Governance and Execution

US Complementary PNT System

The request to which we are responding on this docket asks specific questions about the need for and potential use of an eLoran system as a complement/backup for GPS. We are addressing those specific questions for six critical infrastructure sectors separately.

This comment assumes that, if the system is established, the federal government will lead the effort.

Were it to be established, success or failure of an eLoran system in helping to protect critical infrastructure will depend upon the way in which the system is created, operated and governed. We strongly recommend that the following criteria and attributes be included.

- **A government commitment to maintaining a signal on air for 20 years** beginning when the precise time signal is first available across the continental United States. This is necessary to:
  o Encourage users to incorporate the signal, along with GPS, in their enterprise systems to increase resilience, and
  o Enable return on investment for a private entity that might contribute to establishment or enhancement of the system

- **Allowed, but not required, use of legacy government-owned legacy Loran-C sites, facilities, and in-situ and other equipment**
  o This will provide the quickest path to establishing the system and reducing risk to our critical infrastructure by minimizing the time needed for site acquisition and permitting
  o The government should also make a search for and make available any unused relevant equipment that is not in-situ.

- **A single, empowered government executive agent**
  o Government infrastructure and equipment that could be used is owned by at least seven different agencies/departments.
  o Governmental equities, interest and use of the system will span all agencies and departments
  o A single and empowered agent is required for the system to be cost-effectively built and operated.

- **A service-level, performance based contract/agreement to build and operate the system**
  o eLoran is a mature technology now in operation elsewhere. It is therefore very low risk with no need for development before implementation. The government need only specify performance requirements and establish a small staff to monitor contractor/private partner performance.
  o The contract/agreement should include use of the allotted frequency band and facilities by the private party to provide additional services, absent the objection of the government executive agent. Responsibilities for any additional costs and disposition of any revenues should also be addressed.

- **Day-to-Day Operation and Management by an Empowered Non-government Entity**
  - eLoran will be a new national IT utility. Its greatest benefits may be realized by unanticipated users and unanticipated uses. The operator/manager of the system should be able to adapt/modify the system to increase its utility to the nation, as long as the baseline required performance parameters are unaffected.
  - A governmental management entity would probably be unable to be as responsive to innovative users.

- **Maximized automation and autonomous operation**
  - The government should mandate performance, not staffing levels. The system should be highly automated to minimize cost and maximize performance.
  - Each of the transmitting sites should be fully autonomous using triply redundant, hot-swappable, and soft-fail technology. This will require only a part time, on-call technician.
  - Transmitting sites should be well secured as they are not staffed and many are in remote locations. More than one of the deactivated Loran-C sites has been vandalized or stripped for scrap metal.

- **An open architecture that other entities can supplement**.
  - Other governmental and private entities may wish to improve/augment service in a particular area by establishing additional primary and/or differential transmitters. System architecture and governance should anticipate this. It should provide a mechanism to coordinate such efforts to ensure they improve, and not conflict with, existing service.

- **Harmonization of the US system with that of other nations.**
  - This will be key for receiver manufacturers and enthusiastic adoption by users.
  - This will require US government agencies and their contractors to actively engage with international standards bodies such as IALA, IMO, IEC, RTCM and RTCA.

- **Phased implementation beginning with provision of CONUS precise time**
  - Provision and adoption of eLoran's difficult-to-disrupt, precise, synchronized time signal will have the greatest and most immediate impact to reduce the risk to critical infrastructure from reliance on GPS as a sole or primary PNT source.
  - Only four or five transmitting sites are needed to provide an eLoran precise time signal to the entire continental United States (CONUS). Eight to ten transmitting sites would ensure that CONUS users would have access to signals from at least two sites. When paired with GPS, this would provide users three independent, but synchronized, sources of time, frequency, and phase, and two sources for data via eLoran.
  - Ten CONUS transmitting sites could be on the air in less than a year (after the contract was sufficiently funded and executed), if existing infrastructure and equipment were used.

o Several additional sites per year could be easily built in CONUS, funding permitting. These would enable location-based services and provide addition resiliency for critical time, frequency, phase and data applications.

o It could be mutually beneficial for Canada and/or Mexico to host eLoran sites that support the first CONUS phase of the project. This could improve the geometry for the US, and help those nations begin to develop their own systems to complement GPS.

o Providing eLoran services in Alaska, Hawaii, Guam, and Puerto Rico will be in the nation's best interests for both infrastructure and transportation. This should be the second major phase of the project. While the logistics may be more complex and costly, establishing the service will not be a technological challenge. In fact, these areas were served by earlier versions of Loran (Loran-A and Loran-C).

- **Additional mechanisms to encourage use of the signal,** especially integration into critical infrastructure and systems.
    o An underlying presumption of the DOT request for comments is that constructing a eLoran system will be for naught, if the signal is not used. The larger goal is to increase national security and resilience. This requires not only that they system be built, but that the signal be used.

    o Government has a leadership role to encourage resilience, particularly for critical infrastructure and systems. Once the eLoran signal is available, due diligence, economic, and legal liability should compel widespread use, alongside GPS and other sources. Appropriate government agencies and department should also encourage and facilitate adoption of eLoran and/or other PNT resilience measures through establishment of best practices, regulations (not preferred, but if needed) and other mechanisms.