) to no more than about 5 ppb. The effectiveness of a 50% rollback in CFC production has been in question for some time. EPA, in fact, initially favored phasing out 95% of world CFC production, but backed away from that in response to Administration pressure.

The inadequacy of the protocol strategy first became clear in March when the National Aeronautics and Space Administration (NASA) released the report of the Ozone Trends Panel (*Science*, 25 March, p. 1489). That report's findings showed that ozone depletion was occurring at a faster rate than previously recognized in scientific models. In a study* released 28 September, EPA estimates that under the Montreal Protocol, chlorine levels in the stratosphere could rise to 8 ppb. This is because CFC production levels would remain relatively high. Furthermore, production of methyl chloroform and other halocarbons with relatively low ozone depletion potentials would not be regulated and would rise appreciably.

"It will take a complete phaseout" of CFCs and halons, Thomas said, to stabilize chlorine levels for the next 100 years. Production of methyl chloroform, which is not controlled under the treaty, would have to be frozen, if not curtailed, according to EPA. The chemical is used in manufacturing principally for cleaning metal and electronic components. Once these actions are taken, EPA says chlorine levels in the atmosphere will continue to grow for another 6 to 8 years because the compounds have a long residence time in the atmosphere.

Sherwood Roland of the University of California at Irvine, who along with colleague Mario Molina first warned in 1974 about the threat posed by CFCs, urged Thomas to go further. Carbon tetrachloride, a cleaning solvent, should also be eliminated from the marketplace, Roland contends.

Meanwhile, the Du Pont Company, which first developed CFCs, announced on 29 September that it is building a commercial-scale plant to produce a substitute for CFC-12, a leading ozone-eroding compound used in auto air conditioning, refrigeration, and for other purposes. This compound accounts for 40% of CFCs produced in the United States and about 30% of world production. Imperial Chemical Industries, a British concern, also is gearing up to market substitutes. Du Pont says it will be 5 years before toxicity tests on the substitute compound, CFC-134a, are complete.

■ MARK CRAWFORD

**Future Concentrations of Stratospheric Chlorine and Bromine* [Office of Air and Radiation, Environmental Protection Agency (EPA400/1–88/005), Washington, DC, August 1988].