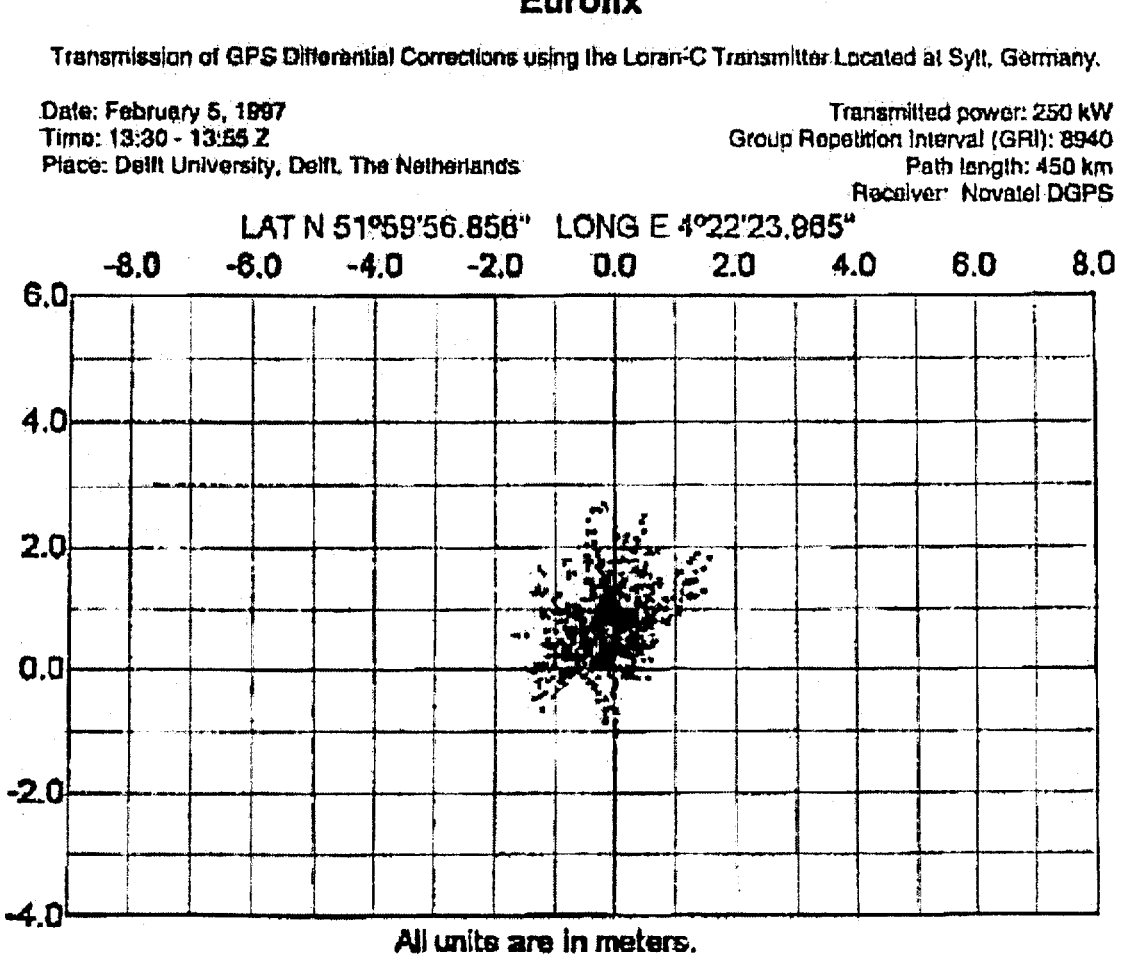
# Loran Lines

The newsletter of the *International Loran Association* (Formerly the Wild Goose Association's newsletter, *The Goose Gazette*

**Volume 97-1 - Fall/Winter 1996-97**


# TWO METER ACCURACY WITH Loran/GPS

Eurofix uses Loran-C to carry DGPS correction data over 450 km!




First test results of the Eurofix system.
See the article on page 2 for details.

