



# Loran Lines

December 2010

Newsletter of the International Loran Association

Volume 2010-1

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## With Loran no longer available, where is the backup for GPS ?

Along with many other publications for the aviation and the marine navigation community *The Working Waterfront* and *Inter Island News* published by the Island Institute of Rockland, Me., has expressed a deep concern over the critical gap in navigation resources produced by the sudden governmental decision to discontinue Loran-C. This action was made in spite of the findings of several select and highly qualified independent review boards which recommended that eLoran be established as a backup to GPS.

Comments have been made that in the event of a loss of GPS the mariner would revert to traditional methods of navigation and position plotting using visual bearings and radar ranges interpreted on a paper chart. Assuming that a ship's crew has retained personnel with the requisite expertise and experience to accomplish this task, such a remedy for the loss of GPS might be feasible as a temporary alternative for a small craft operating at low speeds. For large vessels and vessels operating in restricted waters at high speeds depending on this course of action would be both impractical and dangerous.

The next major improvement in navigation is heralded by the growth of world-wide plans and ambitions to move to an all eNavigation frame of reference.

The International Association of Lighthouse Authorities (IALA) defines eNavigation as "The harmonised collection, integration, exchange, presentation and analysis of maritime information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment."

Reliable and precise position information is essential to eNavigation. It is assumed that GPS or an equivalent GNSS will provide the core reference for eNavigation systems. Prudent navigators and planners are well aware of the need of a complementary back up. Any primary source must have a secondary or backup system

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## Langhorne Bond to chair Special Committee to propose future strategy and action for ILA

I'm sure we all know how easy it is to be so busy that we almost forget an important date – perhaps a birthday or an anniversary. So here's one for your diary: our International Loran Association will be 40 next year!

Over the last 40 years the ILA has been highly successful as the focal point for developing Loran technology and for advocating its use and relevance worldwide. Its contribution in the broad positioning, navigation and timing (PNT) world has been invaluable.

As part of its birthday preparations, the ILA's Board of Directors has set up an ILA2020 sub-committee to propose a ten-year strategy and action plan for our organisation. The sub-committee's terms of reference include: considering the broad context in which the ILA operates; reviewing the ILA's mission, vision and objectives; and assessing potential future operating scenarios. It is expected that the sub-committee will consult widely.

This is about taking ownership of our future and so is extremely important. I would like to thank our immediate past-president, Langhorne Bond, for agreeing to chair the sub-committee. I would also like to thank Mr. Jim Doherty, Professors Sunny Gug and David Last, and Mr. Chuck Schue for agreeing to be members.

Please give them all your support.  
Sally Basker

# International Loran Association

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ILA members who have not yet paid this year's dues are asked to do so now. Membership forms can be downloaded from ILA's website:

[www.loran.org/Membership/FormIndividual.htm](http://www.loran.org/Membership/FormIndividual.htm)

or

[www.loran.org/Membership/FormCorporate.htm](http://www.loran.org/Membership/FormCorporate.htm)

Please note ILA's web site address: [www.loran.org](http://www.loran.org)  
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The ILA encourages readers to submit material for publication. Any and all news related to Loran and ILA members is welcome. Send information (with pictures, if possible) to either of the co-editors:

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## Backup for GPS?

*Continued from page 1*

available in the event of the degradation of the quality or loss of the GPS signal. As eNavigation guidance for shipping moves to be the state-of-the-art solution for large vessels such as oil tankers and ferries, the International

Maritime Organization (IMO), a specialized agency of the United Nations with 169 Member states and three Associate, responsible for the establishment and enforcement of regulations concerned with safety of life at sea, will undoubtedly insist that a clear and independent second source of navigation data be available. Enhanced Loran

(eLoran), which provides accuracy comparable to GPS using an "all in view" mode, collecting data from a large number of terrestrial reference transmitters for analysis and comparison, has been proposed as the most effective candidate to fill this role of back-up to GNSS.

