



Loran Lines

October 2008

Newsletter of the International Loran Association

Volume 2008-2

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RTCM SC-127 moving forward with proposed standardization documents for eLoran

In a series of working meetings which have taken place since October 2007, members of RTCM Special Committee 127 have made a concerted effort to put in place the technical framework and basic ground rules that will be required for the implementation of an initial form of eLoran as a successor to Loran-C. The preliminary organizational steps taken in October at the ILA36 convention in Orlando FL, USA were tentative and made in the expectation that eLoran might at last gain governmental approval. Since the announcement by DHS in February establishing a future role for eLoran as a backup to GPS, planning has moved forward and made significant progress. Members of the ad hoc Committee met in January, May and August of 2008 and will meet next on October 31 immediately after the NAV08/ILA37 technical conference in London.

Under the chairmanship of Dr. Ben Petersen of Petersen Integrated Geopositioning, three committees have been assigned to define the eLoran signal in space, to establish the MPS for marine receivers and to organize survey data. Present working groups are Survey Data, chaired by Z. Conover of Crossrate Technology, and Receiver MPS, chaired by G. Offermans of Reelektronika.

The efforts has been facilitated by the extensive program of performance analyses, field work and tests performed since 2001, made largely with FAA support. In particular, the current results must in some measure be credited to those who were active in the Loran Integrity Performance Panel (LORIPP) and the Loran Accuracy Performance Panel (LORAPP).

Continued on page 3

Basker cites future challenges to Loran Data Channel capacity

In a letter to RTCM Special Committee 127 commenting on the potential information capacity that might be required of the Loran Data Channel (LDC), Dr. Sally Basker of GLA raised the question whether either technique, Eurofix or 9th pulse as presently proposed, has sufficient bandwidth. Noting that since the Loran Data Channel might be used for UTC corrections, early sky wave integrity information, and differential eLoran corrections, the approximately 30 bps bandwidth provided by either method might prove insufficient.

In light of this situation, Basker suggests that there is an urgent need to explore the spatial correlation of differential eLoran and how it might be improved by modeling and mapping. There is a parallel need to explore measures to provide the maximum possible service provision bandwidth.

With these concerns in mind RTCM Committee 127 was urged to keep its systems options as flexible as possible and to standardize both Eurofix and 9th Pulse.

The long and hard efforts by the Loran community have been successful in giving it the chance to deploy eLoran. The decisions that must be made during the transitioning of the legacy system to the eLoran of the future are critically important. The design must employ the newest in digital technology and signal processing with tighter operating tolerances.

In conclusion, she proposes that the President of the International Loran Association set up two international working groups to explore the problems of coverage and signal capacity.

The complete text of this communication to SC127 can be found at:
rtcm.info/sc127/130-2008-sc127-021.pdf

Dr. Basker is Director of Research and Radio-navigation, General Lighthouse Authorities of the United Kingdom and Ireland.



Nav08 The Navigation Conference & Exhibition ILA37

October 28 – 30, 2008 in London U.K.

BE THERE!



International Loran Association

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A complete listing of the Board Membership, addresses, affiliations and phone/fax numbers can be found on the ILA website: www.loran.org

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

or

www.loran.org/Membership/FormCorporate.htm

Please note ILA's web site address: www.loran.org
and e-mail address: ila@loran.org

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The course of these meetings as documented in the agendas, summaries of meeting activity, working papers and drafts, which are available on the RTCM website, illustrate a progressive evolution and refinement of the various task assignments.

In a report delivered at the RTCM Annual Meeting in May 2008 on the progress achieved by Special Committee 127, Dr. Peterson in his paper "Developing Standards for the eLoran System" reviews some of the needs and requirements of the system and the work accomplished

to date. His remarks also underscore the fact that this effort up to now represents the personal findings, judgments and opinions of the committee members and not those of those governmental agencies who will be called on to implement and operate the eLoran system as it evolves from the legacy configuration of Loran-C.

