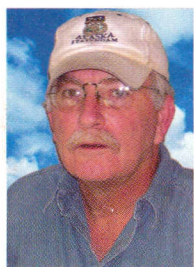


E-Loran: It's Back — and Here to Stay

Sometimes, Everything Old *Can* Become New Again.

BY CAPT. GARY P. JOYCE



WHEN LAST WE LEFT E-LORAN (ENHANCED Loran) back in 2005, it was the subject of a U.S. Coast Guard/Department of Homeland Security (DHS) status investigation. The big question: Should the Loran infrastructure, into which the government pumped some \$160 million over the last decade, be kept and upgraded?

The 2007 public-comment period garnered nearly 1,000 responses; the Coast Guard reports that 92 percent favored keeping Loran-C and/or e-Loran, 8 percent preferred to terminate Loran-C and 80 percent wanted Loran as a backup for GPS.

Why, you may ask, do we need Loran? Because GPS can be jammed. In the summer of 1996, the Great Lakes bulk carrier *MV Manatoulin* began experiencing GPS difficulties — only when heading in a certain direction — that would show the boat crossing large areas of dry land at erratic and dramatic speeds. The source of the erroneous reading turned out to be a television antenna in the captain's quarters.

Starting in April 2001, the GPS signal in Moss Landing Harbor, south of San Francisco, was jammed for more than a



month. Eventually, investigators identified three VHF/UHF television antennas configured to be active even with the televisions switched off as the sources.

More recently, at the Space Weather Enterprise Forum meeting last April (2007) researchers at Cornell University revealed that on Dec. 5 and 6, 2006, they observed two un-forecasted solar eruptions so severe that large numbers of receivers ceased tracking GPS signals.

"... We found the effect on GPS receivers was more profound and widespread than we expected," says Paul Kintner, Ph.D., professor of electrical and computer engineering at Cornell University. "Now we are concerned more severe consequences will occur during the next solar maximum." Solar maximum and minimum — the highest and lowest periods of sunspot and solar-flare occurrences — are thought to occur in 11-year cycles, with the next solar maximum due in 2011.

"This solar radio burst occurred during the solar minimum yet produced as much as 10 times more radio noise than the previous record," says Dale Gary, Ph.D., chair and professor of the physics department at New Jersey Institute of Technology. "This was enough to swamp GPS receivers over the entire sunlit side of Earth."

News attributed to a Department of Defense report followed, maintaining that China would be able to block GPS signals.

Enter "GPS jammer" in a search engine and you can find tips, plans and

The **SI-TEX** e-Loran Integrated GPS/Loran Receiver Sensor represents a Generation-2 receiver that gets its heading output using Loran-C. It connects to the company's ColorMax Series, Explorer Plus, TrawlPlot 1 2SD Charting Systems and P-Sea WindPlot software to give you no-conversion Loran positioning. It can also provide improved autopilot performance and, when interfaced with an integrated SI-Tex navigation system, can stabilize radar overlay. MSRP is \$999. Si-Tex, 727-576-5734; www.si-tex.com.

CrossRate's eLGPS 1110: This Generation-3 e-Loran/GPS is a completely seamless receiver with a small, outdoor-mounted combo Loran/GPS antenna (approximately 8 inches in diameter and 3 inches in height). It utilizes NMEA 0183 for interfacing with chart plotters and may contain NMEA 2000 as well. Expect it to have upgradeable software, too. Look for it to retail between \$1,000 and \$1,500. CrossRate Technology, 207-799-4835; www.crossrate.com.



commercial jammers available — some for as little as \$40. Why would anyone wish to jam GPS? Well, as Professor David Last, who writes for *Coordinates* magazine, notes, “We live in a world in which a socially inadequate teenager with acne and no girlfriend can cause havoc in the Pentagon and panic in the banking system. ... Jamming does not take Al Qaeda; it takes a spotty kid in his bedroom. Satellite navigation is like the computer business before the first virus. And [GPS has] no McAfee and no Norton!”

