



Loran Lines

September 2003

Newsletter of the International Loran Association

Volume 2003-2

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32nd International Loran Association Annual Convention and Technical Symposium in Boulder Colorado, November 3 – 7 2003

BOULDER, COLORADO is the location and Enhanced Loran is the theme of ILA 32. Boulder is less than an hour from Denver International Airport in the foothills of the Rocky Mountains.

The International Loran Association is organizing the largest dedicated Loran conference of the year: ILA32. It will provide business and technical programs that integrate all aspects of the expanding Loran industry and an international forum to explore the progress to date with an exchange of ideas for an initial definition of enhanced Loran. The issues of vulnerability, homeland security, and the concept of sole-source navigation systems are being critically re-evaluated around the world. The results of analyses and tests currently being studied by the FAA and USCG will be useful in all countries using GNSS and can be expected to influence the form of new enhanced Loran in various parts of the world.

Convention Chairman Tom Celano of Timing Solutions and Technical Chairman Ben Peterson of Peterson Integrated Geopositioning are organizing a dynamic conference agenda exploring new technology and applications. Papers and reports will include system and governmental policy, operational doctrine, and transmitting and user equipment. GAUSS meetings to be held on Monday and Friday are under the chairmanship of Gerard Offermans of Reelektronika.

(ILA Convention continued on page 3)

FAA and Coast Guard evaluating the capability of enhanced Loran for GPS backup

THE Federal Aviation Agency (FAA) and the U.S. Coast Guard are conducting studies to determine whether enhanced Loran can provide the accuracy, availability, integrity, and continuity of service to support lateral aircraft navigation in all phases of flight including non-precision approach (NPA) as well as supporting harbor entrance and approach (HEA) for maritime services. There is also interest in the ability of Loran to support Stratum level 1 timing and frequency. Participants in the program include several sectors of the FAA, the U.S. Coast Guard, DOT Volpe Center, and members of the industry and academia. The results of these and related studies will be reported to DOT by a deadline of 31 March 2004 for a final decision by DHS and DOT at the Secretary level.

With a current nominal accuracy of .25 nm, the target for enhanced accuracy is a Required Navigational Performance (RNP) of .3 for non precision approaches (NPA) and 8 - 20 meters for harbor entrance and approach (HEA) applications. Actions designed to improve system performance have included installation of new cesium clocks, and timing systems, a move to solid state transmitter technology throughout the system, new ASF tables and prediction algorithms, and for high precision situations the use of differential Loran.

The availability of Loran in the past has been affected by a variety of environmental and system problems. These have included aircraft precipitation static and atmospheric noise. On-air signal availability is affected by

(Loran evaluation continued on page 3)



ILA32 Convention and Technical Symposium

The week of November 3, 2003, in Boulder, Colorado

Be there!



International Loran Association

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Past President: John Beukers	2003	jb20@earthlink.net
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one vacancy		

Board member terms end at the close of the ILA convention of the year shown.

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A complete listing of the Board Membership, addresses 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:

<http://www.loran.org/Membership/Formindividual.htm>

Please note ILA's web site address: <http://www.loran.org>
and e-mail address: ila@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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Current advertising rates per insertion:

1/2 page: \$100 (4 for \$300)
Business cards \$15 (4 for \$50)
Classified: \$5 for each 50 words or part thereof

ILA Convention *Continued from page 1*

The Convention will be held in the Hotel Boulderado. A block of rooms has been reserved at a reduced rate for those attending the Convention. Reservations should be made by October 3, 2003. Be sure to mention ILA.

Phone (800) 433-4344 Fax (303) 443-7035

Registration forms are available at the ILA website www.loran.org together with the preliminary Conference Program. Prior to October 3rd, full registration for members is US\$510. After October 3rd the cost is US\$550. For non-members, full registration is US\$550. Full registration includes all of the technical sessions, a copy (CD format) of the Proceedings, hosted lunches, evening receptions, and the banquet. ■

NBA reaffirms support for Loran as a backup and complement for GPS

IN URGING that the needs of the boating community require a reliable backup to GPS, Earl Waesche, Legislative Director of the National Boating Federation, made the following observations as part of a letter to the FRP Input Conference of May 19, 2003.

Given the Volpe Center Report citing the vulnerability of GPS to either intentional or non-intentional jamming, the attempt by Iraq at the outset of the war to jam GPS signals and that the technology and capability to do this is well known to DoD and others, the recreational boating community is very concerned about the loss of GPS as a navaid. We see this as a significant safety issue when in a time of peril at sea or a terrorist attack on our communications infrastructure, our primary navaid is lost, we need a dependable backup. When in a critical situation, there would not be sufficient time to revert to manual methods. We continue to make the case that Loran-C should be maintained as a backup to and complement for GPS.