Summary records of the meetings of January, May and August 2008 can be found by consulting the RTCM home page at rtcm.info/SC127/. This resource also provides

an accumulating record of the activities of the Committee, Meeting Documents and Reference Documents, starting with the basic Terms of Reference under which it was organized. Among the many recent documents of interest available at this site is "Specification of the eLoran System" which (as one might expect) is subtitled "Preliminary, Tentative and Unofficial."

Committee members and attendance information is available at rtcm.info/sc127/membershipREV3.xls

Crossrate Technology gains funding for hybrid receiver development.

Crossrate's development of an integrated GPS/eLoran receiver, which has attracted attention from government agencies and commercial applications, has attracted over \$1.5 million in grants and awards since its founding in 2004. Zachariah Conover, founder of the Standish, ME USA company, reports that their initial product, the eLGA 1110 re-

ceiver, is presently undergoing tests in a beta version and is expected to be released commercially this fall. Mr. Conover is a former US Coast Guard officer and member of the Board of Directors of the International Loran Association

The receiver incorporates both an eLoran and a GPS receiver in the same unit and analyzes and integrates the dual nav-data inputs to provide the user with the best possible solution of position. With the concurrent availability of both GPS

position and Loran signal information, the integrated system is able to develop and store a database of signal corrections indexed to actual position resulting in improved receiver accuracy with time. Designed to operate in place of a simple GPS receiver, it is compatible with NMEA 0183 devices.

Additional information on Crossrate and its products can be found at its website www.crossrate.com.

U.S. Coast Guard to support eLoran 9th Pulse Data Channel

The announcement on February 9, 2008 by the Department of Homeland Security that eLoran would be implemented as an independent PNT system to complement and backup GPS has set in motion a wide range of necessary actions by the public and private sectors of the navigation community. Work is already well underway by RTCM Special Committee 127 to define the technical operating parameters of this new system.

In a statement to RTCM 127 the U.S. Coast Guard noted that it will act as the executive agent for DHS and will undertake to develop eLoran as a GPS backup. In addition, they expressed the intention to support a Loran Data Channel (LDC) via 9th pulse modulation.

While in time the Loran program will migrate to the National Protection and Programs Directorate of DHS, many major items need to be resolved and actions finalized. These include specific critical infrastructure requirements, system life cycle support, funding for continuing modernizations and the development of a time line defining the necessary sequence of signal and equipment modernization stages. It is expected that the system will continue under the U.S. Coast Guard throughout 2009. The full text of the U.S. Coast Guard statement can be found at rtcm.info/sc127/129-20080SC127-DIST.doc.

Election Results

The ILA Board for 2008-2009

President	Langhorne Bond	2009
Past President	Linn Roth	2009
	John Beukers	(consulting)
Elected Directors	Sally Basker	2010
	Marc Clarens	2010
	Zachariah Conover	2011
	Thomas Gunther	2011
	Tamotsu Ikeda	2010
	Bob Lilley	2009
	Sherman Lo	2011
	Jacques Manchard	2009
	Gerard Offermans	2010
	Chuck Schue	2010
	Paul Williams	2009
	Durk van Willigen	2009

Three Directors to be appointed for one year terms. Terms expire as indicated.

Nav08/ILA37 papers range from new applications of AIS and GNSS to the status of eLoran today

Eight months ago the US Department of Homeland Security announced that eLoran has been adopted as the designated backup for GPS. This announcement sparked a concerted effort in many sectors to move forward with the essential tasks of setting standards for the signal in space and related equipment operating parameters. The activities of RTCM Special Committee 127 are reported on page 1 of this issue of *Loran Lines*. The commercial sector has also been swift to respond to the need to explore advanced receiver and transmitter technology appropriate to the potential capabilities of eLoran systems.

This surge in creative activity is clearly reflected in the wide range of papers on eLoran to be offered at NAV08/ILA37 in London in October under the title "Navigation and Location: We are Here!" The Conference will be held at Church House, in the heart of Westminster, not far from Westminster Abbey and the Houses of Parliament, and near to the Westminster and St. James Underground Stations.

