

1. **Wall Street Journal, 24 Sep 02**
Early Bird

U.S. Military's GPS Reliance Makes A Cheap, Easy Target

By Anne Marie Squeo

The hugely successful satellite-based technology that has enabled a growing number of U.S. bombs to hit their targets may be vulnerable to a kind of jammer available through the Internet for \$39.99.

That could mean potential problems in any invasion of Iraq. In recent months, the Pentagon has stepped up orders for precision-guided bombs that use Global Positioning System satellites to hit targets with pinpoint accuracy, and is expected to rely on them for surgical strikes on Saddam Hussein's military infrastructure.

Bombs that use GPS-guidance systems were employed heavily in the U.S. campaign in Afghanistan. Air Force officials estimate 95% of Boeing's Joint Direct Attack Munitions landed within 10 to 30 feet of their targets, well above performance thresholds originally set for the weapons.

But with Iraq expected to force the U.S. to fight in the tight spaces of Baghdad -- as opposed to the expansive desert where most clashes took place during the Gulf War -- highly accurate weapons could mean the difference between hitting a hospital and a military building.

But the more reliant the U.S. has become on GPS over the past decade, for both military and civilian use, the more people have developed systems that can misdirect or even stymie the technology.

GPS "jammers," now available via the Internet for as little as \$39.99, can easily interrupt the signal coming from the satellite system in a local area. At the Paris Air Show in 1999, a Russian company called Aviaconversia demonstrated a 4-watt GPS jammer, weighing about 19 pounds, capable of denying GPS reception for more than 100 miles. (By comparison, most hair dryers today have at least 18 watts of power.)

That has caught the attention of military officials and politicians alike. "We believe Saddam Hussein has GPS-jamming capability and that he will use it," says Rep. Joseph Pitts (R., Penn.).

He is co-chairman of the Electronic Warfare Working Group, whose members include 25 congressmen who have been studying GPS vulnerability, among other issues. "While we do not know the extent of our vulnerability, there is evidence to suggest that GPS jamming can significantly inhibit precision

targeting," Mr. Pitts added. One congressional staffer noted it is also possible to "spoo" the system, or provide incorrect satellite readings that could misdirect a weapon.

Conceived by the military in the late 1970s, GPS is a constellation of 24 satellites that circle the globe twice a day, continuously beaming radio signals that provide timing and other information to anyone with a receiver. Air Force Col. Douglas Loverro, who oversees the program, likens it to "rainwater."

But the signals travel 11,000 miles from satellite to Earth's surface, making them so weak by the time they arrive that a single Christmas tree light is about 1,000 times as bright.

The current GPS satellites emit two signals -- one dedicated to the military and another that has been made available to commercial users around the world, including as a timing device for big computerized networks such as telecommunications and transportation systems.

The military signal is configured so it is more difficult to interrupt. But the problem is that the military uses the commercial signal, which is more readily available, to "find" the military one. And while some efforts are under way to develop technology that enables aircraft to access the military signal directly, an Air Force spokesman said that isn't being done now.

"It turns out that intentional jamming is far more of a problem for the military than civilian users," says Col. Loverro.

Military officials refuse to say whether GPS signals have been jammed in battle and what specific fixes are being put in place, citing the classified nature of such information. They admit that concerns about the system's vulnerability are taking on increased prominence, especially as they relate to Iraq.

"Everyone knows how successful these [JDAM] weapons are so we know that they are going to try to take them away from us," says Richard Walley, chief of program development for the Pentagon's JDAM program office. Both the Navy and Air Force use JDAMs.

The only bona fide fix is strengthening signal power. Such efforts are under way, with the Air Force planning three stages of upgraded satellites over the next 10 to 15 years. The launch of these spacecraft has been delayed in part because the current fleet has lasted longer than expected. Technical challenges and budgetary decisions have also played a role in the delays.