

Peace through Strength, whose co-chairman, retired Lieutenant General Daniel O. Graham, former director of the Defense Intelligence Agency, maintains that within a decade of crash spending the United States could "create spaceborne capabilities which could neutralize the Soviet strategic nuclear threat." In Congress, beam weapons have militant backers such as Republican Senator Malcolm Wallop (Wyo.), who claims that "the goal of space defense is within our grasp—if we will seize it."

The big attraction of laser weapons is the speed with which they can project across vast distances. A missile moving at eight times the speed of sound will travel less than an inch in the time it takes a laser beam to travel a mile. So proponents imagine spaceborne laser guns almost instantaneously destroying strategic missiles launched anywhere on the Earth.

There are several problems with these imaginary scenes, however. The amount of energy delivered to a target decreases with the square of the distance. So the amount of power capable of damaging a target at a range of 1 mile would have to be multiplied by a million to inflict the same damage at a range of 1,000 miles. Laser weapons in space would need huge quantities of consumable chemicals to provide such tremendous energy, enormous mirrors capable of focusing the beams at great distances, and elaborate systems for detection and tracking. This gargantuan labyrinth of technical marvels would be simple to disable with ball bearings, lumps of "chicken-wire" projectiles, or another laser beam. Its detection and tracking system could easily be fooled by electronic countermeasures and decoys. Weather would be a formidable obstacle to laser beams aimed at the Earth. And missiles exuding a thin shroud of smoke would be impervious to lasers.

These severe limitations of laser weapons have spurred research into directed particle-beam weapons. Although somewhat slower than lasers, particle beams do not have to remain locked on their targets, another serious drawback of laser weapons. But the energy demands are even more extreme for particle-beam weapons, which would require linear or circular accelerators, with capabilities far greater than any on Earth, to be launched and maintained in orbit.

Both lasers and particle beams pose another grave problem as anti-ballistic-missile weapons. Even such ardent backers as former astronaut Senator Harrison Schmitt (R-N.M.) concede that beam weapons can only "play a role in intercepting missiles in the boost phase." According to the latest Pentagon analyses, this would allow too little time for any human command authority to be involved, since such satellites would have to be programmed to attack immediately and automatically just after missiles were launched. Critics have pointed out that this would cut out most of the existing safeguards against accidental nuclear war. An ABM satellite might even initiate global hostilities by zapping an innocent space launch.

Similar problems surround the laser battle stations planned for space-to-space combat. These costly embodiments of science fantasy would actually be vulnerable to simple objects placed in their path, killer satellites exploding on a near-miss trajectory, missiles or beams fired from airplanes, or even disruption of their Earth-based command links. In order for these battle stations to survive and function they would almost certainly need to be protected by a fleet of other satellites, some equipped with umbrella-like screens against beam weapons, others with their own beam guns, and still others with missiles. The projected maintenance and supply demands of such a space fleet have already led to the award to General Dynamics of a development contract for a small space cruiser. Three of these service vehicles are supposed to fit, with their wings folded, in the cargo bay of a space shuttle. To coordinate the battle stations, defensive outposts, and space cruisers, an orbiting command post would also seem essential. Yet this entire armada would be vulnerable both from below and above. It could be bombarded with missiles and beams from Earth until its supply of consumables was exhausted by its enormous energy demands. Or it could be attacked by droves of spacemines previously placed in high parking orbits.

Even more serious problems are analyzed at length by Kosta Tsipis and Michael Callahan in *High Energy Laser Weapons*, a study under MIT's Program in Science and Technology for Interna-

tional Security. Tsipis and Callahan reach highly skeptical conclusions about the military usefulness of laser weapons in space, and they raise frightening questions about attempts to develop and deploy these weapons or any similar systems. In fact, they conclude that the deployment of any space-based anti-missile system, "even of unknown efficacy, would tend to upset drastically the strategic balance," thus easily initiating "a major crisis and possibly an all-out war."

Even choosing to develop such systems is inherently destabilizing for the world's security, for it depends on what has become known as "the fallacy of the last move," the wishful thinking that ours would be the last move in the game. Tsipis and Callahan call this "the ever-unfulfilled expectation that recourse to a new and ever more exotic weapon system" will "confer absolute military superiority to the U.S. over the Soviet Union." It was this fallacy that led the United States to develop nuclear weapons, intercontinental bombers, thermonuclear weapons, ICBMs, tactical missiles, nuclear submarines, MIRV (Multiple Individually Targeted Re-entry Vehicle), strategic cruise missiles, MARV (Maneuvering Re-entry Vehicle), the neutron bomb, and now the shuttle designed to turn space into a battlefield. It was the United States, not the Soviet Union, that launched research of these new rounds in the arms race, sometimes under the phony argument that the Soviets were already ahead, always under the illusion that the United States would thus achieve a decisive and permanent military superiority. In fact, the Soviet Union has always soon caught up, and the security of both nations, as well as that of much of the world, has become more and more precarious. Even the enthusiasts of these weapons systems have sometimes come to lament their folly. Thus Henry Kissinger has said: "I wish I had thought through the implication of the MIRVed world when the MIRV was approved."