Over twenty papers will explore the present status of Loran in the USA, Europe and Asia, describe the development of a new generation of receivers and transmitters suitable to a digital technology, consider the applications of the new Loran Data Channel as part of the redefined eLoran signal in space, and provide quantitative evidence of the effectiveness of H-field antennas in static reduction. Beyond this, speakers will seek to explore the future architecture of eLoran and its crucial role in the maintenance of a widespread reliable PNT infrastructure.

The success of the effective detection of possible marine-based terrorist activity is clearly related to precision navigation and position-finding aids and target identification using GPS and eLoran. Dana Goward, Director of the U.S. Coast Guard Maritime Domain Awareness Division of the U.S. Department of Homeland Security, will speak on "The United States Way forward for eLoran" at the Wednesday afternoon reception located in the Conference Exhibition area.

Megapulse installs new transmitter at Lorsta St. Paul

The eighth Megapulse Accufix 7500 series Loran Transmitter was installed at the Loran station on St. Paul Island, Alaska in November 2007. The transmitter was installed in a period of two weeks. In the week following, testing and certification was completed by representatives of the US Coast Guard Loran Support Unit.

Lorsta St. Paul is the master station of the Alaska North Pacific (NorPAC) GRI 9990 and is the second Alaskan station to receive the new equipment. Two additional transmitters for Lorsta Tok and for Lorsta Shore Cove are at the factory awaiting completion of civil engineering work at the respective sites.

The Accufix 7500 is the latest Loran transmitter designed and manufactured by Megapulse. The new units

Parallel sessions during the three-day Conference will report on many other related areas including the impact on navigation and vessel traffic management of AIS and growing applications of GNSS of significance to the future of e-navigation.

Nav08/ILA37 will include the following sessions representing international participation by sixteen countries sharing 78 papers:

- GNSS Vulnerability
- The Human Element in Marine Navigation
- Six presentations on topics related to eLoran
- GNSS Technology
- Integrated Systems
- Maritime Hazard Mitigation
- Land and Urban Navigation
- Radar, Automatic Identification Systems (AIS) and Electronic Chart Display and Information Systems (ECDIS)
- Urban and Indoor Navigation
- Autonomous Vehicle Navigation
- Air Navigation
- Geospatial Applications
- Location Based Services (LBS)
- Evolving techniques and technologies in maritime navigation
- GNSS Simulation and Authentication

An array of commercial presentations will be offered by industry representatives on Tuesday afternoon. A Conference banquet will be held on Monday evening.

Royal Institute of Navigation (RIN) and the International Loran Association (ILA) welcome the following collaborating partners in the Conference

- German Institute of Navigation (DGON)
- Netherlands Institute of Navigation (NIN)
- The Institute of Engineering and Technology (IET)
- Location and Timing (KTN)
- The Nautical Institute (NI)
- UK Space

The full program for the Conference can be found at the RIN website: www.rin.org.uk.

have complete redundancy, eliminating the need for on-site personnel and improving transmitter availability. The system is UTC synchronized with cesium steering. Power section improvements in the new series have included improved control logic for better timing stability and dynamic module reassignment for better soft-fail performance. Additional information on the Accufix 7500 can be had at the Megapulse website www.megapulse.com ■

RIN Nav08 / ILA37 Conference Banquet Monday 27th October

Limited number of places, so register quickly

Evening Schedule:

1845: Champagne Reception

1930: Dinner set meal (dietary options) to include wine; toasts

Speeches from Trinity House, VT Communications and ILA; Awards

Dress: Business Formal

Deadline for registration: 19th October

Registration and Advanced Payment: Whether or not you are required to pay, you must register by sending your name and names of guests to the ILA Operations Center by one of the methods below.

Cost: Complimentary to ILA Members; US \$88 for spouses and other non-members (that is, £50)

Please send checks drawn on a US bank, payable to the International Loran Association at the Operations Center address below.