While the emphasis of the FRP meeting was clearly on aviation, there are 14 million registered boats in this country, most of whom use either GPS or Loran. This is a significant portion, perhaps the majority numerically, who have apparently not been considered in the decision to maintain and continue the Loran-C system. As was stated today improvements have been made to the system, more are scheduled and the funding is available. The system is in place, reliable, fully redundant and cost effective, and thus an ideal back up. ■

Loran evaluation *Continued from page 1*

lightning, loss of station power, and the need to have a chain of stations available. Technical improvements in receiver and antenna design have provided a significant reduction in the impact of atmospheric through the use of H-field antennas combined with all-in-view receivers and digital signal processing.

Station down-time is significantly reduced through the use of solid state transmitters and the rapid response time of "uninterruptible" power supplies (UPS) combined where needed, with new lightning protection.

System integrity is concerned with the probability of a navaid providing Hazardous or Misleading Information (HMI). Integrity target for NPA has been set at 10^{-7} with a horizontal protection limit of 556 meters. Loran presently provides a 10-second alert indication. A target value for HMI of 3×10^{-5} has been set for HEA.

With current Loran continuity at .997, the target for HEA is from .9985 to .9997. For NPA these numbers are increased to .999 to .9999. Factors involved in continuity of performance are the same as those which influence availability, plus receiver acquisition time which is being mitigated with the use of solid state antenna switches and all-in-view receivers with new signal processing capabilities.

Results to date have demonstrated that en route RNP 0.3 is feasible throughout continental USA and the RNP 0.3 required for approaches may be feasible with improvement in related infrastructure. In both cases work continues. ■

DOT Volpe Center preparing a Cost Benefit Study of Loran

USDOT Research and Special Programs Administration (RSPA) is the principal sponsor of a study of the benefits and the cost of Loran-C as a backup to GPS. RSPA sponsored the Volpe Center work on the GPS Vulnerability Study and has since participated in the Loran Integrity Panel (LORIPP) and the Loran Accuracy Panel (LORAPP) as needed. These groups within the FAA Loran team are charged with determining whether Loran can achieve FAA standards for accuracy, availability, integrity and continuity of service.

The Center has been instructed to provide a draft report by September 30 in time to integrate their findings with those of the LORIPP and LORAPP panels. The coordinated analyses will be reported to the USDOT Positioning and Navigation Executive Committee, the body tasked by the Secretary of Transportation to recommend a decision on the future of Loran-C. ■

President's Message

President's Message

I AM PLEASED to report that the positive Loran momentum that I reviewed in the last President's Message has continued right up to press time. Here is a summary of that activity.

1. The Far East Radionavigation Service (FERNS) and Japanese Coast Guard will hold a meeting from September 29 – October 2, 2003 in Tokyo. Conference organizers have invited representatives from the International Association of Light-house Authorities (IALA), the Federal Aviation Administration (FAA), the United States Coast Guard (USCG), the Northwest European Loran System (NELS), and the ILA to present their ideas on how to foster international cooperation and standards on Loran, "having recognized the vulnerability of GPS." This is an important forum, and FERNS representatives will come from Japan, the Peoples Republic of China, Korea and Russia. The meeting certainly verifies that a growing number of nations now recognize that sole-means systems are not viable, and are seeking cooperative means to provide international solutions with integrated systems. On behalf of the ILA, I would like to extend our sincerest thanks to the conference organizers and sponsors (i.e. the Ship and Ocean Foundation of Japan), and to indicate the ILA looks forward to working closely with each of these groups in the future.

2. In an effort to alert European government officials about national vulnerabilities associated with sole-means dependence and how Loran can support national and European Union (EU) navigation and timing infrastructures, David Last, Durk van Willigen and I sent approximately 100 letters (one example is included) to European lawmakers and officials. The results were quite

positive, and we have received encouraging letters from recipients.

Today, there is no question that Loran is getting significant attention within the European community. For example, Loran is under discussion at the European Maritime Radionavigation Forum and with regard to the European Radionavigation Plan (ERNP). The UK, Italy, and Austria have developed an active interest in Loran, and France has indicated it will add transmitters. While NELS will not continue as currently organized, the general consensus is that it will continue in another form.

