

Statement of Mr. Dana A. Goward
President and Executive Director
Resilient Navigation and Timing Foundation

House Subcommittee on Coast Guard and Marine Transportation
Hearing: "Finding Your Way – the Future of Federal Aids to Navigation"
February 4th, 2104

Mr. Chairman, distinguished members of the committee, thank you for the opportunity to speak with you today about the future of federal aids to navigation. I am Dana Goward, President of the Resilient Navigation and Timing Foundation, a 501(c)3 scientific and educational charity dedicated to *"Helping protect critical infrastructure for a safer world."* Our officers and members are retired senior government officials, members of academia, industry leaders, and professional associations - all of whom understand navigation and timing issues, and their importance to the nation.¹

The federal GPS satellite navigation system revolutionized navigation and timing services in the US and around the world. Highly precise and free for use by all, it has been so successful and widely adopted that it is now an essential utility for many facets of life in America. At the same time it has become a potential single point of failure for our society. Cell phones, the internet, financial systems, power distribution, agriculture, most all forms of transportation – all use and need GPS. It has become essential technology and transportation infrastructure. As a result, If GPS is ever substantially disrupted, it could have serious impacts.

Dr. Brad Parkinson, widely regarded as the 'father' of GPS has said that "Reliance on satellite navigation and timing systems has become a single point of failure for much of America and is our largest, unaddressed critical infrastructure problem."

This is because GPS is a distant, faint signal that is very easy to disrupt. In fact, it is being actively disrupted every day. Fortunately, most of these disruptions are very local and of short duration. Occasionally, however, they cause economic loss and can threaten safety of life.

In 2009, authorities at Newark International Airport noticed that a newly installed landing system would periodically malfunction, but were at a loss to explain why. After much effort by the airport, the FAA and the FCC, they finally traced the problem to a man with a GPS jammer regularly driving past the airport on I-95. The driver had purchased the inexpensive and illegal jammer on line and was using it to keep his employer from tracking his movements each day. According to press reports, the airport continues to detect jammers passing by on the highway about five times each day, though fortunately they do not often disrupt important safety systems.

GPS has also been jammed by foreign governments. Though much of such information is classified, it has been publicly reported that North Korea has interfered with GPS as a way of provoking their neighbors to the south. Also, the US Army Office of Foreign Military reports that Russian military

¹ More information about the RNT Foundation, our leadership team, and our proposals is available at www.RNTFnd.org.

doctrine recognizes the ease of jamming space-based signals like GPS, and assumes space services will not be available to their forces during a conflict.

Besides jamming by foreign governments, the threat of GPS spoofing also presents a real and present danger. Professor Todd Humphries of the University of Texas has used spoofing to take control of ships and drone aircraft. By transmitting false GPS signals he has been able to make the ships maneuver and the aircraft fly at his command. He has also written convincingly that financial markets could be manipulated by interfering with the GPS time signal.

The federal government has long recognized GPS vulnerabilities and the risk they pose. In response to presidential direction, and after much deliberation, the government announced in 2008 that it would establish a nation-wide, resilient terrestrial system to augment to GPS, called eLoran. This new, eLoran system would build upon and modernize the Cold-War vintage Loran-C system, be much less expensive to operate, and much more precise. Unfortunately, even though this course of action was agreed upon and endorsed by every federal department involved in its implementation, the plan has still not been carried through.

Meanwhile, many of America's allies, competitors and adversaries have not only recognized the risks of broad reliance on satellite navigation and timing signals, but have been taking action to mitigate those risks using the same technology the US decided to implement. Most of northwestern Europe is serviced by an eLoran system led by the United Kingdom and supported by several other nations. China has retained its Loran system to support critical infrastructure resilience and may upgrade to the eLoran standard. South Korea and India have both budgeted to build new eLoran systems. Saudi Arabia is upgrading its Loran system to eLoran, and Iran has established a terrestrial system that appears to be very much like eLoran. Russia is also upgrading its legacy Loran system (called "Chayka") to eLoran. They are working with the British on this project and will use the new system to, among other things, help ensure safe navigation in the Arctic. The Russians are also building a portable version of eLoran for their military called "Skorpion," because, as I mentioned earlier, they believe that, in almost any combat scenario, signals from space will be jammed as a matter of course.

Establishing an eLoran system in the United States will help protect our critical infrastructure and provide a new utility which entrepreneurs will use to establish new business, products and services, contributing to job creation and economic growth. For example, since the eLoran signal penetrates underground, underwater and indoors, it can be used in many locations where GPS cannot, and could be a valuable asset for first responders. It can also carry data to such locations. This could be especially important for national emergency and continuity of operations communications, and for applications such as positive train control. These are very desirable features and we have already had inquiries from those who would like to build upon the technology.

This system could also save the federal government money by allowing us to finally move navigation from the industrial age into the information age. Although GPS has shown us the way, it is a single point of failure and federal agencies have been unable to take best advantage of the economies that electronic navigation brings. For example, the FAA still maintains an expensive GPS backup system of over 3,000 short range terrestrial beacons that has its roots in the 1950's. In the maritime world, the US Coast Guard spends over a billion dollars a year maintaining over 50,000 buoys, lights, beacons and other visual aids to navigation, some number of which might be eliminated if federal electronic

navigation signals were more robust and resilient to unexpected disruptions, whether natural or manmade.

The RNT Foundation's position is that establishing an eLoran system is in the nation's interest. It could help us avert disaster if GPS is ever disrupted or compromised for any significant period. And it is relatively inexpensive. By repurposing existing, unused Loran infrastructure (towers and land), we believe that such a system could be created in the continental United States for approximately \$40M, and operated for about \$16M a year. Timing services could be established within a year of funding and would begin to dramatically reduce the risks in most critical infrastructure sectors. Preliminary navigation services would be on air within two years, with full system capability realized in less than four years.

The RNT Foundation also believes that this project could be most economically and effectively completed as a partnership between the federal government and a commercial or non-profit entity, and have proposed such an arrangement.

Unfortunately, instead of preserving the infrastructure needed for such a project, the Department of Homeland Security is tearing it down. Losing this infrastructure will likely double or triple the eventual cost to develop an eLoran system.

The single most important thing the Congress could do right now to start solving this important issue, is to persuade DHS to halt destruction of the infrastructure.

This is an important transportation infrastructure, IT and communications infrastructure, national and homeland security issue that our nation must address. The RNT Foundation wants to help in whatever way we are able. We would be equally happy to be the "private" partner in public-private partnership, or to provide other appropriate support. The important thing for America is that it gets done.

I have provided your staffs with copies of two reference documents that I hope will be of further interest.

The first is a white paper by the National Space-Based Position, Navigation and Timing Advisory Board. This group is chaired by former Secretary of Defense James Schlesinger, and co-chaired by Dr. Brad Parkinson. The paper is titled "Jamming the Global Positioning System - A National Security Threat: Recent Events and Potential Cures." This 2010 document does an exceptional job of outlining the problem and making recommendations for action. It heartily endorses implementation of the government's 2008 decision to create an eLoran system and urges prompt establishment of the system. There have been numerous US government and academic studies that have come to the same conclusion, but this one by the Advisory Board is an excellent summary. Additional reference material is available on our website, www.RNTFnd.org.

The second document is a copy of the article "The Low Cost of Protecting America" which appeared in January's "GPS World" magazine. In addition to outlining the problem, it explains the business case for creating an eLoran system in the continental US as a public-private-partnership.

Thank you again for your interest and the opportunity to speak with you today. I am happy to get your views and questions on this important issue.