Or, e-mail your banquet request with Master Card or Visa credit card number, expiration date and name-on-card to ila@loran.org.

Alternatively send the same information by fax to the Operations Center fax number below.

The venue: Trinity House, Tower Hill, London, EC3N 4DH is the headquarters of The Corporation of Trinity House that is responsible for the provision of marine aids to navigation for England, Wales, the Channel Islands and Gibraltar. Trinity House is situated in the City of London overlooking the tower of London. It was built in 1795 and, apart from some modifications during and after World War II, is original in every aspect. This is one of the more exclusive places to dine in London and is an opportunity not to be missed.

For more information on Trinity House see www.trinityhouse.co.uk.

Thank you! We'll see you in London! Visit www.loran.org for details as they are available for the 37th Annual ILA Convention and Technical Symposium in London, UK, 28-30 October, 2008, with the Royal Institute of Navigation.

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RIN announces one-day eLoran tutorial session preceding Nav08/ILA37

Under the sponsorship of the three General Lighthouse Authorities of the UK and Ireland (Trinity House, the Commissioners of the Irish Lights and the Northern Lighthouse Board), the course will focus on maritime, aviation, timing and indoor applications of eLoran. The program is being presented at Church House, Westminster, London on October 27, 2008 by an international team of experts under the leadership of Prof. David Last (past president of RIN). As has been pointed out with increasing frequency by those concerned with the security of the international PNT infrastructure, GPS, the backbone bone of the industry, is far from perfect.

Extended analyses have shown that eLoran provides the ideal backup system. These lectures will include material on eLoran propagation, signal characteristics, Loran data channels and signal processing. Time will also be devoted to the new UK station at Anthorn in Cumbria which embodies much of the latest eLoran technology. In association with stations in Norway, France, Germany and the Faeroe Islands, Anthorn is currently providing a trial eLoran service for Northern Europe.

The sponsors urge all to attend and open their eyes to the future of eLoran. Additional information including an outline program and registration can be obtained at the RIN website www.rin.org.uk/news-events/events/eloran-training-day



Dr. Paul R. Johannessen

1926 – 2008

Dr. Paul Romberg Johannessen of Lexington MA USA, founder and chairman of Megapulse, Inc., passed away unexpectedly on June 26, 2008. Beloved husband for 57 years of Astrid Johannessen; proud father to Nina Johannessen of Lexington, Mass., and Erik Johannessen and wife Mary of Bedford MA; grandfather to Kristen, Kurt, and Peter Johannessen and Ian, Brendan and Alex Sullivan. He was brother to Anne Marie Frivoll and the late Gunhild Wisloff, both of Oslo, Norway.

Paul was known to many as a tennis player, skier and woodworker. In the past few years Paul and Astrid took up golf with the same enthusiasm he had shown in his life and work.

Dr. Johannessen was born in Oslo, Norway, in 1926 and lived through the Nazi occupation of Norway. He received an Engineering degree from Schou's Institute of Technology, Oslo, in 1949. He attended graduate studies at the Massachusetts Institute of Technology from 1953 to 1958, earning S.M. and ScD degrees in Electrical Engineering. He worked in the MIT Servomechanism Laboratory from 1953 to 1956. In 1956 he became an Instructor at MIT and 1958 was promoted to Assistant Professor, teaching courses in Circuit Theory, Feedback Control Principles, Theory and Applications.

In 1959 Paul joined the GTE-Sylvania Applied Research laboratory, Circuit and Control Research Department, where he participated in work on servo systems for the positioning of large antennas, research on control theory and non-linear circuit techniques and the development of a high-power all-solid-state Loran transmitter.

