



UNIVERSITY OF NORTH CAROLINA

SEA GRANT COLLEGE NEWSLETTER

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105 1911 Building
NCSU, Raleigh, N.C. 27607 Tel: (919) 737-2454

Getting ready For LORAN-C

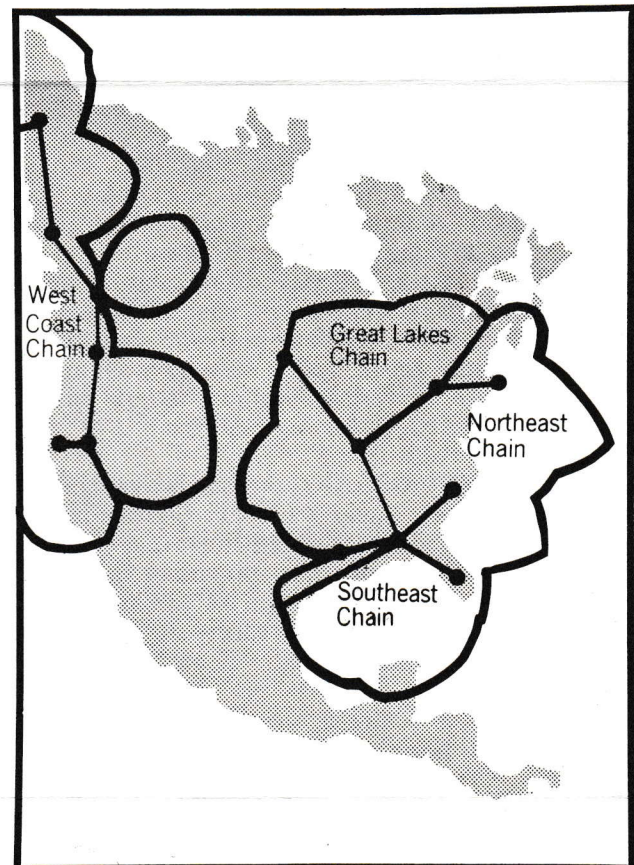
Here today, gone tomorrow. The saying doesn't apply to fashion design or pocket computers alone. It holds true for just about any product of technology. Take navigation. How many systems have been developed during your lifetime? Probably a lot more than you think. And while these changes have been for the better, they have created some problems for those caught in the transition.

That's one reason Sea Grant is working with the U.S. Coast Guard to help ease the burden of converting to the new LORAN-C system of navigation. Currently several systems of radionavigation are available along the United States. In addition to such private systems as Omega and Decca, the government sponsors LORAN-A and an older LORAN-C system. But by December 31, 1980, the new LORAN-C will be the only government-provided radionavigation system in the U.S. At that time all LORAN-A and older C services will be discontinued.

Converting to a new navigation system isn't as easy as pulling one plug and turning another one on. It means changes for everyone, and lots of them. From purchasing new equipment and navigational charts, to replotting and converting obstruction or "hang" locations, mariners throughout the U.S. will be affected by the switch over.

According to Lt. Commander David Carter, chief of the Coast Guard's LORAN-C Information Project, the decision to convert to a single system was made to avoid duplication and unnecessary expense. Navigational systems such as LORAN A and C, Omega and Decca were compared in detail on the basis of accuracy, efficiency of operation and cost to the mariner. And in 1974, the Department of Transportation selected LORAN-C as *the* government sponsored system of navigation.

Reaction to the selection was predictable. UNC Sea Grant Marine Advisory Agent Jim Bahen notes that many mariners, particularly commercial fishermen,



were already making the switch to C because of its greater accuracy and range. And while some objected to the costs associated with the conversion, most saw the switch to the more sophisticated system as inevitable.

Still, the actual transition will create some problems for mariners. Along the East Coast, existing "chains" or areas of LORAN-C coverage will be reconfigured once the new system is turned on this summer and next fall. That means marine operators already using LORAN-C will still have to convert their navigation charts and logbooks to the new system.

For LORAN-A owners, the conversion to C will require substantial investment in new equipment. (See "Easing," page 2)

Easing the transition

(Continued from page 1)

While several A models can be adapted for C use, the majority cannot. And there is some question as to the accuracy of converted models over long distances.

Currently Sea Grant and the Coast Guard are looking into ways to help make the transition as smooth as possible. Studies are being conducted at Oregon State University to see what kind of tax breaks, investment credits and capital improvement loans can be extended to mariners forced to buy new equipment as a result of the conversion. The Coast Guard is exploring the possibility of buying outmoded A systems from mariners who will not be able to use the equipment once the A chains are shut down.

In North Carolina, Jim Bahen is gathering information for a series of workshops he plans next year to help mariners learn about the new system, select the proper equipment and convert their navigation charts. To help with the conversion, the Coast Guard is developing a canned computer program which will enable marine operators to plug their old LORAN-A and C log coordinates into a desk-top calculator and automatically obtain the new C coordinates.