**INTERNATIONAL LORAN ASSOCIATION**
***Twenty-Sixth Annual Convention and Technical Symposium***
**Ottawa, Canada ---- 6-9 October 1997**

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**Formerly the Goose Gazette**

*Loran Lines* is an official publication of the International Loran Association (ILA).





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# Eurofix Test Results

by John Beukers

There has been considerable response to the recently released Eurofix test results. Some have asked what Eurofix is; others have requested more information. The objective of this article is to answer some of these questions and to provide contact information for anyone wishing to follow up with those involved in the project.

Background:

During the development phase of Loran-C, the United States Department of Defense initiated a project with the code name "Clarinet Pilgrim" (Walt Dean had a lot to do with this project - waldean2@aol.com). The objective of this classified program was to provide a secure and reliable data link to Loran-C receivers in the field to communicate essential messages. Communication was achieved by a time displacement of the last two pulses in the eight pulse sequence of the transmitted navigation signal. The pulse position modulation of these pulses was designed to be "balanced" so that there was minimal, if any, degradation of the position information.

The concept of using the Loran-C data link capability to transmit GPS and GLONASS differential corrections has been recognized for many years; however, the limited data rate that can be supported by the data link and the amount of data that must be transmitted to mitigate the effects of Selective Availability have stood in the way of implementing the technique.

The Delft Team Contribution:

An international consortium, under the guidance of Professor Durk van Willigen at the University of Delft in The Netherlands, has been working over the past 9 years to come up with a solution to the Loran-C data rate limitation for the communication of GPS differential corrections. This had to be achieved while maintaining compliance with the RTCM format for transmitting differential corrections from medium frequency beacons. By incorporating compression algorithms at the transmitter and complementary decompression techniques in receivers it has been demonstrated that the effects of GPS Selective Availability can be removed while retaining the RTCM format.

The Sylt On-Air Test.

With the cooperation of the German Government and with the assistance of Megapulse, Inc., (Bedford MA, USA) who provided the minor modification to the Sylt transmitter in Germany, the international team has just completed the first on-air tests of the data link. The results are encouraging and indicate that the accuracy degradation caused by SA can be removed in real time over a wide area. The scatter plot on page 1 is also available at ftp://bb.iu.net/pub/jb and is in the Europe folder with the file name Eurofix.jpg (size about 26K). The scatter of corrected GPS position information on the plot shows a standard deviation of about 2 meters. Distance of the receiver at Delft University is 450 km from the Sylt transmitter.

Implications:

GPS SA differential corrections over the entire European Loran-C service area (or any other area covered by Loran-C) can be made available to provide a position accuracy of under 10 meters while at the same time providing integrity and significantly improving the availability of positioning information. In addition, sole reliance upon a single system is avoided.

Contact Information:

For further information the following can be contacted:

Professor Durk van Willgen, University of Delft, The Netherlands
D.vanWilligen@et.tudelft.nl

Professor David Last, University of Wales, U.K
jdl@sees.bangor.ac.uk

William F. Roland, Megapulse, Inc., Boston MA USA
broland@tiac.net

Dr, Dirk Kuegler, Avionik Zentrum Braunschweig, Germany
kuegler@aerodata.de

Dr. Michael Braasch, Ohio University, Athens Ohio, USA
mbraasch@oucsace.cs.ohiou.edu

Dr. Linn Roth, President, Locus, Inc. Madison, WI, USA
roth@locusinc.com

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# Upcoming Radionavigation Conferences

Northwest European Loran-C System (NELS) Technical Symposium/Workshop, April 16 - 17, 1997, The Netherlands, Contact: Andreas Stenseth, Tel: +47 23 09 24 76; Fax: +47 23 09 23 91.