3. On June 4-5, 2003, the German Institute of Navigation (DGON) held a symposium in Munich entitled "European Radionavigation Networks – Integration of GPS, EGNOS, Galileo and Loran-C/Eurofix." This was the fourth DGON symposium, and for the first time, it was held in cooperation with the ILA. As always, this was an interesting meeting, and a visit to the EGNOS - Navigation Land Earth Station (NLES) at Astrium GmbH was a highlight. The ILA would like to thank the DGON organizers for another excellent job, and we look forward to working with the DGON in the future.

4. The European Group of Institutes of Navigation (EUGIN) held the highly successful European Navigation Conference GNSS 2003 in Graz from April 22-25, 2003. As the conference program stated, "GNSS 2003 reflects the transition from a pure satellite navigation conference to The European Navigation Conference, covering all kinds of navigation systems," and eleven Loran papers were presented. Our Vice President, Professor David Last, gave the keynote address, which was very well received. The ILA's GAUSS standardization group also

took this opportunity to have a productive meeting.

But from my perspective, there are two particularly noteworthy items to convey to ILA members and colleagues regarding this major meeting. First, conference attendees exhibited a clear openness to consider Loran as a viable partner in the satellite/terrestrial mix. Just the number of Loran papers and the associated discussions verify this new level of recognition and interest. I believe the professional community is now gaining an appreciation for the performance a modern Loran system can provide and how Loran can contribute to extremely robust, integrated systems. Second, a Loran paper won the Best Presentation Award for the entire conference, again indicating a growing appreciation for new Loran technology. The paper was given by Wouter Pelgrum of Reelelektronika, and was entitled "Loran-C Challenges GNSS: From a Quarter Nautical Mile down to Meter Accuracy." This was a well-deserved award, and on behalf of all ILA members (and he is a member, of course), I would like to extend our congratulations to Wouter for his outstanding work.

5. As I mentioned in the last President's Message, David Last's presentation, "Is Loran-C the answer to GPS Vulnerability," for the Air Traffic Control Association (ATCA) meeting in January was published in the ATCA journal (Vol. 45:1, January – March 2003). Subsequently, David gave a very similar presentation to Eurocontrol officials in Brussels in March, at the DGON meeting in June, and now an article will appear in the December issue of the European Journal of Navigation. We are fortunate to have David articulate this message, and the fact that his message has been distributed to a broad audience suggests it has been well received.

(continued on page next page)

In addition, Durk van Willigen has just published an article in the August edition of the European Journal of Navigation entitled "GNSS Vulnerability – Can We Solve the Problem?" As Durk documents so well, Loran can solve the problem, and his article will inform a great many people of this solution.

6. The Institute of Navigation (ION) will hold its ION GPS/GNSS 2003 meeting in Portland from September 9-12, 2003. Several papers will be presented on USCG and FAA programs to evaluate performance of the new enhanced-Loran or E-Loran system. In addition, the FAA's Loran Integrity Performance Panel (LORIPP) group will hold its meetings in Portland just prior to the ION meeting.

7. Members of the ILA were involved in two briefings for the Office of Science and Technology Policy (OSTP), which is part of the Executive Branch of the federal government in the US. These were extremely productive meetings, and demonstrated another level of interest in Loran as a national asset that can support US security and its national transportation and timing infrastructure.

8. I also had the pleasure of meeting with RADM Jeffrey Hathaway, the Director of Operations Policy for the USCG, and several members of his staff at USCG Headquarters in Washington, DC. This was a very productive meeting, covering user community support, ILA activities, international Loran activities, and US Loran policy and funding issues, and I believe communications between the USCG and the ILA are extremely good.

9. In the United States, the ILA continues to work with Congress, which has maintained strong, bipartisan Loran support for several years, providing nearly \$100M for the Loran recapitalization effort currently underway. At press time, the

House Appropriations Committee has completed action on the FY2004 Transportation, Treasury, and Independent Agencies Appropriations bill, which included \$25M for the FY2004 Loran recapitalization effort, the same level as FY2003. Senate action is expected in September. Note the House Report accompanying the FY2004 Homeland Security Appropriations Bill stated: "There is also strong support for the recapitalization initiative from marine and other users who utilize Loran since it is the most compatible and only other available multimodal backup navigation system for satellite technology. In view of the significant progress and improvements that have been accomplished to date, the Committee believes the Coast Guard should advance efforts to expedite the Loran modernization effort as an important priority."