To further soften the impact of the switch over, most areas will be given a two-year transition period, during which both A and C will be available. Because of the way the transmission station network is set up, only the area including South Carolina, Georgia and northern Florida will be given one year, from 1979 to 1980, to make the conversion.

Currently the new LORAN-C coverage is available along the West Coast. Under the Coast Guard's implementation plan, the reconfigured Northeast chain will go into effect this summer, providing *new* C coverage from Canada south through North Carolina. Next fall a Southeast chain will be turned on and will cover the Gulf Coast and waters off southeastern Florida.

Once the LORAN-C chains are in operation, the Coast Guard will begin termination of LORAN-A transmissions. Carter emphasizes that the termination dates were carefully selected in an effort to minimize possible disruption of marine operations. Along the East and Gulf Coasts and the Caribbean, the shut off date is scheduled for December 31, 1980, coinciding with a relatively inactive season for boat use.

Although the A cutoff doesn't affect North Carolina for another two and a half years, Bahen is anxious for mariners to start thinking about the conversion now. He warns them against rushing out and buying a new C receiver if they already own a reliable A system which can be used in the interim. But, he emphasizes, mariners should be studying the market now to find out what is available and at what prices.

Sea Grant and the Coast Guard have prepared several booklets to help explain LORAN and the conversion timetable. For more information, write: LORAN-C Information Project, U.S. Coast Guard (G-WAN/73), Washington, D.C. 20590. Or write UNC Sea Grant for a free copy of "What You Should Know About LORAN-C Receivers."

From stars To satellites

Navigation hasn't always been the precision science that it is today. In earlier eras it was more an art than a science as sailors used landmarks, stars and intuition to grope their way around the coast, from one port to the next. Rarely did a ship venture beyond the sight of land. When it did, it was only through luck that it returned safely.

Celestial orientation has always played an important role in navigation. But through the centuries the overpowering desire to explore and chart the vast expanses of the oceans has given rise to more sophisticated tools of navigation. Though primitive by today's standards, poles and lines enabled ancient mariners to measure water depth. Later, the magnetic compass made it possible to measure direction day or night.

With the development of the sextant during the 17th century, the location of a ship could be even more precisely pinpointed. Eventually timepieces enabled navigators to plot longitudinal and latitudinal courses. Maps of the world, elaborately decorated with sea demons and monsters, were replaced with more detailed navigational charts, complete with degrees of longitude and latitude. Any gaps that existed were soon filled in as explorers continued to traverse the seas in search of adventure.

But it was not until the early 20th century that the science of navigation began to mushroom. Spawned by technology developed during World Wars I and II, radionavigation soon became a reality. Today radar and LORAN are as basic to ocean navigation as the compass and sextant once were.

What next?

Satellite navigation is already commonplace aboard most military vessels. And according to many navigation experts, it is simply a matter of time before the technology of satellite navigation is transferred to civilian use. Of course the cost of the system will have to be substantially reduced. And an expanded network of satellites providing continuous signal readout will also have to be developed. But these are the kinds of problems that technology could conceivably overcome in a matter of years.

If satellite navigation is the system of the future, what, then, will happen to LORAN-C? According to David Carter with the U.S. Coast Guard's LORAN Information Project, there's still plenty of time to worry about that. "LORAN-C," he states, "won't become obsolete before the year 2000."

Conversion from the consumer's Point of view

To most mariners deciding on a piece of navigational equipment is like choosing a car—it has to be dependable, easy to operate and maintain, and it has to fit into a budget.

Finding something that meets all those criteria isn't so simple. Anybody who has ever shopped for an automobile knows that it takes a great deal of research and time to find the "perfect" selection. The same is true when it comes to purchasing LORAN equipment.

There are, however, a few tips to keep in mind if you are in the market for a new LORAN-C system.

Probably the biggest question about LORAN-C is when is the best time to buy equipment. Should you buy a receiver now, or wait and gamble on the chance that prices will go down?

Unfortunately there aren't any pat answers. Currently prices for LORAN-C receivers range anywhere from a little over \$2,000 to about \$6,000. A year ago the least expensive models averaged between \$3,000 and \$3,500. A decade ago, even the cheapest LORAN-C receiver cost well over \$20,000.

Despite these downward trends, neither the Coast Guard nor LORAN manufacturers predict major price decreases in the next few years.

According to Carter, prices may begin to drop again once inland uses of LORAN-C, for such things as police, fire, ambulance and highway work, begin to catch on. But he emphasizes that this is an area that is just beginning to be explored and it will be several years before it has any impact on industry pricing.

Like many LORAN dealers, Ted Scott of Sea Coast Communications, Inc. in Wilmington tells his customers to wait to buy LORAN-C units until they are certain about the kind of receiver they want and can afford it. "I wouldn't recommend that anyone go out and buy a C today unless their A unit breaks and the cost of getting it repaired is excessive."

But for someone buying a LORAN system for the first time, virtually every dealer agrees it's best to go ahead and purchase the C unit now, especially since the new C signal will be available along North Carolina later this year.