## PPD devices pose jamming threat to GPS

The November-December issue of *ATC Reform News* reports on the harmful effects of personal privacy devices (PPD) used by truckers on the New Jersey Turnpike on the introductory installation of the first Ground Based Augmentation System (GBAS) at Newark airport. PPDs are GPS jammers that can be purchased inexpensively and used to defeat fleet tracking using GPS and to hide the vehicle location from a fleet dispatcher. Such devices are not new and have been easily available for years. Dr. James Carroll (Volpe Center DOT) in a paper presented at a meeting of CGSIG in Salt Lake City, Utah, USA, on September 10, 2001 warned of the ease with which the low energy satellite signal can be masked either accidentally or by design.

GBAS is one of the initial elements planned for NEXTGen, the ATC System of the future. GBAS can provide precision navigation to the ends of all runways at an airport, including those where space restriction do not permit an ILS.

The situation which arose in Newark demonstrates once again the vulnerability of GPS to intrusive signals. Such signals can also arise from equipment malfunction, deliberate attempts to deny GPS to all users in an impacted area, or as in this case the careless (and illegal) use of equipment by those ignorant of, or indifferent to, collateral consequences.

Other proposed uses of GPS in connection with highway use such as road taxes have rapidly proliferated and can only increase the motivation to defeat the tracking capabilities of on-board GPS transponders and provide an increasingly pervasive threat to all related equipment.

A significant effort over a period of time was required to locate the sources of the New Jersey jamming incident and only one offender was positively identified, with the potential for many more on the road. For this reason the National PNT Advisory board has urged the formation of an agency to promptly locate and prevent the illegal operation of these devices.

Beyond these efforts to prevent such serious intrusions into the GPS spectrum, an effort which can at best be only partially successful, is the urgent need to provide a seamless backup network which can act as a second source of navigation and timing data, a second opinion against which to judge the reliability of the basic GPS system. Recognizing this aspect of the problem, the PNT Board has also urged the renewal of efforts to re-deploy eLoran as a low frequency ground-based navigation system operating in a clearly different propagation mode than satellite systems.

## Relocations :

Dr. Sally Basker, President of ILA, formerly with GLA General Lighthouse Authorities, Trinity House, is now Director of Sally Basker Consulting where she is engaged in a number of new and exciting opportunities. Her many friends and colleagues in the navigation community wish her all the best in this new enterprise. Her e-mail contact is now [sallyb@baskerconsulting.com](mailto:sallyb@baskerconsulting.com).

Tamotsu Ikeda, member of the Board of Directors of ILA, has moved to the Japan Aids to Navigation Association where he is Chief Executive Director. His e-mail address is [ikeda\\_t@jana.or.jp](mailto:ikeda_t@jana.or.jp).

Carl Andren, longtime member and officer of ILA has retired from his position of Technical Director at the Institute of Navigation (ION). His new e-mail address is [carl\\_andren@verizon.net](mailto:carl_andren@verizon.net).

## **Senate version of DHS Appropriations Bill may include support for GPS backup**

Senate Report 111-222 relating to the Department of Homeland Security appropriation for 2010 may include the following language concerning the needs and

nature of a possible of a back up for the Global Positioning System:

“The Committee is aware that the Department is in the process of conducting an analysis across the Federal Government and critical infrastructure and key resources sectors to determine if there is a need for a nationwide, systemic backup to the Global Positioning

System (GPS) and, if so, what that back-up should be. As a follow-on to this effort, the Department, in coordination with the Department of Transportation is to conduct a study of alternatives that could serve as a back-up to GPS. The results of both studies are to be provided to the Committee no later than 90 days after the date of the enactment of this act.”

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## **A Letter from the President**

Dear All,

As I write this, Christmas preparations are well-advanced and the United Kingdom is in the grip of exceptional winter weather with deep snow and very low temperatures: roads are closed, motorists stranded and on-line shopping stuck in warehouses. Is this really exceptional, or have we been lulled into a false sense of security by the many mild winters we have had over recent years?

GNSS jamming is the cold wind sweeping across the global positioning, navigation and timing community: we read about law enforcement agencies seizing jammers or “personal privacy devices”; we hear conference presentations that describe jamming events in downtown New York and at Newark Airport; and we see new interference detection and mitigation programmes.

Have we been lulled into a false sense of security? Hasn't interference of one form or another always been a feature of previous radionavigation services? Shouldn't we expect a normal GNSS operating environment to include service denial and countermeasures and plan accordingly?

