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U.S. gave Navstar to the Soviets

by Charles B. Stevens

The Department of Defense director for Command, Control, and Communications (C^3), Donald Latham, revealed in congressional testimony Sept. 9 that the Soviet Union has stolen the technology for the U.S. Navstar Global Positioning System (GPS): "We gave away, so to speak, the entire design of this over the last many years. The Soviets have launched what they called GLONASS [navigation satellites], and they have three or four of them up there testing them. We would expect them to put up around 9 to 12 satellite constellations for their coverage purposes."

This catastrophe has immense implications for both the immediate strategic balance and for development of missile defense systems. In one fell swoop, the U.S.S.R. has been handed the capability of making all of its ballistic missiles extremely accurate.

How Navstar works

The U.S. Navstar system, when completed, will have 18 active satellites and 3 passive spares. Each satellite puts out an extremely accurate radio pulse. When pulses from three or more satellites are picked up by a radio receiver and properly interpreted, one can locate one's position *and velocity* with an accuracy of a few inches. Given that fixed objects on the Earth's surface can be photographically located with the same accuracy, the Navstar system provides a means of determining from virtually any distance the position of any fixed object, to an accuracy of several inches.

While it appears simple at first glance, Navstar actually represents the synthesis of a wide range of advanced technologies. First, the satellites must be placed in exact orbits and maintained there. The satellite signal output must be timed with extreme accuracy, measured in fractions of a trillionth of a second. Computers to control and regulate the system must be constantly in operation.

The pioneering scale of Navstar can be somewhat realized from the fact that the Navstar program is the first satellite project in which satellites are being mass produced on an assembly line.

Anyone who has had to make an estimate of distance, particularly under circumstances of stress, will have some idea of what Navstar means for the battlefield. Normally, indirect artillery fire has an average accuracy of several hundred yards. With Navstar giving fixes within a few inches, the artillery should have accuracies of a few yards. But it is in the realm of missile trajectories that Navstar has the greatest impact. At the present time, missile accuracies are measured in fractions of a nautical mile at best. With Navstar, they will be measured in fractions of a foot.

More significantly, because Navstar can interact dynamically with a missile guidance system, it is no longer necessary to know the location of the launching site and/or target with great accuracy when the missile is first sent off. By proper use of Navstar signals, the missile can be guided during its boost phase, and course corrections can be made throughout its flight. This is of particular value for sea-launched and submarine-launched ballistic missiles.

Fast rocks

Some defense planners have suggested that the accuracy made possible by Navstar has even elevated rocks to the equivalent value of nuclear weapons against hardened military targets. For example, if we had in orbit thousands of ceramic-coated, 10-ton rocks, with small guiding rockets—like those utilized to maintain satellites in precise orbits—added onto them, Navstar is sufficiently accurate to place these rocks on a trajectory which would land them within a predetermined spot on Earth, no larger than a few square yards. Progress in astronautics has reached the point where ceramic-coated re-entry vehicles can now re-enter the Earth's atmosphere at a very steep angle, almost vertical, and not burn up. This means that the velocity of the re-entry vehicle is so great that the atmosphere in no way alters its trajectory. It is as though the Earth's atmosphere did not exist.

Coming in at four or five times the speed of sound when it hits the ground, the rock would have more energy per pound than if it were made of TNT. The result is that it would plow through virtually any type of missile silo or bunker. Studies are now being conducted on how such rocks can be most economically obtained from the Moon or asteroid belt. (Another possibility is to simply place them in orbit with the Shuttle or some other heavy lift vehicle.) One significant advantage of such an approach is that, unlike nuclear weapons, the fast rocks would not be vulnerable to electronic disruption by directed-energy beams. They would also be far more difficult to kinetically disintegrate or deflect.

Navstar has immense implications for any missile defense. Usually the system that detects a missile is not the same as that which will destroy it. And both are probably moving at great velocities. Therefore, to accurately point and track the detected missile with the weapon that will destroy it, is not trivial. Navstar is able to provide one solution to this by locating the laser, the detecting satellite, and the target, with respect to each other, with an accuracy of a few inches or better.

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