Second International Radionavigation Conference & Exhibition: Planning for Global Radionavigation, Moscow '97, Russia, June 24 - 26, 1997; Contact: Vladimir Denisov, Internavigation RTC, Bolshoy Trekhsvyatitelskiy Pereulok, 2, 109028, Moscow, Russia, Tel +7 (095) 926-25-01; Fax +7 (095) 917-01-27; email: postmaster@internavi.msk.su

Fifty-Third Annual Meeting of the Institute of Navigation: Future of Navigation: Facing the Challenges, June 30 - July 2, 1997, Albuquerque, NM; Contact: ION, 1800 Diagonal Road, Suite 480, Alexandria, VA 22314

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# Coast Guard Commandant: Better Use Loran to Check GPS

[Editor's note: The official position of the Coast Guard is that Loran-C is an expensive people-intensive system which needs to be shut down]

Interview with Admiral Robert E. Kramek Making high-tech a reality
Navy Times, 6 January 1997

Q. Are you saying that's overkill?
A. I wouldn't call it overkill. We have had success with those systems, and success begets success. All I'm saying is that there are other systems now, so perhaps you don't need those people-intensive systems. We have to look more toward trusting some of this automation. I think there's a lot of room to reduce the personnel-intensive systems that we have today, without putting it on the backs of the people.

Q. Even so, aren't there limits to what technology has to offer?
A. Yes. Sometimes it doesn't work. You can't become totally reliant on differential GPS, you need to check the Fathometer once in a while, you have to check the LORAN-C and check the radar, and take a real visual bearing. Recently a cruise ship ran aground almost at full speed off the island of Nantucket, because all it was using was GPS, and the antenna wasn't screwed in right. All they had to do was look out the window! But they were too reliant on this new whiz-bang thing. So you have to have some oversight, but you don't have to go back to the old ways, where the guy is standing down in the engine room with a clipboard, looking at every gauge 24 hours around the clock.

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# ILA Answers Boat US Questions and Concerns about Loran and GPS

1. Is the year 2000 too soon for the Coast guard to begin shutting down its Loran service?

Yes, much too soon. There are millions of marine and other Loran users in the United States who have invested more than a billion dollars in Loran-C equipment. Loran should be available to users for at least 10-15 years, for the following reasons: a. GPS and its enhancements do not yet answer all navigation requirements. b. GPS enhancements are not in place or operating as designed. c. Differential GPS requires recreational boat owners to spend about 1/2 billion dollars over the cost of basic GPS receivers. d. Loran-C's proven reliablility and availability enhances GPS better than any other system. e. No other practical alternative navigation system exists for civil navigators. f. It is impractical to close continental Loran-C piecemeal.

2. Should the Federal government, and the taxpayers, continue to support two different government sponsored navigation systems? For how long?

Yes. The Federal Government should support a mix of aids to navigation that meet the requirements of the navigators. The taxpayers should fund Loran-C until there is another reliable aid to navigation that equals or exceeds Loran-C performance and has no common-mode failure with GPS. The users also need a reasonable overlap period to recover their equipment costs. The Federal government defined a reasonable overlap period as 10 to 15 years, and the users agreed.

In support of these premises, the Coast Guard Authorization Bill (Public Law 104-324) passed in late 1996 requires the Department of Transportation (DOT) and its agencies to prepare a plan for the future funding, operation, maintenance and upgrade of the Loran infrastructure. Moreover, the FY 1997 DOT funding bill (Public Law 102-205), even in an environment of tight budget resources, provides $4.65 million for use this year to begin upgrading the Loran system.

3. Can GPS, in its current status with Selective Availability still on, meet all the needs of recreational boaters and sport fishermen?

GPS cannot find thousands of underwater wrecks or rocks known only by their Loran-C coordinates, with accuracy better than 1/4 mile. This is true even if SA were turned off. GPS cannot match Loran-C repeatability as long as SA is on. We are just starting to get a handle on actual performance through extensive monitoring, and are finding some unpleasant surprises. During one recent 16 day period, the Vienna, Virginia GPS monitoring station showed horizontal errors up to 250 meters for periods of around 15 minutes, each day. This was due to one satellite being out of service. This series of fix errors, however unsettling, does not exceed the accuracy specifications of the SPS signal.

Navigators need two independent systems, given the performance of GPS since reaching Full Operational Capability. Otherwise GPS signal problems or receiver failures, or interference, would leave navigators without an electronic aid to navigation.