Today, the critical issue is the way in which GNSS underpins our societies. In this context, eLoran is a great partner for GNSS and can help to secure the GNSS benefits that we all enjoy. As you know, the debate goes on and different administrations are coming to different conclusions. A friend recently summarised the position rather nicely: we've put all our eggs into the GNSS basket – are we really going to burn the other baskets?

Despite this uncertainty, the innovative drive of our members remains strong and was clearly demonstrated at our convention in London held in conjunction with the Royal Institute of Navigation: new transmitter and mast technologies; new data modulation schemes; some very small receivers; strong business cases; and great trials results.

Over the last 39 years the ILA has been highly successful as the focal point for developing Loran technology and for advocating its use and relevance worldwide. Its contribution in the broad positioning, navigation and timing (PNT) world has been and remains invaluable. For this reason, the ILA's Board of Directors has decided to set up an ILA2020 sub-committee tasked with proposing a ten-year strategy and action plan for our organisation.

I'm sure we all know how easy it is to be so busy that we almost forget an important date – perhaps a birthday or an anniversary. So here's one for your diary: our International Loran Association will be 40 next year! We hope shortly to announce three birthday events: one in the US, one in Europe and one in Asia.

Finally, I'd like to take this opportunity to wish you a great Christmas and a happy and prosperous New Year.

Sally

## **Ursa Nav expands capabilities in PNT Technology with the acquisition of Locus Inc. and IP from Crossrate Technology**

In a move designed to further strengthen its commanding position in the field of Position, Navigation and Timing (PNT), UrsaNav has purchased the complete technological assets of Locus, Inc. and the intellectual property of Crossrate Technology LLC. In addition to these acquisitions UrsaNav has also welcomed two internationally recognized research scientists, Dr. Arthur Helwig and Dr. Gerard Offer-

mans to their PNT team. Chuck Schue, President and CEO of UrsaNav and Board member of ILA announced that it is UrsaNav's goal to leverage these recent acquisitions to quickly develop an innovative cost effective multi-mode low frequency receiver which will initially target the eLoran timing community.

It is an effort to address the universally important question "what do you do when the Global Navigation Satellite System Service (GNSS) of which GPS is one version is not available?" A high-power low-frequency

ground wave solution is felt to be the best multi modal back up to GNSS / GPS in a manner that is cost effective to operate and maintain. UrsaNav ([www.ursanav.com](http://www.ursanav.com)) has an exclusive worldwide agreement with Nautel Ltd (Canada) ([www.nautel.com](http://www.nautel.com)) to sell Nautel's next generation multimode solid state transmitters. UrsaNav is also a global retailer of Symmetricon's Timing and Frequency Suite and Two-Way Satellite Time Transfer (TWSTT) Equipment. ■

## **U.S. PNT Advisory Board briefed on the effect of jamming of GPS on the Maritime Environment**

In a paper presented October 15 to the U.S. National Space-based Position, Navigation and Timing (PNT) Board, Dr. David Last, Consultant to the General Lighthouse Authorities of the United Kingdom and Ireland (GLAs) and member of ILA Board of Directors, explored in graphic detail the impact of interference and jamming of the GPS signal on ship-board systems used for eNavigation. This is a matter of concern for Trinity House, GLA, which is responsible for the provision and maintenance of all UK navigational aids such as lighthouses, light vessels, buoys and maritime radio/satellite communications systems.

All navigation satellite systems are vulnerable to natural interference, man-made interference and deliberate jamming. Many devices for jamming are now readily available, some with a capability to take out the L1, L2 and L5 signals of GPS, Galileo, Russia's Glonass and China's Compass-Beidou over an extended area. IMO, the International Maritime Organization, will in the future demand for eNavigation two separate but complementary sources of position information. One will be a Global Navigation Satellite System, which for the immediate future must be GPS.

