

A New Era for a New Loran

Why Loran and e-Loran?

Over the last several years, while the nation migrated away from a sole-means GPS approach to critical infrastructure operations, Loran changed in a substantial way, rapidly evolving into a modern system that can provide unprecedented capabilities as a GNSS backup in numerous critical infrastructure operations. Over these same years, the FAA identified Loran as “the best theoretical backup” to GPS, and rigorous studies of a modern Loran system have removed the “theoretical” qualifier. Today, we are entering a new era for a new Loran, now referred to as “enhanced” or e-Loran. In this brief article, I would like to summarize what is going on and what we might expect in this e-Loran era.

To frame this issue, let me begin by emphasizing that there are national concerns beyond aviation behind this movement towards e-Loran. In a 2003 FAA, USCG, and DOT agreement, the parties “acknowledged that GPS is indeed vulnerable to intentional and unintentional interference and that backup systems are required....,” and identified timing as another part of our critical infrastructure. Timing is essential to the secure and continued operation of telecommunications, power, and financial infrastructures and is primarily based on GPS. Loran is also an extremely good timing source, so it can support the national infrastructure here as well.

However, from an aviation perspective, there are more reasons why Loran is considered “the best theoretical backup” to GPS. Loran is an area navigation (RNAV) system like GPS. Therefore, future navigation and landing procedures would be consistent between GPS and e-Loran, which is why e-Loran has to meet required navigation performance (RNP) standards for non-precision approaches (NPAs). RNAV is a key capability in the transition from the current, highly structured air traffic control system to the future “free flight” system envisioned by the FAA. Moreover, consistency in equipment and procedures ultimately translates into economic benefits for users and providers.

The e-Loran Technical and Cost/Benefit Studies

Since GPS requires a backup, Loran was an obvious candidate because it is the only other multimodal system, does not share vulnerabilities with GPS, and is inexpensive. Because e-Loran offers so much potential, the FAA and USCG have been conducting studies to determine the reality behind that potential. An experienced team of experts performed evaluations to determine if e-Loran could meet FAA NPA requirements and USCG harbor entrance and approach (HEA) requirements, and provide additional benefits to the nation, such as timing.

A report on the Loran technical evaluation was completed in March 2004 and states: “The evaluation shows that the modernized Loran system could satisfy the current NPA, HEA, and timing/frequency requirements in the United States and could be used to mitigate the operational effects of a disruption in GPS services, thereby allowing the users to retain the benefits they derive from their use of GPS.” So, e-Loran has met the necessary technical requirements.

However, e-Loran also has to be cost effective. To address that issue, the DOT's Volpe Center conducted a cost/benefit analysis of Loran, which has not yet been made public. Nevertheless, earlier Loran economic studies were positive, and modernization towards e-Loran has made substantial progress. Congress has funded approximately \$120 million to bring Loran into the digital world, and in my opinion, the end result should be a model for cost-effective use of government resources. After modernization, the e-Loran system will have annual operations costs of about \$15 million. This is a remarkable figure, particularly because e-Loran will provide benefits to aviation, marine, terrestrial, and timing applications, benefits that single modal systems can never provide.

Where We Stand Today

The DOT will use the Loran technical and economic studies to decide the future of Loran, and has indicated they will issue the decision this July. Other government documents have already set the stage for the decision. A January 2004, DOT report identified Loran as the only multimodal and best theoretical backup to GPS, recommending: "If enhanced Loran meets the aviation NPA and maritime HEA performance criteria, and is cost effective across multiple modes, the Federal Government should operate Loran as an element of the long-term radionavigation system mix." That report also looks forward and identifies Loran as a backup for the new Automatic Dependent Surveillance – Broadcast (ADS-B) system and the new marine Automatic Identification System (AIS), both of which will be widely used. Finally, the report suggests exploring the collocation of GPS augmentation and Loran facilities, which would not only maximize synergies but also minimize costs.

World Interest

The Loran decision will set an important global precedent. Several European countries are now reconsidering their Loran position. France will expand its system and the UK will install a Loran transmitter this fall. The Royal Institute of Navigation (RIN) also released a strong Loran endorsement, stating GNSS should never be used alone in safety critical situations, and identifying Loran as the best backup for all modes of transportation.

There is also significant interest in other parts of the world. For example, at a meeting in Japan last fall, representatives from Japan, China, Korea, Russia, Europe and the US were asked to address the question of GPS vulnerabilities. Virtually the entire conference focused on one system: Loran.

Implications for the Future

So, serious efforts by many talented individuals have brought us to a Loran decision point. And while this decision will be made on technical and economic merits, an endorsement will ultimately have a significant impact on users, manufacturers, and nations. Because Loran is multimodal, manufacturers can develop core e-Loran technologies appropriate for multiple markets, just like GPS. Multiple markets mean economies of scale, lower prices for the users, and better cost/benefit for providers. But in addition, I believe an endorsement will foster a period of intense integrated system development. GPS/Loran integration work is already underway for aviation, marine, and timing applications. The e-Loran studies have demonstrated that integrated systems can provide better accuracy, availability, integrity, and continuity than any one

technology, and unprecedented performance in multiple applications. I would also suggest that these studies provide a clear indication that integrated systems will ultimately result in safer flying, safer infrastructures, and in safer and more secure nations.

In conclusion, this is an exciting time for Loran. I am looking forward to the DOT's decision, and expect that we are about to enter a new era for e-Loran.

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