10. Finally, I wanted to emphasize that the ILA's 32nd Convention and Technical Symposium will be held in the beautiful venue of Boulder, Colorado, the home of the National Institute of Standards and Technology (NIST). The meeting will feature discussions on E-Loran, which represents the future of the system. In addition, there will be many papers on integrated GPS/Loran prototypes from the US and Europe, USCG harbor entrance and approach trials and LORAPP results, FAA flight tests and LORIPP results, timing tests, etc., and we expect attendees from Europe, North America, and Asia. In addition, there will be a general members meeting, Board of Directors meetings, and GAUSS initiative meetings in conjunction with the general convention. This will be a convention that has something for all user, government, and industry attendees, and I recommend you make hotel reservations now. Please consult the ILA website www.loran.org for details and for on-line registration.

In conclusion, the Loran initiative has been building for years, and that positive momentum has continued and grown stronger. ILA32 will review the progression towards E-Loran and certainly build on that momentum. On behalf of the ILA, I would like to extend a cordial invitation to our colleagues and friends around the world to attend ILA32, and I look forward to seeing you there.

G. Linn Roth
President, ILA

Linn Roth elected Fellow of Royal Institute of Navigation

IN RECOGNITION of his contributions to navigation systems, the development of world-leading Loran C receivers for navigation and timing, and his service to the navigation community as President of ILA, the International Loran Association, Linn Roth has been elected a Fellow of the Royal Institute of Navigation (RIN). Fellows are members of the Institute who have been responsible for a valuable contribution to navigation and upon whom the Institute Council sees fit to confer a distinction.

Roth will accept this award at a reception in London on October 28, 2003.

The Royal Institute of Navigation (RIN), formed in 1947, serves to unite individuals who are interested in navigation and furthering its development. Navigation also encompasses related areas such as cartography, astronomy, mathematics, electronics and information technology. RIN organizes international conferences and other events, helps in the formation of governmental policies relating to navigation and publishes the Journal Of Navigation. ■

ILA letters to wide range of European officials stress critical importance of the continuation of Loran.

ATTACHED is a full copy of the text of a letter which was sent in May 2003 by the International Loran Association to officials in Norway, France, Germany, Ireland, Netherlands, and the European Union concerned with navigation and telecommunications operations and policy. It presents a vigorous case for the need for European support for Loran as a backup to the proposed Galileo satellite system.

"The International Loran Association (ILA) is aware that several European countries are about to make decisions regarding the future of the Loran-C radionavigation system. These decisions are critical, and deserve the highest degree of awareness and deliberation, as they impact the foundation and future of Europe's transportation and telecommunication infrastructure. Government considerations regarding Loran are sometimes made from the perspective of just a single mode of use, such as civil marine applications, that does not take into account greater national or global issues. Therefore, the ILA is contacting you directly to raise important broader issues and questions that need to be addressed in the decision process.

"We believe these issues and questions can be briefly summarised as follows:

"1. GPS and Galileo are extremely similar systems; they will essentially share the same spectrum and the same vulnerabilities. As documented in the recent Volpe report from the US Department of Transportation, GPS is a vulnerable system that requires backups to preserve the safety and security of transportation and telecommunication infrastructure that employ it. Because of their similarities and shared vulnerabilities, the presence of Galileo or GPS will not make the other, or both, more robust. Furthermore, it is not possible today or in the future to control the international radio spectrum, particularly as wireless communications expand. Therefore, it is essential to ask if any country or union of countries should base its future transportation and telecommunications infrastructure solely on satellite systems that are, and will remain, inherently vulnerable to intentional and unintentional interference.

"2. Like GPS and Galileo, Loran is a multimodal international system that can be used by large marine, terrestrial, and aviation navigation communities and also by the timing community, not least to synchronise the cellular phone networks utilised by many millions of individuals. As a multimodal system, Loran is remarkably cost-effective for

both providers and users. Given its potential for multimodal use internationally, a clear government policy securing Loran's future will create business investment, future jobs, and exports. Today, for example, two European companies are developing combined GPS/Loran systems, three other European companies are developing Loran receivers, and at least three further companies in the US and Asia are developing combined GPS/Loran systems and receivers. The markets for these products will be very substantial, precisely because Loran complements satellite systems and makes them more robust. The mix of satellite and terrestrial systems, promoted by member states of the Northwest European Loran-C System (NELS) organization since 1999, is the requested service for most of the multimodal transport users. For this reason, we must advise that the decisions some countries are about to take be made with full knowledge of Loran's multimodal capabilities and the significant economic and security benefits it can provide.