4. Does Loran have features which GPS cannot match? Such as repeatability ?

Yes, repeatability, the ability to return precisely to a previously recorded position, is one. DGPS offers better repeatability than Loran-C, but at significant added cost and lower availability. Loran also has better integrity than GPS, giving notice of erroneous signals within a minute. GPS gives notice of many errors within 10 seconds, but other failures yield inaccurate fixes for periods of about 1-1/2 hours. Loran-C isn't affected by the same interference that harms GPS, such as that expected with the sun spot maximum near the end of the century.

5. Is there a future for Loran as an augmentation to GPS? Or has the Differential GPS system taken care of that?

Loran-C is the only GPS augmentation system with no common failure mode, the only one that is built and paid for, the only one proven in use, and one with major improvement available at no additional government expense beyond operation and maintenance.

Using a normal Loran-C receiver in addition to a normal GPS receiver reduces the unavailable period from 4.3 minutes per day to 4.7 minutes per year. Using the newest Loran-C receivers reduces that 4.7 minutes per year to a few seconds, and also improves navigational accuracy. If the Loran-C transmitting system were to broadcast differential GPS corrections, the resulting system would be quite reliable and robust.

DGPS has a deplorable availability record. Disregarding the outages of the two worst DGPS stations, DGPS has about 96.3% usable time. Disregarding the worst four stations, DGPS still has about 1.8% unusable time, six times as much as the Coast Guard projected. Even at the planned level (4.3 outages per station per year; average outage: six hours), DGPS falls far short of a reliable system. This is exacerbated by the fact that many ports and their approaches have no overlapping DGPS coverage to offset the effect of an outage. Navigators cannot use the full accuracy of DGPS with paper or electronic charts, due to differences between charted positions and DGPS positions. These differences are as high as 65 meters on approach charts, according to NOAA testimony following the QE II grounding.

6. Is it good public policy for the United States to depend solely upon one system, particularly a system which is satellite-based? (i.e. should Loran continue as a land- based backup to GPS, should anything go wrong with GPS in the future?)

It is never good policy to trust a single aid to navigation. The shoals and mountains are littered with wrecks navigated by those who once believed otherwise. All responsible navigators in the world including the U.S. Department of Defense require two independent methods of fixing position. (References: FRP; Bowditch; USAF messages; DOD testimony to Congressional committee) The U.S. civil navigation community is no different. Only the U.S. providers: DOT, FAA, and USCG, insist that one system will be sufficient to meet all civil navigation needs. (Note: not "is," but "will be")

In addition, the U.S. telecommunications system is increasingly dependent on precise timing. Currently it relies primarily on Loran-C. GPS is beginning to meet many of the needs, but timing is so critical that communications providers need two systems.

7. Do you think that commercial and recreational interests would support the privatization of Loran, through subscription fees, user fees, taxes on equipment or other means?

Any user fees would have to apply to all radionavigation systems in civil use, in proportion to their costs and numbers of users.

Even so, we would oppose them vigorously. Our experience with user fees (the boat user fee and FCC station licenses) indicate that when the Federal government administers specific "user fee" tax programs, they include:

a. excessive administrative costs.

b. outrageous penalty levels for minor errors.

c. spotty compliance.

d. concentration of law enforcement efforts on tax compliance.

e. unintended consequences that are quite important.

Our experience with Wallop-Breaux taxes shows that the Federal Government doesn't distribute the taxes as they say they will.

Our experience with the luxury tax/diesel fuel tax and all its permutations is the final straw in revealing how the boating industry and recreational boat owners have suffered from targeted taxes. We do not need to add new or additional fees to the existing funding system.

Operation is a separate matter from funding. If the government can operate Loran-C more efficiently and inexpensively by private contractors, then it should use contractors.

Commercial and recreational boat owners along with millions of other users need safe, reliable, efficient, and cost-effective electronic aids to navigation. Loran meets all these criteria, and upgrade and automation of the infrastructure promises to reduce

future system operating costs to about $7-9 million annually. Boat owners have taken a beating in recent years, with taxes and fees and also by NOAA's decision to stop taking depth data in channels and areas without heavy commercial use.

I expect BoatUS hears from boat owners who have bought GPS, are starry-eyed about it, and would not support keeping Loran-C.

They believe the exaggerated claims that they have heard about its accuracy--reinforced by the manuals that claim accuracy on the order of 16 meters. This is twice as good as 95% accuracy would be with SA off. They also are unaware of the integrity problem and the interference problem.

