February 2021

UrsaNav Comments on Complementary PNT and GPS Backup Technologies Demonstration Report – DOT Report Number DOT-VNTSC-20-07 dated January 2021

OBSERVATIONS

We are pleased to have been selected as a participant in the US Department of Transportation demonstration on complementary PNT and GPS Backup Technologies. The demonstration was concluded in March 2020, and the long-awaited report was released in January 2021. It is encouraging to note that the US recognizes that a System-of-Systems approach is required to meet the diverse requirements of PNT users. To quote from the report:

> "The findings indicate that the best strategy for achieving resilient PNT service is to pursue multiple technologies to promote diversity in the PNT functions that support transportation and other critical infrastructure sectors."

Unfortunately, the report's recommendations do not follow through on this key conclusion. Rather, it only calls for further study or to "…develop system requirements for PNT functions that support safety-critical services."

Each participant demonstrated their technology under Government observation. However, the differences in testing environments and criteria for various technologies would be fatal in an acquisition or technical study, and any outcomes should be taken merely as considerations.

REPORT HIGHLIGHTS

The report highlights the great diversity in available technologies. UrsaNav, as a worldwide provider of Low Frequency PNT solutions, demonstrated eLoran. A mature technology, with proven performance for all modes and all users in all environments, commercial and military, eLoran is based on recently updated SAE International standards and uses internationally available and protected spectrum. eLoran is also the only standardized, terrestrial solution available that provides very wide-area coverage. The report recognizes the cost-effective nature of making eLoran a foundational component of a national System-of-Systems approach to PNT.

We would like to highlight the "Service Coverage per Unit of Infrastructure" Measure of Effectiveness (MoE) in the report. Although the Figures are somewhat misleading (e.g., only one eLoran transmitter was broadcasting, not two), this MoE clearly shows that eLoran coverage per unit of infrastructure is several orders of magnitude better than any other terrestrial PNT solution. Simply put, eLoran is the lowest cost terrestrial solution per million square miles of coverage. Because eLoran signals propagate over very long distances, its signals are useful at over 1,000 miles radius from a transmission site on land, and 1,500 miles at sea. eLoran also provides 2D coverage to the upper limits of the National Air Space, and 3D coverage when integrated with barometric sensors. Redundant eLoran timing (and data) coverage for the entire contiguous US is possible using from four to ten transmission sites, depending upon accuracy and precision requirements. Other terrestrial technologies would require thousands of transmission sites to provide similar coverage.

Many will notice that the report does not include eLoran positioning demonstrations and performance measurements. Our responses to the DOT solicitation included demonstration of eLoran timing *and* positioning capabilities. It is unknown why the DOT did not want a demonstration of eLoran's positioning capability. We can postulate that it was because eLoran positioning (and timing) has been operationally studied, demonstrated, and tested globally by governments, academia, and industry since its inception in the mid-1990's. We also did not have the opportunity to demonstrate eLoran's additional features: secure "short message service" data transmissions using one or more data channels, usable signals under water, or True North azimuth to within two milliradians, without moving. More importantly, there were no demonstrations conducted in jamming or spoofing environments, which is a requirement in the 2018 NTRSA. Government tests in the US and UK have proven that eLoran performs successfully in heavy GPS jamming and spoofing environments.

It is well known that eLoran is more than a wireless, wide-area time synchronization and distribution technology. eLoran also provides positioning that can achieve 10m-20m accuracy over very wide areas. Sub-10m positioning accuracies were achieved during UK Interim Operational Capability trials. While we were not allowed to demonstrate the positioning and navigation capabilities of eLoran, we were pleased to demonstrate that eLoran is capable of better than 100ns timing accuracy over very wide areas in diverse environments, including inside buildings.

CALL TO ACTION

We are not proponents of having eLoran as a standalone complementary or backup system. We have always been strong advocates of the System-of-Systems approach currently planned in the US, UK, and other countries. Any well-designed resilient PNT solution would include a strong space component (i.e., GPS et al), a very wide area ("continental") terrestrial component (i.e., eLoran), one or more Metropolitan Beacon Systems, and a fiber backbone whenever possible. Additionally, localized wireless solutions, such as 4G or 5G NR, might fulfill niche requirements.

The Government should release a performance-based solicitation for these complementary services. It is obvious that - after waiting 17 years for the market to address the issue - more Government leadership and market motivation is required. The alternative is to continue to wait. This is not to say that the Government should be the provider of these services; they should, instead, become the "anchor customer", subscribing to the services on behalf of citizen users. With a subscription commitment, the Government provides the necessary layers of PNT resilience for Critical Infrastructure / Key Resource Sectors, national security, and protection of economic growth. Of equal importance is accepting its role as a global leader in the provision of resilient PNT and stimulating industry to provide value-added products and services to their customers.

We are confident that resiliency and diversity are the keys to addressing current PNT risks. As evidenced in the DOT report, the technologies exist today to solve this problem. We urge the Government to act. Congress should:

- Insist DOT release an RFP this FY for subscription services that would begin as signals become available, and
- Provide FY22 funding to DOT to enable fulfillment of the NTRSA requirements.