Dr Sally Basker of GLA, and President of ILA, has reported previously on sea trials during which deliberate GPS jamming signals were radiated in a selected zone of the North Sea. In the main area of radiation the chart systems on the test vessel shut down. At weaker jamming signal levels the navigation receivers gave false position and speed indications. In addition the ship's Automatic Identification System (AIS) transmitted false data so that the ship's position as reported to the Vessel Traffic Service was in error. Clearly a skillfully managed jamming effort can destroy the validity of most, if not all, the information systems needed for ship management. Any loss in the quality of the local GPS signal is potentially a serious hazard since most vessels no longer carry just a single GPS receiver to report position coordinates but instead depend on the reliable functioning of several receivers embedded into multiple systems, the Electronic Chart Display, ship's autopilot, helideck stabilization, etc.

A subsequent experiment in a protected area near Newcastle (UK) explored the effect of low level jamming. Initially no alarms were sounded but because of the distortion of the GPS signal the position coordinates provided by the receiver was viewed as HMI (Hazardously Misleading Information) since there was no concurrent

error flag or other indication. Since this low level intrusion caused the displayed ship's position to depart from the true, the autopilot reacted in response to the erroneous data.

Dr. Last went on to point out that with the reduced crew needed on the bridge of a modern automated ship under normal operating conditions the effort and talent needed to successfully cope with an incident involving multiple system failures might prove to be lacking.

These tests were conducted on the Trinity House Multi-Function Tender THV Galatea which is fitted with a range of high specification survey equipment including DP2 Dynamic positioning. Also operating on board at the same time as these tests were conducted was the General Lighthouse Authority prototype Enhanced Loran System (eLoran) which provided accurate and reliable position data throughout the region impacted by the jamming exercise.

In summary, it was noted that an appropriate combination of GPS and eLoran would serve to ensure robust, complementary system performance. GPS plus a backup of eLoran can provide secure navigation with significant cost savings. ■

# Recognition of work for the ILA and the Loran community

## Honors awarded in 2008

### Best Paper Award

**James T. Doherty**, Institute for Defense Analysis, is recognized for his outstanding contribution to Loran and the Association in the Preparation and Presentation of the paper "A Perspective on the Future of eLoran."

## Honors awarded in 2009

### Medal of Merit

#### Dr. Sherman Lo

Dr. Lo is cited for his continuing dedication and achievement in the task of establishing the ability of eLoran to meet the very stringent availability, integrity and continuity requirements of the aviation and maritime operating environment.

Beginning with his graduate work at Stanford University and continuing after graduation he pursued the goal of establishing the ability of eLoran to meet the aviation requirements for availability, integrity and continuity for navigation services. His work lead him to the role of lead investigator for the Loran Integrity Performance Panel. He has been able to develop close, trusting relationships throughout the industry and ultimately he became key author of the panel's 2004 technical report to the U.S. Department of Transportation Undersecretary of Policy.

Dr. Lo has continued his outstanding support to the world-wide Loran community and particularly to the eLoran development efforts. Specifically, he is supporting the Radio Technical Commission for Maritime Services, Special Committee 127, developing the eLoran standards for maritime services.

In recognition of his outstanding

leadership, commitment to Loran-C, and technical skills, the International Loran Association presents its most prestigious award.

### John M. Beukers Award for Technical Innovation

#### Ursa Navigation Solutions Inc.

Ursa Navigation Solutions Inc. is cited for their participation with Nautel in the development of an innovative new Loran-C and eLoran Transmitter. The transmitter uses the latest techniques of class D operation providing exceptional control of all pulse characteristics. The team also developed regenerative antenna damping resulting in better pulse tail shape and improving overall efficiency. With its precision pulse drive control and damping, as well as small footprint, efficiency and ability to provide both Loran-C and eLoran signals this advancement reduces the cost of service implementation and operation benefiting both service providers and users.

In recognition of this innovative new design and the implementation of this dramatic application for the Loran-C and eLoran services and the great positive impact on users and providers the International Loran Association presents the John M. Beukers Award for Technical Innovation to Ursa Navigation Solutions Inc.

### John M. Beukers Award for Technical Innovation

#### Tim Hardy and the Nautel Team

Tim Hardy and the Nautel Ltd. Team are cited for their development of an innovative new Loran-C and eLoran Transmitter. The transmitter uses the latest techniques of class D operation providing exceptional control of all pulse characteristics. The team also developed regenerative antenna

damping resulting in better pulse tail shape and improving overall efficiency. With its precision pulse drive control and damping, as well as small footprint, efficiency and ability to provide both Loran-C and eLoran signals this advancement reduces the cost of service implementation and operation benefiting both service providers and users.

