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Shield in space

Eight days ago, a Minuteman inter-continental ballistic missile (ICBM) carrying a dummy warhead blasted off from Vandenberg Air Force Base in California. Three booster stages hurled the missile out of earth's atmosphere onto a long, parabolic curve towards its re-entry point above Kwajalein Atoll, 5,000 miles across the Pacific.

On Kwajalein, a powerful phased-array radar tracked the onrushing warhead. Eleven minutes before planned impact an experimental interceptor missile was launched into space from the atoll. The two warheads closed at 20,000 feet per second, 10 times the speed of a high-velocity rifle bullet.

At about 100 miles above the Pacific, the interceptor missile's infra-red guidance system locked onto the Minuteman warhead. The interceptor deployed a 15-foot diameter steel-mesh net. Moments later it closed on the Minuteman, snaring and destroying the dummy warhead in the net. For the first time, one missile had intercepted another in space.

The origin of this enormously important event occurred, curiously, in an apple orchard outside of Bern, Switzerland in late 1945. Three German scientists, fleeing the collapse of Hitler's Reich, had presented themselves to a friend of mine who was then a senior officer of Swiss military intelligence.

The Germans had brought with them a new technology which they sought to give to the Americans, via the Swiss, before it fell into the hands of the advancing Russians. My Swiss friend managed to convince a skeptical Allen Dulles, the U.S. intelligence chief in Bern, to come and see a demonstration in his orchard.

At one end of the orchard a tripod was set up that mounted a cigar-shaped device with a glass "eye" at one end. The Germans asked Dulles to stand 200 feet away, light a cigarette and then walk about. Dulles did so and was amazed to see the "cigar" unerringly swivel to follow his lit cigarette. The Germans were rushed off to the U.S., so beginning American development of infra-red systems.

Infra-red sensors identify targets by the heat that they emit. Since 1945, infra-red detection has become common in missile guidance and passive targeting systems. Today, the U.S. holds a commanding lead over the USSR in the fast-developing technology of infra-red sensing.

In spite of this lead, the U.S. had failed in past attempts to produce an infra-red system capable of pinpointing warheads in space. Once a missile enters space, its hot booster engines fall away, leaving only the re-entry vehicle and its warhead. In the airless void of space, the re-entry vehicle generates no friction, and thus no heat. Until the Kwajalein test, it had been impossible for infra-red detectors to spot these cold warheads against the coldness of inner space.

Now, U.S. scientists have surmounted this obstacle by developing highly sensitive clusters of infra-red cells — known as mosaic focal-plane arrays.

These arrays are much like insect eyes: Hundreds of tiny sensors producing a panoramic view. One report suggests that these arrays are sufficiently sensitive to detect the heat of a human body in space from 1,000 miles away.

Linked to the interceptor's infra-red "eyes" are micro-miniature, high-speed computers that act as a brain. Working together, the two systems target and guide the interceptor, even distinguishing between real warheads and decoys. This emerging technology is now on the borderline of artificial intelligence.

In strategic terms, the Kwajalein test means that the U.S. has stolen a technological march on the Soviets. If ensuing tests prove successful, the U.S. could be able to begin deploying an effective anti-ballistic missile system (ABM) within three years.

The mutually observed, but never ratified, SALT (Strategic Arms Limitation Talks) agreement limits the U.S. and USSR to ABM research and the deployment of one system each. The U.S. never did deploy an ABM; Russia has one system protecting Moscow. Over the past few years, both nations have been working to develop the components of a new ABM system.

Now, both nations appear poised to break out of the SALT limitations. Russia has recently built three massive phased array radars along its borders — a clear violation of SALT. The Soviets are also testing at least two interceptor missiles: They evidently have the capability to assemble a new ABM system on short notice.

The Kwajalein test shows, however, that the U.S. has a commanding lead in infra-red guidance, computers and miniaturization. In fact, current Soviet space systems are 10 times heavier than equivalent American systems. This disparity must now be sending tremors of dismay through the rocket-loving brass of the Soviet military establishment.

Russia cannot afford to allow the U.S. to create an even partially effective ABM system without deploying its own version; otherwise, its strategic missile force would become vitiated. The hard-pressed Soviet economy will now have to come up with another $50 to $80 billion for ABM defence while $20 billion is currently being spent on anti-cruise missile systems.

The Soviets may recover from this technological setback by fielding laser or particle-beam ABM systems — an area in which they lead the U.S. Or they may manage to steal enough U.S. technology to duplicate the system. If not, Russia may find itself falling rapidly behind in the campaign to dominate space.

For the Western world, the Kwajalein test is excellent news. It means that at last we have a chance to escape from the mutual balance of nuclear terror by creating a mighty technological shield in space.

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