To get the full benefit of the C system, the Coast Guard urges mariners to buy fully automatic receivers—receivers which will automatically pick up LORAN signals without the use of an oscilloscope and automatically track these signals through cycle matching.

Another important feature the Coast Guard recommends having on a unit is a blink alarm to alert operators to any errors in the signals being broadcast from transmitting stations.

To filter out "noise" or interfering signals, a receiver should also have notch filters. Ideally it should display at least two time difference readouts either simultaneously or alternately so that the operator does not have to go through the acquisition



Bahen: "Shop carefully, know your needs"

process each time he wants a signal.

Finally, the receiver should be a multi-channel set, enabling the operator to tune in on several different chains without changing the receiver internally. For example, along North Carolina a multi-channel receiver would let the operator pick up any chain in the East Coast.

When it comes to actually buying a system, the most important thing to remember is to select the unit that is best suited to your needs. If you are a recreational boater and use your vessel only three or four weekends a year, it's probably a waste of money to spend \$6,000 on a LORAN system that also measures "course made good" (distance traveled), travel speed, longitude and latitude.

On the other hand, a commercial fisherman should purchase a durable piece of equipment—one that can withstand constant, day in and day out use in all types of weather.

Always buy from a reputable dealer that offers complete warranty and installation service. Make sure you understand the operation of your equipment thoroughly before you use it. A mistake could cost a life.

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What is LORAN-C navigation?

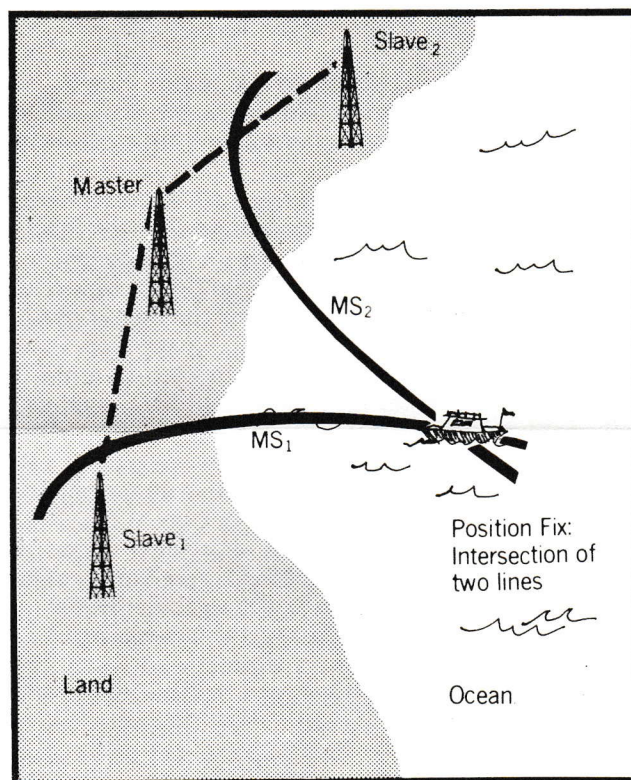
LORAN is an acronym for long range navigation. And while it involves some relatively sophisticated electronics, the principle of LORAN is based on simple trigonometry. Simply stated, a line of position is obtained by measuring the difference in time it takes to receive signals transmitted at synchronized intervals from two onshore stations—a master and a secondary or “slave” station. Location is further pinpointed or fixed by obtaining a second line of position through the use of another slave station and the same master station. Plotted on a chart, the point where these two lines intersect is the position fix.

Currently two types of LORAN are operating in the United States. LORAN-A was originally developed during World War II for military purposes and was later adapted for civilian use. The more recent LORAN-C was developed during the 1950s, also for military purposes, and has been available for commercial use along portions of the East Coast including North Carolina since the early 1970s. Last year C coverage was extended to the West Coast (both U.S. and Canada) and the Gulf of Alaska.

The primary differences between the two systems involve the frequency of signal transmission, the number of pulses each transmits and the way time differences between signals are measured. Because LORAN-C uses a much lower frequency (100 kHz) it has a much broader range of coverage with a greater degree of accuracy.

The C system can pinpoint locations within a quarter of a mile. And it enables mariners to “repeat” or return to within 50 to 300 feet of these sites. By contrast, A is only accurate to within one to five miles. Even this falls off dramatically at night when the high frequency signals are often “drowned out” by sky waves.

The major users of LORAN are boat operators who need a reliable, accurate navigational system for pinpointing their location and the location of bottom obstructions and favorite fishing areas. Obviously



not all mariners need LORAN for navigation. Along inshore waters, radar and depth recorders are adequate. A recent study by Sea Grant researchers at Oregon State University indicates that only 30 percent of the commercial fishing vessels along the East Coast are equipped with LORAN, primarily LORAN-A. The same study found that recreational boaters are the largest single group of LORAN users.

But it appears that the number of users is growing. In light of the new 200-mile fishery zone and heightened interest in offshore oil and mineral exploration, it is likely that it will continue to grow.

University of North Carolina
Sea Grant College Program
105 1911 Building
North Carolina State University
Raleigh, N.C. 27650

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