In recognition of this innovative new design and the Nautel team's implementation of this dramatic application for the Loran-C and eLoran services and the great positive impact on users and providers the International Loran Association presents the John M. Beukers Award for Technical Innovation

### William L. Polhemus Student Paper Award – 2007

**Di Qiu** is recognized for her outstanding contribution to Loran and the Association in the Preparation and Presentation of the paper "Geo-encryption Using Loran."

### William L. Polhemus Student Paper Award – 2008

**Jan Šafář**, Czech Technical University in Prague, is recognized for his outstanding contribution to Loran and the Association in the Preparation and Presentation of the paper "Group Repetition Interval Selection for eLoran."

### William L. Polhemus Student Paper Award – 2009

**Jan Šafář** GLAs of UK and Ireland, is recognized for his outstanding contribution to Loran and the Association in the Preparation and Presentation of the paper "Cross-Rate Interference and Implications for Core eLoran Service Provision"

# Recognition of work for the ILA and the Loran community

## Honors awarded in 2007 President's Award

### Alan Cameron

Alan Cameron is cited for his continuing dedication to assuring reliable services to the transportation industry. As Editor-in-Chief of GPS World Magazine, Alan Cameron has shown great interest in assuring impartial discussions of GPS vulnerabilities and highlighting methods for mitigation, including eLoran. He has encouraged accurate and balanced discussion, resulting in wide-spread knowledge of low-cost eLoran services.

In recognition of his journalistic leadership, his long-term commitment to communicating the need for robust and resilient PNT and for the insights that he brings to governments, the industry and users, the International Loran Association presents the President's Award.

## Honors awarded in 2010

### Outstanding Service Awards

**Zachariah Conover**, Crossrate Technology (ILA-38 2009 Convention Chair)

**Chris Bartone**, Ohio University (ILA-38 2009 Convention Technical Chair)

### Medal of Merit

#### Dr. Paul Williams

Dr. Paul Williams has made a 15-year contribution to the understanding and development of Loran-C and Enhanced Loran (eLoran). As a researcher at the University of Wales, Bangor, Dr. Williams played a leading role in creating a set of simulation tools culminating in

BALOR, that accurately models the variations in strength and delay of Loran signals as they propagate over land of complex conductivity and topography. His many publications represent a key resource for those who would understand low-frequency propagation.

Later, as Principal Development Engineer with the Research and Radionavigation Directorate of the General Lighthouse Authorities of the United Kingdom and Ireland, Dr. Williams has been a key figure in the team that has taken eLoran from a feasibility demonstration to a continuously operating prototype system and demonstrated its successful use in areas of complex geography.

In recognition of his outstanding analysis, technical contribution and leadership in bringing eLoran to the fore, the International Loran Association presents Dr. Paul Williams with its most prestigious award.

### John M. Beukers Award for Technical Innovation

#### Dr. Paul Williams and Mr. Chris Hargreaves

Through teamwork and with dedication Dr. Paul Williams and Mr. Chris Hargreaves developed the technical tools and operating procedures to take the GLA of the UK and Ireland feasibility demonstration equipment of eLoran radionavigation service and develop the prototype stage with 24/7 continuous operating capability and service availability. With considerable time pressure and stringent operating requirements, they were able to complete the project within cost projections and meeting all operating requirements.

In gratitude for this invaluable contribution to Loran and eLoran the International Loran Association presents the John M. Beukers Award for Technical Innovation to Dr. Paul

Williams and Mr. Chris Hargreaves

### President's Award

#### Commander Gary M. Thomas, USCG

Cdr. Thomas is cited for his successful accomplishment in conducting the sensitive process of closing the US Coast Guard's Loran-C radionavigation service.

Cdr. Gary Thomas, as Commanding Officer of the USCG Loran Support Unit, made certain that the Loran-C termination in the USA was accomplished with dignity and professionalism. In addition to orderly procedures with minimum disruption, he provided an appropriate ceremony acknowledging the tremendous service the Loran program and the Coast Guard provided for US military services and for the maritime industry for more than 66 years.