Bill Brogdon
President

## Charron Retires

The ILA wishes good luck to Laura G. Charron upon the occasion of her retirement. Laura served 35 years in the Time Service Department of the U. S. Naval Observatory. She has been a long-time supporter of Loran and the ILA.

## USCG DGPS Availability Remains Low

The U.S. Coast Guard's Differential GPS system using radio beacons continues to provide excellent accuracy, but poor availability. Analyzing the NAVCEN data for November and the first 17 days of December, 1996, we find that the average usable time is about 96.3%, ignoring Alexandria, Wildwood, and two stations listed as "off air:" St. Louis and Youngstown.

Two more stations have continuing problems: Aransas Pass at reduced power for about a month, and Upolu Point off air all of December. If we drop these two stations, the remainder have operated about 98.2% of the time. This is still about five times the level of outages in the goal of 99.7% operation. (In critical VTS areas, the goal is 99.9% usable time.)

1 November through 17 December 1996; 47 days 55 stations. calculations don't include:

| | |
|---|---|
| Alexandria | |
| St Louis | "off air" but operating |
| Youngstown | "off air" but operating |
| Wildwood | |

outages = 2145.7 hours

51 * 47 * 24 = 57528 - 2145.7 = 55382.3 / 57528 = .9627

If we don't include Aransas Pass (721 hrs) & Upolu Pt (448.1 hrs), outages = 976.6 hours

| | |
|---|---|
| Aransas Pass | reduced power since 18 Nov + prev. Nov outages |
| Upolu Pt | out since 30 Nov + prev. Nov. outages |

49 * 47 * 24 = 55272 hours - 976.6 = 54295.4 / 55272 = .982

Capt. Bill Brogdon

## USCG DGPS Coverage

31 December 1996

There is no DGPS coverage for the entire west and north coasts of Alaska, the Aleutian Islands, and an area between south central and southeastern Alaska, near Yakutat.

There is no overlapping DGPS coverage for:
Alaska Peninsula
Southeastern Alaska
Washington seacoast
Straits of Juan de Fuca
Oregon coast
California north of Cape Mendicino
South Texas coast
Area east of Galveston
Most of South Carolina coast
Area near Delaware Bay entrance
Most of Lake Superior
Southern Lake Michigan
Much of Lake Huron
Most of Lake Erie
Lake Ontario
Mississippi River

In these areas, an outage of one station leaves the navigator without an alternative source of DGPS data until the outage is repaired. Outages typically last many hours or even days.

## ILA WWW Home Page

The ILA Home Page at http://www.ent.ohiou.edu/avn/loran continues, "under construction and update" almost constantly. Ms. Patty Wetzel, an Ohio University student and curator of the Wm. Jackson Memorial Library at the Avionics Engineering Center, heads up our home-page development effort. Visit often! There's a complete listing of the recent Congressional actions, and the beginnings of the 1997 conference page. Remember, it's the week of October 6, in Ottawa, Canada!

## Reunion of Loran Coasties

From Perry Campbell via email:

There has been a lot of activity on a recently established civilian Coast Guard internet site at www.fredsplace.org. The below information should be of interest to the ILA and in particular former USCG operators of the loran systems.

Hey, y'all (as they say here in North Carolina)--

Recently, a number of Loran dinosaurs (some from when Loran-A walked the earth) were part of the group that got together to roast Captain Bob Wenzel on the occasion of his retirement from the Coast Guard and entry into reality(?). A significant positive side-effect of attending this "do" was the enjoyment of seeing old friends, finding

out about others, and swapping "war" stories about Loran (funny--I didn't remember Slice 29 quite that way). Anyway, during this event, I suggested we ought to try to get together about once a year (Loran Coasties {former, present, and wannabes}--though I understand there's not too many of those anymore).

Since I opened my mouth on the issue, there was almost unanimous consent that I should set up the first one. Well, here's the first cut and comments are invited!!

