

# SPREADING the eLORAN MESSAGE



U.S. COAST GUARD

## Advocates of ground backup for GPS raise interest but not funds

By BEN IANNOTTA

**W**ith Global Positioning System fever sweeping the U.S. in 1996, technology experts at the Defense and Transportation departments decided to put down in black and white what seemed like an obvious truth: The U.S. Air Force's new constellation of medium-Earth satellites was proving so accurate that "the Federal Government expects to phase out radionavigation systems that are no longer required," they wrote in their "Federal Radionavigation Plan," which examined the electronic systems used by the military, civilian aircraft and telecommunications companies.

The predicted phaseout referred in large part to the world's network of Long Range Navigation shore antennas, called Loran. During the Cold War, the U.S. had erected antennas up to 1,350 feet high along the U.S. coast and locations abroad, with permission of friendly governments. That network appeared headed for the scrap heap of history because of GPS.

Loran was best known as a navigation tool for ship captains, but its biggest value to the Pentagon may have been its timing signals. Loran synchronized the increasingly complex communications and missions the U.S. carried out around the world under its policy of containment during the Cold War.

"By having access to a Loran signal, you didn't have to carry the equivalent of an atomic clock on your jet, on your ship or another platform," said U.S. Coast Guard Captain Curt Dubay, a precision timing and navigation expert at the Department of Homeland Security (DHS).

In their zeal for a space-borne navigation,

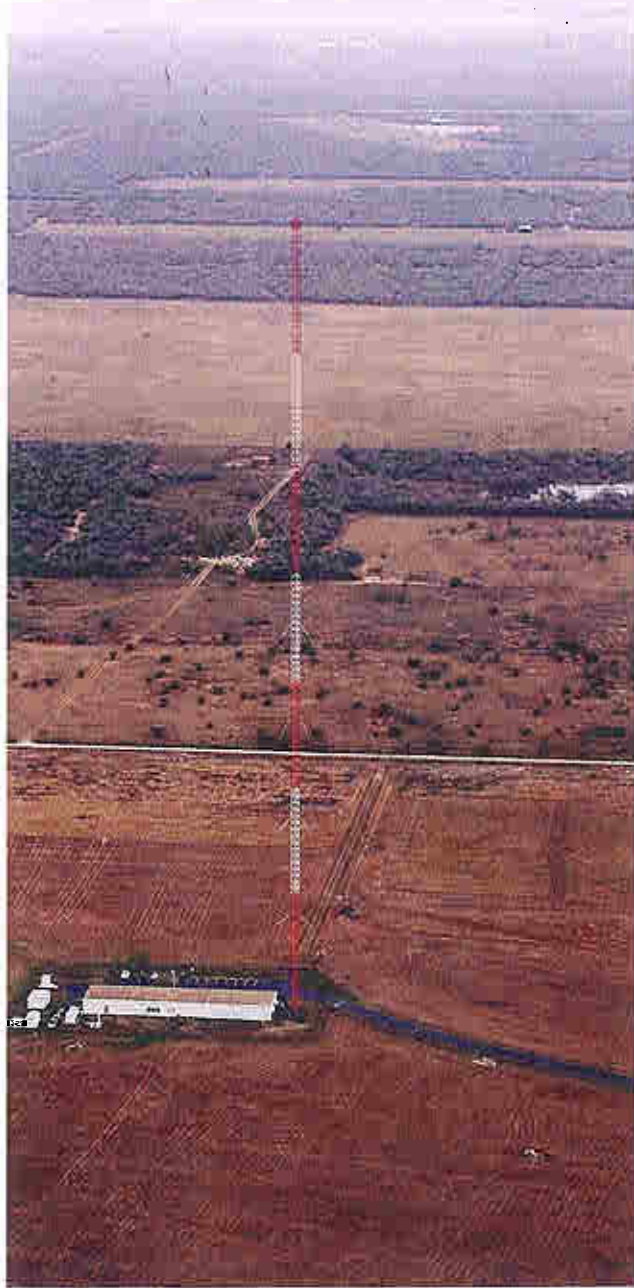
**The Loran C antenna** at Loran Station Dana, Ind., transmits navigation signals to the northeastern U.S. and the Great Lakes region.

the U.S. radionavigation officials had neglected something: the vulnerability of GPS to jamming. A drive to correct that oversight has breathed new life into Loran and an enhancement called eLoran, which the Europeans, who never stopped relying on Loran, have long urged the U.S. to embrace.

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With the GPS satellites orbiting thousands of miles up in space, their solar arrays and batteries can deliver only a relatively modest amount of transmission power.