In recognition of his accomplishments of this sensitive closure with concern for the public and the impact on the service, the International Loran Association presents Cdr. Thomas, The President's Award.

### Best Paper Award

**John Pinks**, Nautel Inc., is recognized for his outstanding contribution to Loran and the Association in the Preparation and Presentation of the paper "A Small Antenna for a Temporary Short-Range Loran System."

## National PNT Board declares jamming of GPS a national security threat

In a comprehensive report released on November 4, 2010, the National Position, Navigation and Timing Advisory Board stated that the Global Position Systems (GPS) should be formally designated by the Executive branch as a critical infrastructure and managed as such by DHS. It was pointed out that the United States is now dependent on numerous extended, complex networks like cell phone towers, power grid management and aircraft landing systems which can not function without access to a viable GPS signal.

To protect GPS from deliberate intrusion, systems must be devised and put in place to locate and shut down sources of interference with appropriate legal powers to arrest and prosecute offenders. Noting that while foreign GPS type systems (Glonass, Galileo and Compass)

may on occasion be of some help to supplement GPS, devices capable of jamming all satellite radio navigation signals are readily available on the world market today.

The report describes in detail the demonstrated vulnerability of the GPS signal and the alarming effectiveness of even simple and inexpensive devices to create harmful disruption to GPS services in an area. Any loss of GPS signal integrity, position and timing data will also react on the operation of secondary systems such as electronic map displays, communication satellite antenna orientation or automatic marine status reporting which depend on it .

Prompt action must be taken in many quarters to preserve and protect GPS integrity. The Board strongly recommended the following actions.

The previously announced decision to deploy eLoran as the Primary Alternative source for PNT should

be reconfirmed and quickly implemented.

The National Executive Committee should establish and sponsor a National GPS Interference Locating, Reporting and Elimination System which will serve to coordinate and expand the present resources of several Departments

The Government should take such steps as appropriate to accelerate the design and production of interference-resistant multi-modal receivers especially those intended for safety-of-life applications.

The National Space Based PNT Advisory Board is a federal Advisory committee established by NASA on behalf of the Executive Committee. It consists of experts from outside the U.S. Government who provide advice on U.S. Space-based PNT policy planning, program management and funding profiles, in relation to the current state of national and international space-based PNT services.

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## RTCM Special Committee 127 moves forward to craft specifications for eLoran

RTCM Special Committee 127, Standards for Enhanced Loran (eLoran), met July 23 and 24 at Trinity House, Harwich, UK. Dr. Paul Williams, the new Chairman of SC 127, presided. The chief objective of the meeting was to discuss the current status of Committee work to create minimum performance standards for eLoran for submission to IMO (Inter-

national Maritime Organization). It was agreed that previous draft versions are to be reformatted based on the recent Galileo standards

It was pointed out that there is at present no accepted specification of the eLoran signal in space. Work is now proposed to develop a statement based on the earlier LORIPP/LO-RAPP documents adapted for marine applications, including reference to Eurofix and the use of 9th pulse. It is planned that this specification, when completed, be published as an

RTCM SC 127 document.

Working groups were organized for future tasks including MPS, ASF, Receiver Testing and NEMA

The next meeting is scheduled for 29 November 2010 in London in conjunction with NAV10 at RIN.

Further information on the Committee, its activities, publications and membership can be had by contacting Bob Markle at [R.Markle@rtcm.org](mailto:R.Markle@rtcm.org)

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## Coast Guard Authorization for 2010 requires study of need for back up to GPS

The U.S. Coast Guard Authorization act of 2010 has been enacted by the Congress as U.S. Public Law P.L. 111-281 and signed into law by the President on October 15, 2010.

The final version contains language requiring a study of the need for a backup to GPS as follows:

### SEC. 219 SUPPLEMENTAL POSITIONING SYSTEM

Not later than 180 days after the date of enactment of this Act, the Secretary of the Department in which the Coast Guard is operating in Consultation with the Commandant of the Coast Guard shall conclude their study of whether a single domestic system is needed as a back-up navigation to the Global Positioning System and notify the Committee of Transportation and Infrastructure of the House of Representatives and the Committee on Commerce, Science and Transportation of the Senate the results of such determination.

No other information on the study as mandated and who will be tasked to carry it out is currently available.