"3. Loran is undergoing a strong revitalisation internationally. The US Congress has allocated approximately \$100 million over the last several years to modernise the US Loran infrastructure. Congressional support has been strongly bipartisan since Loran is viewed as a national asset in the US, and its support transcends party boundaries. In fact, it is common to use the

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term "Enhanced-Loran" or "E-Loran" in the US, to reflect the performance that a modern Loran system can provide to complement GPS in various multimodal applications. In Asia, Japan is currently modernising its Loran system, China is evaluating a complete upgrade of its Loran system, and Korea is testing the broadcast of GPS corrections using its Loran system. It is also worth noting that Russia strongly supports its Loran system, "Chayka," and will continue Chayka operations regardless of the future of GLONASS, Russia's satellite system. Given Loran's ongoing international growth and revitalisation, we must respectfully ask that Loran growth and revitalisation be considered in European countries' Loran decision-making process.

"4. Within Europe, much Loran activity is currently underway. France anticipates adding two more Loran transmitters, and has initiated discussions on future expansion plans with Italy and Germany. Even in countries that are not currently members of the NELS, highly respected professional groups have issued strong statements on the need for such systems to complement GPS and Galileo and protect national infrastructures. The following, taken from the Resolution passed at the last Royal Institute of Navigation (RIN) meeting, reiterates some of our concerns: "In order to ensure that Galileo can contribute to a robust global navigation and timing infrastructure, this conference strongly recommends that

European Administrations recognize the key findings of the US Volpe Report, the NAV02 proceedings and other studies of the significant vulnerability of GNSS to loss of signal, interference, and jamming. The conference noted that many of these concerns apply to Galileo as well as GPS. The Volpe Report identifies the need to ensure that appropriate and adequate alternative systems are maintained as required for maritime, aeronautical, and land navigators, as well as for timing and telecommunications applications." As professionals in the field of radionavigation, we must advise that these European-wide issues and perspectives should be taken into consideration when contemplating the Loran system.

"5. The concept that GPS (and Galileo) are vulnerable systems is well accepted today. Defence agencies recognise that such systems can be "jammed," and in fact plan for continued operations by utilising complementary systems such as Loran that do not share the same vulnerabilities. For example, STN Atlas of Germany has presented several papers on a combined GPS/Loran system that is intended to provide continued minesweeping operations during a period of GPS denial due to jamming. Similar programs are underway in at least three other countries. Given that defence agencies expect and plan for GPS (and by implication, Galileo) outages by providing for use of a complementary system such as Loran, we do not believe any nation

should base its transportation and telecommunications infrastructure solely on systems that can be relatively easily disrupted, and advise that European countries deliberate this important issue very thoroughly.

"In conclusion, we advise that these issues and concerns be fully addressed during European countries' deliberations regarding Loran. Loran should not be considered from a limited perspective, as it is truly a national and international asset whose safety, security, and economic benefits span well beyond single modalities and individual countries. Furthermore, Loran is uniquely complementary to the GPS and Galileo satellite systems, and therefore can uniquely support individual users, national infrastructures, and international harmony well into the future."

The letter was signed by Linn Roth, President of ILA, Prof. David Last, Vice president ILA, and Prof. Durk van Willigen, ILA Board Member. ■



ILA32 Convention and Technical Symposium

The week of November 3, 2003, in Boulder, Colorado

Be there!



Federal Radionavigation Plan 2003 to be published in two sections

THIS YEAR a new format for the Federal Radionavigation Plan (FRP) had been created. FRP 2003 has been redefined as a policy and planning document. Work on FRS (Systems) is in progress but with no firm schedule at present for its publication.

The first edition of the FRP was released in 1980 as a part of a Presidential Report to Congress prepared in response to the International Maritime Satellite (INMARSAT) Act of 1978. It marked the first time that a joint Department of Transportation (DOT) and Department of Defense (DOD) plan for common-use (both civil and military) systems had been developed. Now this biennially updated plan has served as the planning and policy document for all present and future Federally provided common-use navigation systems.

As readers of Loran Lines are aware there was consternation expressed in many sectors of the navigation community when FRP 1994 announced plans to terminate Loran at the end of 2000. The gov-

erning assumption at that time was that GPS would then be fully operational as a totally reliable and secure navigation aid and able to assume the role of a sole reference for navigation. Numerous user groups lodged a strong protest that the proposed termination of Loran and other nav aids was preemptory and reflected an unwise policy of dependence on a sole source. Subsequent FRP editions modified the comments regarding Loran, stating that its continuation was a matter of study and that it would be retained beyond the previous deadline, for an indefinite period. Such a vague position provided no encouragement either for the improvement of the Loran system or for investment in receiver purchase or development. However, widespread and vigorous support for Loran, spearheaded by such groups as the NBA and ILA, has since been successful in gaining the support of the Congress to fund a progressive update of the National Loran System and the development of state of the art receivers.