Here's how the Coast Guard explains e-Loran: “As e-Loran uses high-powered transmitters and low-frequency signals (not microwatts and microwaves like GPS), it is very unlikely to be disrupted or jammed by the same causes that would disrupt GNSS signals. This means that small, low-cost e-Loran receivers, even built into GNSS units, can mitigate the impact of disruptions to GNSS. Moreover, e-Loran can do things GNSS cannot, like act as a static compass. At sea, a new concept of enhanced navigation (e-Nav) — is being

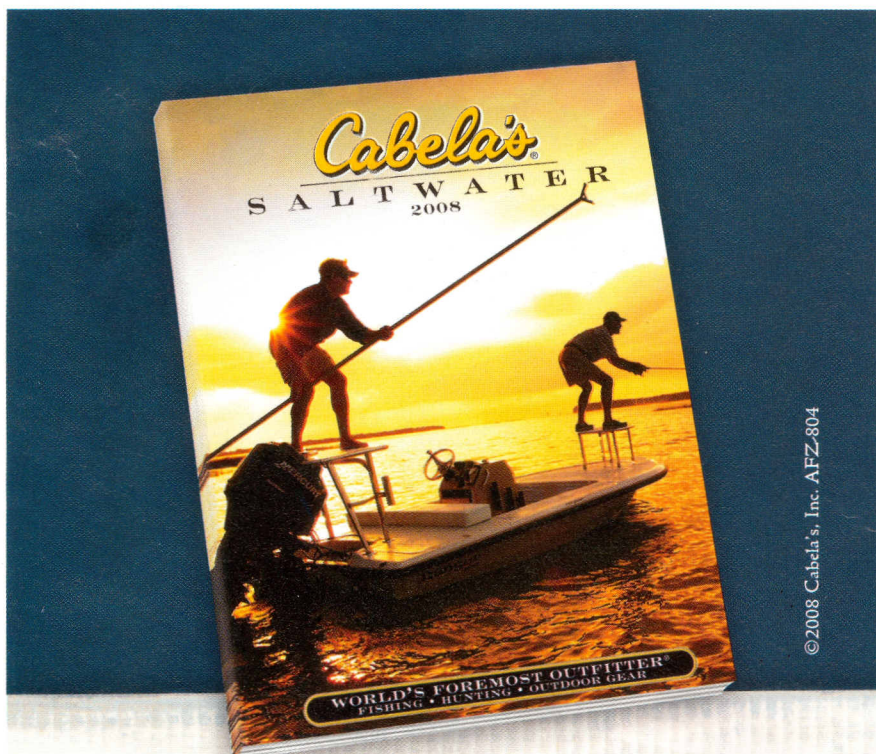
developed, which requires an exceptionally reliable input of position, navigation and time data. Uniquely, the combination of GNSS and e-Loran has the potential to meet its needs.”

Enhanced Loran is not Loran C; it's two generations removed from that technology, which went through rehab (Furuno's LC-90 can be considered a “second-generation” unit), moving them into the digital era; this third-generation receiver, usually a combined e-Loran/GPS unit, represents the newest “old” technology.

Again, as the Coast Guard explains: “Loran-C provides coverage for maritime navigation in U.S. coastal areas. It provides navigation, location and timing services for both civil and military air, land and marine users. The Loran-C system serves the 48 continental states, their coastal areas and parts of Alaska.” The Loran-C network will remain in operation “for the short term.”

Zach Conover, president and CEO of CrossRate Technology (see Hardware), was the configuration manager for the North American Loran system when he was in the Coast Guard. He clarifies the definition of Enhanced Loran: “E-Loran is like WAAS-equipped GPS ... far more location-accurate.”

Concerning recreational boaters, there are two basic differences between Loran and GPS: First, Loran is ground-based; GPS is space-based. Second, GPS is low



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HOW LORAN WORKS

Loran works by comparing time differences between radio transmitters that are set up in a chain of three or more, separated by hundreds of miles. A chain will have one master transmitter and a series of secondary transmitters constantly transmitting signals with precise timing information. The Loran receiver compares the difference between the timing signals from the master-secondary transmitters and measures the difference. With this information, your position somewhere on a curved line from the transmitter can be determined. To find out where you are on the curved line, a second signal from another chain is required. The second chain indicates your position along a second line. The intersection of all the curved lines represents your exact position. This is essentially what GPS is doing from satellites. GPS measures the time the signal travels over a known distance among three satellites.

power (and thus the reason it's easier to jam), while Loran is high power.

On the other hand:

- Both offer excellent accuracy once you account for all the variables.
- With the new generation of e-Loran, this process takes place seamlessly, i.e., the machine does the necessary computations to tell you where you're located.
- It combines its input with the GPS input so that you really don't know what signal is doing the work; regardless, it puts you right back on the bow of that wreck

you maxed out on last time.

• The location of your Loran antenna isn't critical and can even be indoors, while a GPS antenna needs to "see" the sky.

• And, of course, when compared to GPS, Loran infrastructure represents a real bargain (\$400 million versus \$10.5 billion).