In 1970 he founded Megapulse, Inc., now located in North Billerica,

Mass., USA, a company whose purpose is to develop high power solid-state signal sources. Since that time Dr. Johannessen's efforts were directed to the development of Loran C solid state transmitters with associated timing, control and monitoring equipment making up a complete position, navigation and timing system. More recently he was a pioneer in the development of small antennas for advanced user equipment. He was awarded twenty five patents in the field of pulse compression and non linear magnetic and crossed loop antennas. He published numerous papers, and was a member of Sigma Xi, Eta Kappa Nu and a senior member of IEEE.

For his contributions to the science of navigation he was awarded in 1994 the Thurlow Award, established by the Institute of Navigation in memory of Colonel Thurlow, U.S. Army Corps, who contributed significantly to the development and testing of navigation equipment and who met an untimely death while flight testing a new compass in 1944. In 2007 Dr. Johannessen was awarded the John Beukers Award for Technical Innovation by the International Loran Association. ■

Paul Johannessen

Loran loses a pioneer

While Paul Johannessen retired twice from Megapulse Inc., the radio navigation equipment company he founded in 1970, that was not enough to keep him away. Every day he drove to the North Billerica MA, USA headquarters walking through the plant to see what was new. He was, as his son Erik said, working half time. He could still solve issues that occasionally stumped the staff and recently fixed a problem with a transmitter. Basi-

cally he continued to innovate and work up until the day he died.

He was at home in Lexington watching television coverage of the Wimbledon matches when he died of a heart attack on June 26 at age 81.

Throughout his professional career Dr. Johannessen continued to contribute improvements to improve the Loran systems. Megapulse is credited with several breakthroughs in Loran technology including the introduction of a Loran data channel

for the broadcast of differential corrections to GPS.

He was a lifelong tennis player, skier and woodworker. He and wife Astrid took up golf when tennis became too demanding. That switch took place six years ago and they continued to enjoyed golf in Lexington and in the winter in Naples FL with the same enthusiasm he had shown in his life and work.

In the words of his daughter Nina "He was guy who loved every minute of his life."

Growing concern about GPS vulnerability in civilian and military applications

Beginning with Dr. Jim Carroll's presentation of the Volpe report on the vulnerability of GPS to jamming at the CGSIC meeting at Salt Lake City on September 10, 2001, the threat and likelihood of deliberate hostile interference with the GPS signal has become an increasing concern to civil and military users of GPS for PNT. The navigation and timing community's vigorous campaign for a secure secondary PNT source led to the adoption in February 2008 by the US Department of Homeland Security of eLoran as a backup to GPS.

European eLoran Forum report stresses importance of a secure, reliable PNT system.

The European eLoran Forum released in April 2008 a report entitled "eLoran, Securing Positioning, Navigation and Timing for Europe's Future." The document stresses the vital strategic importance of the routine availability of position, navigation and timing (PNT) resources in the day-to-day operation of power generation and distribution systems, information and communications logistics, telecommunications, banking systems and transportation. A secure PNT system is vital to the support of critical infrastructure activities throughout Europe.

It is important that European policy makers, service providers and users be aware that this dependence on PNT is, at present, based solely on the capabilities provided by the Global Positioning System, GPS.

While the European Galileo satellite system will provide support for

NAUTEL demonstrates new design eLoran transmitter for U.S. Coast Guard

Nautel Inc. recently announced that they have conducted on-air tests of new transmitter technology at the U.S. Coast Guard Loran Support Unit (LSU) Wildwood NJ.

The design, using switching amplifiers with solid state elements operating

Inexpensive devices capable of limited jamming performance have been augmented in the years since 2001 with increasingly effective means for GPS interference through jamming or spoofing. For example, a small unit, offered on the Internet, provides a jamming signal effective over more than a hundred-foot radius. It is advertised as a means to "protect" the user from GPS identification or tracking despite the fact that such unlicensed signal radiation is illegal and subject to prosecution and fines.

With the widespread use of GPS for land, sea and air navigation and its incorporation into automatic tracking systems and guided munitions, the search for means to identify and combat such interference, whether

GPS system failures, both are equally vulnerable to signal interference effects, either natural or man-made, which interrupt the service.