WHO? -- the address list for this e-mail was developed from e-mail listings I had AND a review of the e-mail list maintained at Fred's Place. (THANKS, FRED!) It is NOT, repeat NOT even close to a list of those who could and/or should be invited. I expect those on the list to spread the word and my snail mail address/phone number, etc., to those who should be invited--some who leap to mind are Teaneysan, Burt Thomas, The "Imler", and many, many others. One point--At this point (I'm open to comment on this issue), this is a USCG Loran Marine affair and, as such, should be limited to those in the Coast Guard family (active, retired, civilian, etc.) who dedicated their life to Loran (well, not quite THAT strong but you get the general idea). Soooo, spread the word. Oh yeah, bring the family--I'm sure the ladies would like to see their old friends as well.

WHAT? -- To be developed but primarily a get-together (picnic, softball, dinner, dance, let's pick someone and roast them, all of the above??). Lots of time to mix and catch up with old friends, etc. Before and after the "event," there are a lot of beautiful beaches nearby (less than there were--Fran was NOT kind to our beach communities!), lots of golf courses, and for those looking for the neon, Myrtle Beach is only an hour and some away.

WHEN? -- June 7, 1997

WHERE? -- Right heah in Wilmington, Nawth Carolina--Yankees are welcome but are expected to use the spitoons and not the floor. Exact location to be determined but there are a number of beautiful parks in the area and lots of nice dinner/dance locations.

WHY? -- Because it's ALWAYS good to see old friends (and who knows? Maybe you'll make a few new ones.)

HOW? -- Well, first three people who call get to stay at my house. For everyone else, I'll be happy to help arrange lodging, rental cars, etc., etc. If there are expenses involved with setting up the event, I'll ask those who are coming to help out--I wish I could afford to just go ahead and bankroll the thing, but I can't. Also, I will need a firm number by at least May 1.

Bottom line: Come if you can--if you can't, spread the word!

Questions? Comments? Outraged comments??

You can reach me at--
campbell@wilmington.net
OR
(snail mail) 1308 Shenandoah Street
Wilmington, NC 28405

Please do NOT use----
campbellp@uncwil.edu

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# Obituary

We are saddened to receive word of the passing of Diane Cornett after a long illness. Diane was the wife of former Ohio Division of Aviation's Director John B. Cornett. Members will remember John as a leader of the Loran Planning Work-Group in the early 90's and as a tireless worker for the benefits of aviation for all users.

The International Loran Association extends the sympathy of its members to Mr. Cornett, his family and friends.

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# Summary Report of the Silver Anniversary Convention and Technical Symposium of the ILA

November 3-7, 1996, San Diego California, USA

The past and the future of Loran-C were addressed at the Plenary Session of the 1996 ILA Annual Convention and Technical Symposium held at the Catamaran Resort Hotel in San Diego, California at the beginning of November. Being the Association's Silver Anniversary the theme chosen was to reflect on the past 25 years of Loran-C operation and to look to the future 25 years. In doing so, it was felt that the dedicated performance of individuals in the Coast Guard who had been responsible for the high level of Loran-C service for the past 25 years or more should be recognized. In addition, it was considered appropriate to commend the action of the Federal Aviation Administration (FAA) to implement Loran-C in the mid-continent to serve the General Aviation and land user community. To accomplish this a special President's Award was presented to the Secretary of the Department of Transportation (DOT), Federico Pena, representing both the Coast Guard and the FAA. Replicas of the award addressed individually to the Coast Guard and the FAA were also given. Nominated by the Secretary to receive this award on behalf of the Department of Transportation was Capt. Jim Doherty of the Coast Guard who also accepted the awards presented to the Coast Guard and the FAA. Responding to the presentation, Captain Doherty said "We greatly appreciate this recognition, it is important to all those that do a tour of duty at the Loran-C stations, especially in the remote areas. I will make sure that this ceremony and award is communicated to those in the field."

The second half of the Plenary Session was devoted to the future of Loran-C in the United States and was dominated by the Congressional legislation that had recently been signed into public law by President Clinton. The legislative language and its immediate impact was provided by Larry Barnett of AB Management Associates who explained that the DOT is required to implement upgrades to the U.S. Loran-C service and to provide a plan for the continued operation of Loran-C beyond the year 2000. This theme was picked up by Elisabeth Carpenter of the Volpe National Transportation Systems Center (VNTSC) in her presentation of "What to Expect in the 1996 Federal

Radionavigation Plan (FRP)." It was stated that the 1996 FRP would continue to include a phase-out date of the year 2000 for Loran-C, but that there would be recognition of the Congressional legislation.