"GPS is a very, very weak signal. Someone with a device the size of a soda could take out reception within a small city," said Dana Goward, director of DHS's Maritime Domain Awareness program. In the view of Goward and others, al-Qaida now had a new, low-tech opportunity to wreak havoc



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Loran stations such as this one in Raymondville, Texas, have been providing navigation signals for many years. Advocates want to revive and enhance the system in the U.S. and abroad as a backup for the Global Positioning System.

on U.S. banking systems, cell phone communications and wireless data networks. Those systems rely on GPS's timing signals much as the Pentagon relied on Loran's timing signals during the Cold War.

"We need to have a backup. This is not just a maritime thing. It has implications across every aspect of U.S. society," Goward said. eLoran advocates say they are not enemies of GPS. They simply believe that new, commercially provided navigation and timing receivers will be designed to switch seamlessly between GPS and Loran.

The truth is, some U.S. officials had begun

to realize the vulnerability of GPS not long after the 1996 report and well before the Sept. 11 attacks sent the minds of intelligence officials reeling.

The U.S. Air Force has a multibillion-dollar plan to improve GPS partly to cope with jamming. The more advanced versions of the upcoming GPS III satellites, whose builder the Air Force plans to announce this month, will give U.S. commanders the ability to focus more powerful spot beams on regions where jamming is detected, GPS wing commander Air Force Col. Dave Madden wrote in an e-mail relayed by his public affairs office.

U.S. Homeland Security officials do not take much solace in that plan because spot beams, by their nature, cannot be everywhere at once, and they might still prove vulnerable to jamming.

"Twice almost nothing is still almost nothing," Homeland Security's Dubay said of the stronger GPS signals. Another complication is that those signals will be available to the military, not civilian users.

eLoran's receiving stations, although they won't offer global coverage, would not suffer from the volume and mass constraints of satellites. They could have power-hungry transmitters. The eLoran signals would be able to pierce jungle canopies and parking garages, Goward said.

Jamming eLoran would be hard to accomplish in secrecy. An attacker would have to have a big, powerful transmitter.

"Certainly, it wouldn't fit in your hand. You'd need something big, a truck or something to carry it," said Jim Doherty, a navigation expert at the Institute for Defense Analyses, a nonprofit cor-

poration that conducts research for the U.S. government.

#### BUDGET FIGHTS

For years, Loran advocates in the U.S. government have been involved in a tacit argument with their bosses in the Bush administration and before that in the Clinton administration. Dubay and others happily accepted the \$160 million in congressional additions, or earmarks, added to the White House budget requests for Loran dating back to 1997. Those earmarks kept Loran running and funded the first steps to modernize it. But without bless-

ing from the executive branch, advocates were unable to spread eLoran beyond a single prototype receiving station in Boston Harbor whose signals, so far, are for testing and evaluation purposes only.

February was a turning point. The White House, in its 2009 budget request, signed on to the backup idea, and DHS announced that it would "begin implementing" eLoran. The fine print of the budget proposal showed a big question mark. "We have not yet identified the funding for continued transformation from Loran C to eLoran," Goward said. The Homeland Security portion of the 2009 White House budget allocates \$34.5 million for eLoran, but those funds would go toward operating the existing system, which is a mix of Loran C and eLoran prototype equipment, Goward said.

Fully implementing eLoran would mean building new receiving stations whose software would make real-time corrections to existing Loran transmissions to improve their positioning accuracy to 10 to 20 meters, which is within the range promised by civilian GPS manufacturers.

By one official estimate, eLoran could cost the U.S. as much as \$400 million. Dubay said he expects eLoran to cost much less than that figure, which was calculated in 2006 by an "independent assessment team" headed by GPS orbital architect Brad Parkinson, now of Stanford University. "We've refined that number down substantially," Dubay said. He said he was not sure that the new estimate should be released publicly.

The U.S. government has not officially released the Parkinson report either, but Dubay said it makes a strong case for upgrading Loran into a backup of GPS.

Meanwhile, overseas, the General Lighthouse Authorities of the United Kingdom and Ireland, which operates navigation aids in Northern Europe, rushed out a press release applauding "the U.S. decision to implement Enhanced Loran in the U.S." Officials in England have set up a new eLoran station in Cumbria in the Lake District. Together with stations in Norway, France, Germany and the Faeroe Islands north of the U.K., it is providing a trial eLoran service in northern Europe.

"As responsible and prudent service providers, the [General Lighthouse Authorities] identified the need for eLoran to mitigate satellite navigation vulnerabilities," the authorities said.

In the U.S., advocates also were pleased with the change of heart but realistic about its short-term impact. Even if the U.S. government finds money to implement eLoran, making it a true backup to GPS is expected to take years because so much of the U.S. communications and transportation infrastructure had gravitated exclusively to GPS.

"It's going to take two things: The money and investment to build out eLoran. And two, the user equipment has to be produced and adopted by the users," Dubay said. ■