The document outlines in detail the economic and the critical infrastructure protection benefits to be derived from using eLoran. It points out that the complementary but dissimilar technology of eLoran with a frequency at 100kHz and a signal in space of substantially greater strength than that available from satellite transmitters make eLoran far less vulnerable to jamming.

Significant progress has been made in the last decade in refining Loran technology. It is now possible for an upgraded system to meet accuracy, availability, integrity and continuity of performance requirements for aviation non-precision approaches and for maritime harbor entrance and approaches. As a precise source of time and frequency, eLoran will provide timing performance at a Stratum 1 level equivalent to current GPS.

in a signal controlled on/off mode of modulation, is combined with antenna damping techniques developed by Nautel. This operating mode is reported as resulting in a significant reduction in cooling requirements. Pulse timing and flexible modulations systems are included to support future advanced applications of eLoran. Nautel reports the use of soft-fail amplifiers designed for extended life under normal operations.

from natural atmospheric sources or accidental RF emissions or deliberately created as a part of terrorist or hostile military strategy has assumed a high priority. Present efforts to combat jamming include the resources of the GPS Jamming Location (JLOC) System, an operation supported by the National Geospatial Intelligence Agency. It uses various sensors and reporting systems to collect information about GPS jamming and interference. Information on NGA and JLOC can be found on their website: www1.nga.mil.

eLoran, as it becomes available over ever widening areas, will be able to provide significant protection from data loss. Hybrid receivers capable of seamlessly fusing GPS and eLoran inputs will be essential in the future. ■

The report urges that the essential supporting role to be played by eLoran in the future be recognized in the context of the European Radio Navigation Plan.

The complete document can be found at the Trinity House website: www.trinityhouse.co.uk/media/press_releases/press79751_file_1__pdf_eloran_pnt.pdf

The European eLoran Forum is an ad-hoc group of European organizations having an interest in eLoran because they currently operate, fund or host eLoran infrastructure. Its purpose is to support the successful introduction, operation and provision of eLoran services in Europe as part of a European Navigation Plan. Current members include the Danish Maritime Safety Agency, France, and the General Lighthouse Authorities of the United Kingdom and Ireland. Norway is an observer. ■

Nautel has been active in solid state broadcast transmitter engineering since its founding in 1969. Headquarters are located in Hacketts Cove, on St. Margaret's Bay, 25 miles west of Halifax, Nova Scotia, Canada. To serve the US market, a wholly owned subsidiary, Nautel Maine Inc., in Bangor, Maine was founded in 1974. For further information see their website at www.nautel.com. ■

Positioned for the future



Innovators in advanced navigation and communication concepts
Leaders in high power, low frequency solid-state transmitter technology



eLoran Monitor Receiver

The Accufix eLoran Monitor Receiver is designed for use in monitor and control of Loran systems. The unit is designed to support legacy Loran-C systems while featuring the processing capabilities for tomorrow's eLoran. Housed in a 2U 19" rack module, the powerful DSP platforms are flexibly controlled via software commands.

eLoran Antenna

The eLoran sensor integrates GPS, Loran, and their augmentation systems such as WAAS in a single package. A clear benefit is the two independent navigation systems with dissimilar failure modes. A single cable provides power in and data out. In addition to precision navigation from the WAAS/GPS, the eLoran outputs true TD data. The crossed loop antenna also provides compass functionality with true heading accuracy within 1 degree, even while stationary.

Loran Signal Generator

The LS1000A is a precision Loran Signal Generator that generates a simulated Loran-C signal. Pulse and group parameters that can be controlled include the Group Repetition Interval, ECD, and phase code. In response to a 5MHz input, the unit will output a single rate stream of Loran pulses on either or both of two rear panel connectors. Additionally, the output can be automatically synchronized and/or phase delayed to an external signal such as Phase Code Interval (PCI), Local Interval (LI), or Loran-C Time of Coincidence (TOC.)



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