Advances in Loran-C receiver and antenna technology were presented during the technical session and of particular interest was the development work being performed at Megapulse on an H-Field loop antenna that showed impressive results receiving signals in urban environments. In locations where neither GPS or a Loran-C whip antenna could receive signals, the combination of GPS and Loran-C using the loop antenna showed few signal outages.

The work being performed at Delft University in The Netherlands on a system to provide both GPS and GLONASS differential corrections using Loran-C as the communication medium was reported by Durk van Willigen and his associates. The ability to cover large areas of land mass with minimal additional cost is receiving substantial interest in Europe where Loran-C is written into the European Radionavigation Plan as a component of the future mix of systems.

Two papers were presented by user organizations representing close to a million Loran-C users. Both Margo Brown of the National Federation of Boat Owners and Terry Pearsall standing in for Doug Helton of the Aircraft Owners and Pilots Association recognized the utility of GPS but strongly endorsed the retention of Loran-C with a transition time to GPS as stated in the 1992 FRP or until GPS as a sole-means radionavigation system has been proven.

The debate of the motion "Despite documents and statements to the contrary, this House foresees that Loran-C will remain in full operation in the United States after the year 2000" resulted in a unanimous vote in favor of the motion with one abstention suggesting that the People may have a better insight as to the future of Loran-C than the Government.

The international community was well represented with several papers covering radionavigation plans and policies. The status and next step of the Baseline for a European Radionavigation Plan was provided by the European Union Commission for Transport and a review of the document was given by Dr. David Last, University of Wales, and Dr. Durk Kugler, Avionik Zentrum, Braunschweig, who also presented a review of the German radionavigation plan. The status and operational experience with Far East Radionavigation Service (FERNS) was provided by Peter Kent, and an update of the Northwest Europe Loran-C Radionavigation Service (NELS) was given by Andreas Stenseth of the Norwegian Defence Communications and Data Services Administration (NODECA). A review of the General Lighthouse Authorities' report (Trinity House, England; Northern Lighthouses, Scotland; Irish Lights, Ireland) on the "Joint Consultative Process to establish marine aids to navigation into the 21st century" was given by Stuart Ruttle (Irish Lights) and Nick Ward (Trinity House). The session concluded with a presentation of the International Association of Lighthouse Authorities' (IALA) function and radionavigation policy provided by Stuart Ruttle, Chairman of the IALA Radionavigation Committee.

In addition, it was pointed out that the reference to the European Radionavigation Plan should make it clear that this is in fact a "Baseline" from which the plan will be developed. For this Baseline material to become the official plan of the European Union it will have to go before the Council for approval and Parliament for acceptance. This process could take some time and will determine when the plan becomes the official document of the European Union.

At the banquet the award of the Medal of Merit, the highest award of the Association, was made to Durk van Willigen for both his contribution to Loran-C technological advances and to his professorial work teaching and nurturing graduate students to be contributors in their own right. Not to mention the Banquet speech given by Dr. David Last of the University of Wales would be unforgivable. A humorous homily on the "Silver Goose and the Golden Egg" had the guests in stitches and must go down in history as one of the best prepared and delivered of all ILA (WGA) after dinner presentations.

The Convention concluded with a session devoted to the development of a Resolution that put into writing the deliberations of the Convention and the sentiments expressed by the participants. The Resolution finally approved is given at the end of this report.

Convention Proceedings will become available early in the New Year.

The next ILA Convention will be hosted by the Canadian Coast Guard and chaired by Dave Waters to be held in Ottawa during the week of October 6, 1997. One of the highlights of the Convention will be a presentation about the Canadian Loran-C automated transmitter operations showing the substantial decrease in annual operating cost by the reduction of on-site personnel.