In view of the many factors involved it is not surprising that it is difficult to craft the FRP not only because of the technical complexity of the areas involved but the neces-

sarily differing requirement and outlooks provided by those Federal Agencies who must in the end concur on a document which effects all in a significant way. The current publication is in response to the requirements of the FY 1998 Defense Authorization Act under which the DoD and DOT have a Memorandum of Agreement for a cooperative effort on the Document. Since the authors have in the past been required to combine systems and policy definitions into a single document the FRP has appeared on occasion a year late from its target date for publication. To resolve some of the problems arising from the linkage of dissimilar subject material a two-document format has been adopted. FRP 2003 (Plans) will be published as scheduled in 2003. It will be signed off by the Secretary of Defense and the Secretary of Transportation. No decision has of yet been made whether the Secretary of Homeland Security will be a signatory.

It is to be noted that decisions regarding the future of Loran will not be contained in FRP 2003 since the deadline for FAA reports to the Secretary of Transportation is March 30, 2004. ■

The continuing threat to GPS by jamming

THE ANALYSIS of the vulnerability of GPS so clearly delineated by Jim Carrol in the Volpe Study presented in Salt Lake City, Utah at CIGSIC on September 10, 2001 stressed the simplicity and easy availability of jamming devices. In the eventful and turbulent period since then, the potential denial of GPS by jamming has been a growing concern to the timing and navigation community and a reality in the war zone of Iraq. Early in the conflict, US officials expressed anger that sophisticated technology devices, specifically night vision glasses and GPS jammers were

being smuggled to the Iraq forces. Shortly thereafter reports appeared in the world press that US Air Force raids had destroyed a GPS jammer site near Basra.

One initiates a jamming assault knowing that the device ultimately serves as a beacon for its own annihilation. Either the jamming site is the target of direct assault or anti-jamming techniques evaluate the threat and move to alternate channels or signal coding. Accordingly strategic doctrine dictates that a jamming capability be held in reserve as a key card to be played at a critical moment, being effective in the brief interval before the opponent can evade or counter the effects.

An excellent example of this is the use which German forces in World War II made of their newly developed capability to jam early British coastal radars. The jammer installation was held in reserve until it was deemed essential by the German command to move two cruisers from Brest through the Channel to naval bases in Germany. Under the cover of night the jamming "noise" was mistaken for normal atmospheric static and the fleet movement was undetected. In the same way it could be expected that GPS jamming resources will be held in reserve and activated when the target, missile or aircraft is at a critical point its trajectory or flight path. ■

Integrated Loran/GPS receiver tests reported in GPS WORLD cover story

A PRELIMINARY REPORT of research in progress on an integrated GPS/Loran receiver system is contained in the March 2003 issue of GPS WORLD. Widespread concern since 9/11 about the vulnerability of GPS and the possibility of signal interference either accidental or by deliberate hostile action has sparked interest in the proposal that enhanced Loran can serve as a navigation safety net for GPS users. The development program, a combined effort of Rockwell-Collins, Cedar Rapids, Iowa, and Locus Inc., Madison, Wisconsin, is designed to provide a prototype receiver for FAA flight tests.

The research and development effort is designed to provide a test bed on which to evaluate the per-

formance of a combined GPS/Loran receiver configured to provide seamless navigation guidance based on the best fusion of GPS and Loran data. The signal processor, using raw Loran data (TOA measurements using an all-in-view receiver) and GPS data (GLIP), computes an integrated navigation solution based on available GPS and Loran signals. In addition (GLIP) creates an independent navigation solution based on Loran-only data and one on GPS-only data. The antenna unit comprises a GPS antenna and an H-plane (magnetic) Loran loop antenna co-mounted in a certified ADF radome.

Significant and challenging limitations were imposed on the design by the certified multimode flight receiver (MMR) selected as the system platform. These included the space available for two receivers and associated data processors,

voltage levels and power available from the MMR buss and the need for isolation and non-interference with other MMR functions. The new card occupies a slot nominally assigned for MLS. Preliminary tests indicate no degradation in either Loran or GPS performance in the composite system and Loran navigation solutions within the RNP .3 limits specified by the FAA.

Initial flight tests have been carried near Madison Wisconsin and Athens Ohio and more tests are planned for the future when integrated receivers delivered by Rockwell Collins to FAA Test Center are used for tests this summer and fall.

Full text of the article, including system block diagrams, photographs and flight performance plots can be downloaded from the Locus Inc. web page at www.locusinc.com. ■

ILA to deliver Loran Lines Electronically

THE International Loran Association will distribute Loran Lines electronically to all "connected" members beginning with the next issue. This move will reduce costs and increase the speed of delivery considerably, and allow the use of more color in the layout. You can print the files and easily forward copies to your Loran-C interested friends and associates.