The fallacy of the last move is nowhere more blatant than in space, where research and development have been moving at a dizzying pace and where either of the two great pioneering nations could easily emulate any achievement of the other. For example, those who believe that the U.S. shuttle could grant hegemony in space may be ignorant of the Soviet space shuttle program, which has conducted several successful atmospheric tests of a space vehicle designed to take off and land on conventional runways. Relying on the U.S. shuttle for military superiority would be perilous anyhow, for if the two facilities for launching the shuttle (one present and the other under construction) were destroyed, the U.S. could lose its access to space. Even if the world survived any crises caused by the development and deployment of weapons in space, our security would still be jeopardized, not enhanced. Spaceborne weapons systems are, as Tsipis and Callahan put it, inherently "subject to a technological instability, i.e. they will be faced with frequent crises of vulnerability."

Then there are some blood-curdling possibilities inherent in either side or both maintaining weapons in space. Whether designed for offense or defense, such a weapons systems would have to be regarded as part of the strategic force. So any attack upon it would almost inevitably precipitate a thermonuclear holocaust.

What if a key military satellite suddenly and mysteriously disappeared? This is not such a far-fetched possibility. Several non-military satellites have, at least for a time, mysteriously disappeared. One example occurred in 1963 with Syncom 1, another in early 1979 with a Japanese satellite. These were later located. But in December, 1979, Satcom 3, which was operating normally in a stable orbit, was given a correction and then disappeared, mysteriously and permanently.

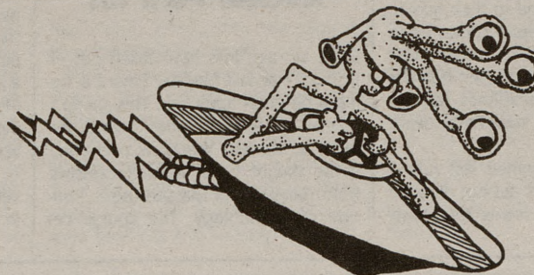
What if a meteor, or even worse a meteor shower, smashed into part of a strategic space fleet? Who could differentiate this from an attack by killer satellites or space mines? Another grim possibility could come from a third power, intent on provoking a nuclear exchange between the Soviet Union and the United States. After all, by 1978 China had already launched eight satellites, including one weighing three to five tons. If military satellites were attacked from space, it might be virtually impossible to determine the identity of the attacker.

The inescapable conclusion seems to be that we are on the verge of committing ourselves to an enormously expensive, militarily impractical, and

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# MIND GAMES

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## CELLULOID INVADERS

### A Science Fiction Alien Quiz

Where would science fiction be without aliens? Think about it. Can you imagine *Star Trek* without Vulcans? Or John Carter without Martians? If people from other planets never existed, the bar scene in *Star Wars* would have been nothing more than an unreasonable facsimile of *Looking for Mr. Goodbar*. And what would the protagonists of *Close Encounters of the Third Kind* have encountered with if it weren't for aliens? Oh sure, there's always New Jersey. But how many plot lines can you develop wherein scantily clad heroines can be chased by mutations from a chemical dump fire?

Face it. We owe a great deal to aliens. It has been their task to add just the right touch of sci-fi authenticity to our fantasy films and literature and they have performed beautifully. Recognizing this, we pay homage to our friends from other worlds with this little quiz. To join in the tribute, just match the name of the sci-fi film or television series with the alien clan associated with it. And please don't get caught cheating because...we are not alone!

- |   |                                      |
|---|--------------------------------------|
| 1. <i>This Island Earth</i>             | 6. <i>Dr. Who</i>                    |
| 2. <i>The Time Machine</i>              | 7. <i>Flash Gordon</i>               |
| 3. <i>The Day The Earth Stood Still</i> | 8. <i>Star Trek</i>                  |
| 4. <i>Battlestar Galactica</i>          | 9. <i>Forbidden Planet</i>           |
| 5. <i>War of the Worlds</i>             | 10. <i>The First Men in the Moon</i> |

- |                  |                        |
|------------------|------------------------|
| a. The Talosians | f. Klaatu's people     |
| b. The Cylons    | g. The Martians        |
| c. The Daleks    | h. The Metalunians     |
| d. The Selenites | i. The people of Mongo |
| e. The Krel      | j. The Morlocks        |

ANSWERS: 1.h., 2.j., 3.f., 4.b., 5.g., 6.c., 7.i., 8.a., 9.e., 10.d.

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