• While GPS may be more accurate when guiding you to a particular spot, Loran is much better at returning you to a spot you've previously visited (repeatability). That's why so many wily charter captains still like to use their old Loran-C sets. Enhanced Loran is going to make coastal navigation as dead-on as possible.

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A SOFTWARE ALTERNATIVE

Those of you who carry around your treasured old book of Loran numbers and want to convert them to GPS lat/lon (or vice versa) should take a look at two software programs. One developed by the U.S. Coast Guard has POSAID2 version 2.1a, a DOS-based program for converting Loran-C Time Difference (TD) measurements to latitude and longitude. Go to www.rdc.uscg.gov/posaid2/tabid/58/default.aspx. There are no guarantees or responsibilities borne by the Coast Guard for use of this program.

An alternative — and the best one around at that — is the conversion program by Andren Software (321-725-4115, www.andren.com). Their LoranGPS program converts waypoints from any Loran chain including old A and C chains to lat/lon for your GPS and can convert GPS readings to Loran TDs. It allows for precision calibration utilizing real-time local knowledge to adjust the correction factors. It can store 32,000 complete readings; display them in list or chart format; has a search function; can sort in a variety of ways; can print maps, charts or books; and can interface with Furuno, Garmin, Lowrance, Magellan, Northstar, Raymarine and Standard Horizon equipment. It retails for around \$85 and boasts several upgrade programs.

BOTTOM LINE

No one will say officially, and that includes DHS and the U.S. Coast Guard, but in Washington, the word on the street says e-Loran is a go.

"The unofficial word is that the decision *has* been made," says Conover. "Officially, we're waiting on someone's signature, but we should have a decision in the next couple of months."

I contacted several marine electronics manufacturers to ask if any had an e-Loran/GPS in the works. Garmin's senior communications manager, Ted Gartner, says, "We have nothing planned at this time, but we're keeping an eye on all emerging technologies, including e-Loran." And Liz Boal, who handles public relations for Raymarine, said the company is, "... keeping close tabs on the e-Loran subject but currently doesn't have any products planned."

FOR MORE INFORMATION

visit our Electronics section at www.sportfishingmag.com/electronics.



Loran is reborn as backup to GPS

Si-Tex's new sensor sidesteps the risk of signal jams

By Michael Crowley

It seems like the Coast Guard has wanted to get rid of loran C for some time now — which is probably why a number of electronics companies dropped loran receivers from their product line. And just when you thought well, yes, loran is history, the government reversed its stance this winter and not only will continue to fund loran, but it will implement a new generation of loran designed to be more accurate and have greater coverage.

That would be enhanced loran, or e-loran as it is being labeled. One of the few major marine electronics companies to offer an e-loran sensor is Si-Tex. The company's loran sensor is partnered with an independent GPS sensor inside a product Si-Tex calls the e-loran integrated GPS/loran receiver sensor.

A big reason e-loran is being promoted is because there is a crucial problem with GPS; it is vulnerable to interference and jamming. That became clear in the war in Iraq, where convoys were getting lost because their GPS was getting jammed,

says Si-Tex's Cindy Henderson. "But they found out you can't jam loran signals. So loran was a good backup system. The Iraq war is where e-loran came from," she adds.

Si-Tex, like other marine electronics companies had stopped manufacturing loran electronics. However, Koden, Si-Tex's parent company, was involved in a project to help develop e-loran, so Si-Tex knew the government was working on the new loran system. They developed their e-sensor based on that system.

With the Si-Tex e-loran integrated GPS/loran receiver sensor, you can find your way around with GPS or take advantage of the improved accuracy and repeatability in the loran system.

Si-Tex's e-loran works with the Si-Tex products ColorMax series, Explorer Plus, TrawlPlot 12SD charting systems, as well as P-Sea WindPlot II software.

Speaking of charts the Si-Tex e-loran can be hooked up with, latitude/longitude numbers can be converted to time differences — or TDs — but "to get the best accuracy when navigating to a location, you will want to use TDs from the



Si-Tex's new e-loran sensor is coupled with an independent GPS sensor inside this dome.

loran receiver and once in the vicinity of the target, drive those numbers down," says Si-Tex's Jim Lewis.

The new e-loran sensor from Si-Tex should also improve the accuracy of your autopilot's performance, and when interfaced with integrated Si-Tex navigation

equipment, help stabilize a radar overlay.

The Si-Tex sensor has a suggested retail price of \$999. Contact your local marine electronics store or Si-Tex 11001 Roosevelt Blvd., Suite 800, St. Petersburg, FL 33716; tel. (727) 576-5734; www.si-tex.com.