The ILA will also post each Loran Lines issue on its web site at www.loran.org.

The association maintains a database with member names, address and e-mail address when available. We will prepare two newsletter delivery lists and will e-mail the newsletter to those with an electronic mail address on file. For those members with no e-mail

address, Loran Lines will continue to be sent by U.S. mail.

All members are urged to become "network connected" and send their e-mail address to the ILA Operations Center at ila@loran.org

The newsletter will arrive in the form of a Portable Document Format (Adobe PDF) file, readable using the familiar Adobe Acrobat software. File size will typically be between 0.5 and 1.5 Mbytes.

Members may download the free Adobe Acrobat Reader at www.adobe.com (click on the yellow "Get Adobe Reader" button).

There are versions of the reader optimized for broadband (Cable modem and DSL) users and optimized for dial up users. While at this page you might also want to follow the links to look at the description of the PDF files and

some of the other information that Adobe has to offer.

Members who find the electronic delivery of Loran Lines unusable or inconvenient can have their e-mail address removed from the delivery list by contacting the Operations Center.

We hope that all members will become electronically "connected" and will take advantage of the opportunity to spread the word on Loran C throughout the world. Send your e-mail address to the Operations Center and be sure to send any address changes. ■

ILA Re-Elects Linn Roth to Presidency for 2004

DR. G. LINN ROTH has been re-elected to the Presidency of the International Loran Association (ILA). He previously served as ILA President during 1999 and 2000 and again in 2003. As President, he heads a Board of Directors which includes four newly elected Directors and eight Directors continuing in their three year terms. The President appoints three members to one-year terms on the Board. Terms begin after the ILA Convention and Technical Symposium in November 2003.

The full Board of Directors for the year 2004 is:

G. Linn Roth President

John Beukers, past President (ret.)

Langhorne Bond

Jim Doherty

David Last

Ben Peterson

Tom Rice

Chuck Schue

*Tom Celano

Erik Johannessen

*Bob Lilley

Marty Poppe

*Bill Roland

*Durk van Willigen

* elected to three year term

plus three to be appointed

ILA Expands On-Line Services

ELSEWHERE IN THIS ISSUE you will find information on the Association's new distribution plans for Loran Lines. ILA is building an increased on-line presence with annual conference registration and membership renewal available on the Internet. All members are encouraged to provide e-mail address information to the ILA Operations Center at ila@loran.org so that maximum use can be made of the network.

ILA has recently placed essentially all its proceedings of past conferences on the web page at www.loran.org. These are PDF files readable with Adobe Acrobat and can be selectively printed as you need individual papers. The more recent proceedings are filed as individual papers so you can view and download a single presentation if you wish. Note: The older proceedings files are very large so users with dial-up connections need to be quite patient during download. ■

Leo F. Fehlner

1915 - 2003

LEO F. FEHLNER, mechanical and aeronautical engineer, passed away on May 27, 2003 at the Tabor Manor Health Care Center in Tabor IA. A member of the International Loran Association he served three terms as Vice President in 1975, 1976 and 1978, was Association Secretary from 1981 to 1988 and elected member of the Board of Directors for 1989 and 1990.

In recognition of his contributions of outstanding value to the development and fostering of Loran he was awarded the Medal of Merit in 1993.

Mr. Fehlner was born on August 8, 1915 in Dolgeville NY. He attended Catholic University in Washington DC and graduated Magna Cum Laude in 1937 with a BS in Mechanical Engineering

After graduation he worked at the Langley Aeronautical Laboratory at the wind tunnel facility, where he was involved in the design of the P-51 aircraft. Subsequently he worked at the David Taylor Model Basin where he was involved in numerous aspects of marine hull design.



In 1955 he joined the staff of the Johns Hopkins University Applied Physics Laboratory, where his work contributed significantly to the development of Loran as a precision navigation system. During the Viet Nam war he was head of Defense System Projects Group (DSPG) concerned with the tracking of North Vietnam truck convoys carrying munitions to the South. Leo's group determined that positioning requirements could be met using Loran navigation provided by the Tight Reign chain established in South East Asia by the US Coast Guard in

1966. Under his leadership DSPG was active in promoting Loran receiver development.

Mr. Fehlner held patents on Loran Systems and for the design of marine hulls, aircraft wings and early cruise missiles. He retired from Johns Hopkins in 1986 but continued an active affiliation with ILA.

