

The Migration to Enhanced or eLoran

Loran

Most of us are well aware of GPS' role in navigation, timing and frequency applications. Because GPS is vulnerable to intentional, unintentional, and natural interference, the United States and other governments have placed increased emphasis on technologies that can mitigate overdependence on GPS in these critical applications. Loran is very complementary to GPS and can backup GPS in multiple applications. While GPS technology is satellite-based and high frequency, Loran uses ground-based transmitters and is low frequency. Loran signals are very high-powered, so they penetrate cities, buildings and densely foliated areas where low level GPS signals are often blocked. From a practical perspective, Loran is virtually unjammable because of its high power.

What is Enhanced or eLoran?

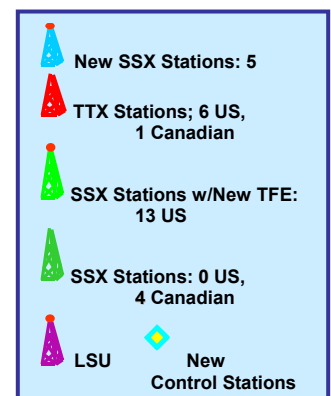
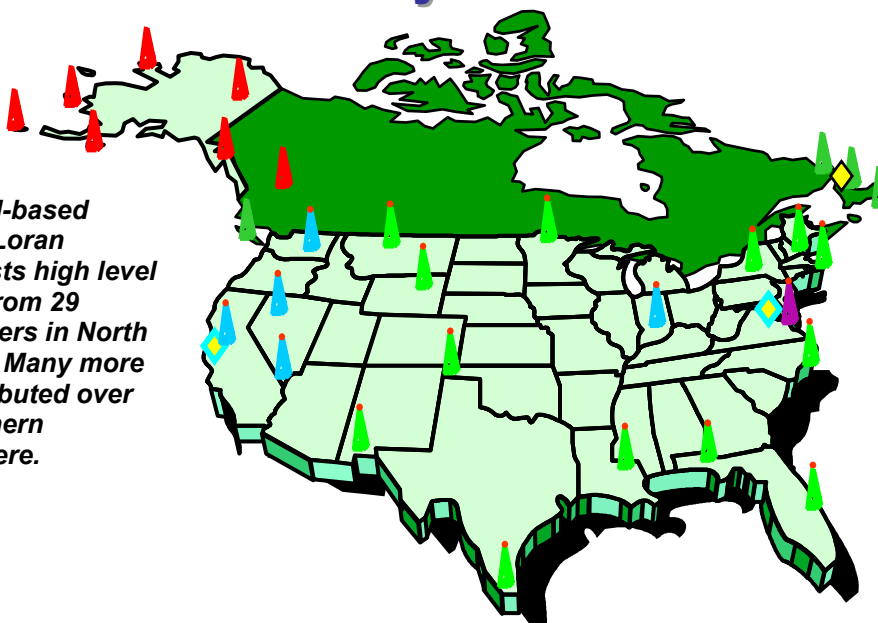
Enhanced, or eLoran is a Loran system that incorporates the latest receiver, antenna, and transmission system technology to enable Loran to serve as a backup and complement to global navigation satellite systems (GNSS) for navigation and timing. This new technology provides substantially enhanced performance beyond what was possible with Loran-C, eLoran's predecessor. For example, it is now possible to obtain absolute accuracies of 8-20 meters using eLoran for harbor entrance and approach. Similarly, eLoran can function as a highly accurate frequency source and as an independent source of coordinated universal time (UTC). An eLoran transmission infrastructure is now being installed in the US, and a variation of eLoran is already operational in northwest Europe. There will be a global evolution towards eLoran, and users can anticipate integrated eLoran/GNSS receivers in the near future for a variety of applications.

eLoran's Role in US Timing and Frequency Applications

As summarized below, the US Loran infrastructure is now being modernized with state-of-the-art control equipment. Each transmitter uses 3 new Cesium (Cs) standards that are ensembled with GPS receivers and tightly synchronized to GPS time. Since 29 Loran transmitters operate in North America, this network of 87 Cs now constitutes the largest distributed primary clock system in the world.

North American Loran System Modernization

As a land-based system, Loran broadcasts high level signals from 29 transmitters in North America. Many more are distributed over the Northern hemisphere.

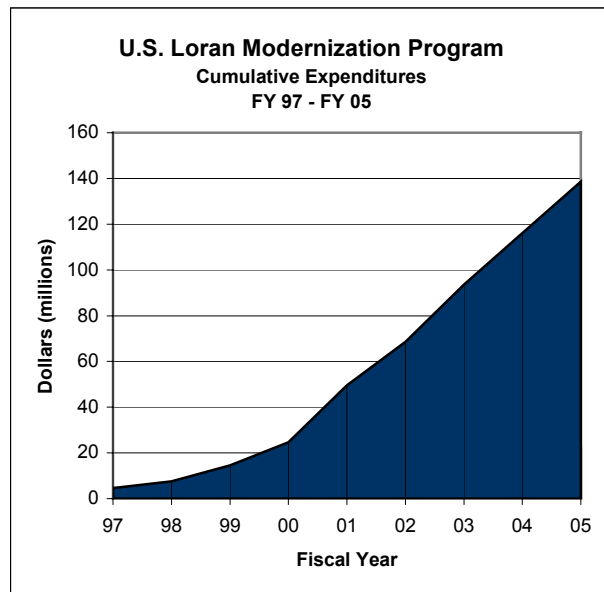


All transmitter and control stations in the continental US are complete, including new Time and Frequency control Equipment (TFE)!

One recent US study investigated the time recovery possible with “common-view” Loran, a technique very similar to common-view GPS. That investigation suggests common-view eLoran can provide 25-50 nanosecond (RMS) time recovery and is a viable method to backup precision time recovery by GPS. Furthermore, it indicates that common-view Loran is the only method (except GPS) to provide < 50 ns timing anywhere in the US, which bolsters Loran’s role in critical infrastructure support. It is already well documented that Loran can provide better than Stratum 1 (1×10^{-11}) performance for frequency applications, and the UK’s prestigious National Physical Laboratory recently demonstrated eLoran can achieve 2×10^{-13} in one day.

eLoran Today

Over the past several years, the US Congress has provided approximately \$140 million for eLoran infrastructure upgrades, and will approve additional modernization funding for FY2006. This Loran modernization program also involved technical studies by the US FAA and Coast Guard to determine if eLoran can meet their stringent performance criteria, and a benefit/cost study by the Volpe Center. The technical report* on these studies was released in December 2004, and a summary (Appendix C) states: “*Both the technical evaluation and the benefit/cost study strongly support retaining a modernized Loran-C system as a part of radionavigation systems provided by the US government.*” This report underscores a bright future for eLoran products throughout the world.



eLoran’s Future

In today’s age of technology, and given the changing political and economic conditions which affect our world, many people and their governments recognize that “putting all your eggs in one basket” is rarely a good idea. The idea of GPS as a sole-means solution for timing and frequency applications doesn’t make sense, as the consequences of interruption would be severe. The synergistic nature of Loran and GPS will ensure the continued operation, efficiency and security of critical infrastructures around the globe.

Locus, Inc. leads the evolution towards eLoran technology and has the highest performance eLoran receivers for time, frequency, and navigation applications. We are encouraged by the research and data emerging from on-going evaluations of eLoran technology, and Locus expects this new era of positioning and timing technology will include the undeniable benefits of eLoran.

*To obtain a copy of the technical report or a summary of it (Appendix C), or to learn more about Locus, Inc., see www.locusinc.com/news_event.html.