He is survived by his sister Margaret B. Barager of Buffalo NY, daughter Christine Dodd of Glenelg MD, son Paul Fehlner of Dyke VA, daughter Katherine Roberts of Columbia MD, daughter Angela Curley of New Market MD, and daughters Kresenz Monday and Frances Fehlner of Tabor IA. ■

32nd Annual Convention and Technical Symposium November 3 – 7, 2003 / Boulder, Colorado / United States

Pre-Registration Cut-Off: October 3, 2003

One registration form per couple. QUESTIONS? Visit www.loran.org or contact ILA at (805) 967-8649

Last Name: _____ First Name: _____
Organization: _____ Title: _____
Address(1): _____
Address(2): _____
City: _____ State: _____ ZIP: _____ Country: _____
Telephone: _____ Fax: _____ E-mail: _____
ILA Member Number: _____ Spouse/Guest Name: _____

REGISTRATION FEES: Conference Registration includes: all scheduled ILA functions, continental breakfast, hosted lunches, receptions and banquet. Attendees will also be mailed a CD copy of the Conference Proceedings. Spouse/Guest registration includes entrance to the hosted reception and banquet only.

Before September 30th: \$510 ILA Members \$550 Non-Members \$250 1-Day ONLY \$120 Guest \$ _____

After September 30th: \$550 ILA Members \$550 Non-Members \$250 1-Day ONLY \$120 Guest \$ _____

Meal choice: Beef Chicken Fish Vegetarian

SPECIAL EVENTS

GAUSS Registration: Monday, November 3, 2003 and Friday, November 7, 2003 \$30/Attendee \$ _____
Two half-day sessions held at the Convention hotel.

Banquet Awards Event and Dinner: Wednesday, November 5, 2003 \$50 Banquet only \$ _____
No charge for full-conference registered attendees and registered spouse/guest.

Meal choice: Beef Chicken Fish Vegetarian

Booth and/or Display: Additional information available, contact ILA Operations Center. \$50 per space \$ _____

PAYMENT:

Payment is accepted through Visa, MasterCard, company or personal check, and electronic wire transfer. Contact the ILA Operations Center for electronic wire transfer information and be sure to include the wire transfer fee of \$45 shown below. Personal and company checks must be in U. S. dollars, drawn on a U. S. bank, and made payable to International Loran Association.

Visa MasterCard Personal or Company Check Electronic Wire Transfer (Fee \$45) \$ _____

Card or Account # _____ - _____ - _____ Expiration ____/____

Card Holder Name: _____

Signature (required for credit card registrants) _____

Grand Total: \$ _____

CANCELLATION POLICY

Cancellations received in writing before October 3, 2003 will receive a 50% refund. No refunds provided after October 3, 2003.

SPECIAL NEEDS

In compliance with ADA regulations, please notify the ILA Operations Center if you require any special assistance.

FORM SUBMISSION and CONTACT INFORMATION

Mail forms to: ILA Operations Center, 741 Cathedral Pointe Lane, Santa Barbara, CA, 93111, USA

Fax Forms to: ILA Operations Center, (805) 967-8471

ILA Operations Center: (805) 967-8649 ila@loran.org www.loran.org

CONVENTION HOTEL INFORMATION (Make reservations directly with the Hotel Boulderado. Conference rates available.)

Hotel Boulderado, 2115 Thirteenth Street, Boulder, CO 80302, USA (800) 433-4344 www.boulderado.com

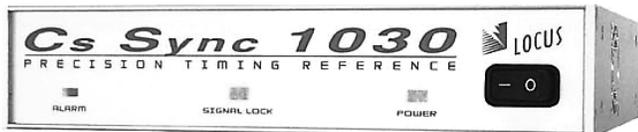
Modern Loran Technology to Complement GNSS and GPS

SatMate 1030 – Navigation Applications



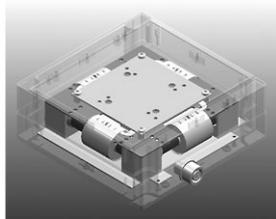
- New DSP based receivers
- All-in-view station acquisition / tracking
- 12 chain, 40 station capabilities
- Adaptive interference cancellation
- E-field or H-field antenna operation
- NMEA 0183 output messages

CsSync 1030 – Timing Applications



- Cesium-like (Stratum 1) timing performance
- Independent UTC source
- Time and frequency outputs
- All-in-view station acquisition / tracking
- Adaptive interference cancellation
- E-field or H-field antenna operation

H-Field Antenna



- P-static immunity
- Small form factor
- No ground required
- Penetration into non line-of-sight areas
- Can be integrated with GPS into single unit