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International Loran Association
25th Annual Convention and Technical Symposium
November 3-7, 1996, San Diego, California

RESOLUTION

PREAMBLE

The 25th Annual Convention and Technical Symposium of the International Loran Association (ILA) was attended by representatives from the International Radionavigation Community including the European Union, the Commonwealth of Independent States, the Northwest Europe Loran Service, the Far East Radionavigation Service, the United States and Canada.

The convention addressed current and future plans for the international use of Loran-C services. Convention participants were encouraged by recently-enacted United States law concerning the operation of Loran-C in the United States beyond the year 2000 and the resulting potential for harmonization with Radionavigation Plans for regions outside the United States.

Technical papers reported major advances in Loran-C technology which enhance the synergy with satellite navigation systems, resulting in increased service availability and integrity.

With the exception of representatives from the U.S. Department of Transportation, participants were in agreement that Loran-C should remain as part of the radionavigation mix of systems for the foreseeable future. Further, these participants expressed dismay at the insistence of the United States government to discontinue U.S. Loran-C service as soon as the year 2000 in disregard of the domestic user input to retain Loran-C and the international plans to expand Loran-C services.

In its final session, the Convention ratified its deliberations by passing the following Resolution:

WHEREAS presentations made at the Convention confirmed that the international community has adopted the concept of maintaining a mix of terrestrial and satellite position location and navigation systems consistent with the ILA adopted radionavigation policy;

NOTING in particular the expansion of Loran-C/Chayka in Europe and Asia and its adoption as an essential part of the radionavigation mix;

WHEREAS the U.S. Congress finds that a requirement exists to maintain Loran-C service in the United States well beyond the year 2000 and has initiated legislative action to upgrade the Loran-C infrastructure;

RECOGNIZING that consultation with users is required in order to comply with the aforementioned legislation;

NOTING that the Letter of Promulgation, signed by the U.S. Secretaries of Defense and Transportation, included in the United States Federal Radionavigation Plan (FRP) states that the document is the "Official source of radionavigation policy and planning for the Federal Government";

FURTHER NOTING that the 1994 FRP is a significant departure from the 1992 issue, in that it describes plans for the termination of U.S. Loran-C services by the year 2000 instead of 2015 as stated in the 1992 plan;

NOTING ALSO that the information provided by representatives of the U.S. Department of Transportation at this Convention confirmed that the 1996 issue of the FRP will continue to state a Loran-C service termination date of the year 2000;

RECOGNIZING the significance of continued operation of the U.S. Loran-C service to maintain and further develop a basis for provision of Loran-C services worldwide to satisfy user requirements;

RECALLING the needs stated by the user community at the two 1996 FRP User Conferences and at the 1995 Westfield's User Conference that unanimously endorsed the continued operation of the Loran-C system as stated in the 1992 FRP;

RESOLVES:

* To cooperate fully with U. S. government agencies which have been directed to respond to Congressional Loran-C legislation that requires consultation with users and user organizations;
* To continue working with the U. S. Administration and Congress to assure that the transition to a mix of radionavigation systems in the future reflects user requirements and international harmonization while maintaining or improving public safety;
* To urge that the U.S. 1996 Federal Radionavigation Plan be consistent with the intent of the Loran-C legislation;
* To encourage further development of Loran-C and associated technologies in Europe and Asia, where the system is considered an important element in the current and future mix of navigation systems;
* That this offer of cooperation and assistance be formally communicated by the Association's President to the U.S. Department of Transportation, the Coast Guard, the Federal Aviation Administration, the cognizant Congressional committees and other government agencies involved in radionavigation planning.

## *President's message*

It is a great honor to be elected president of the International Loran Association, especially considering the previous Presidents and their notable accomplishments. I feel humble indeed, and your many offers of help will assist me greatly. Our new Vice President will be Bob Wenzel, who retired as a U.S. Coast Guard Captain, following a distinguished career of research and managing radionavigation operations. John E. Butler and G. Linn Roth have accepted appointments to the Board of Directors.

Our 25th Annual Convention and Technical Symposium in San Diego saw outstanding technical papers as well as thorough discussions of political issues. Thanks to Chairman Bob Lilley, Technical Chair John Beukers, Technical Co-Chair Tom Gunther, Manager Ellen Lilley, and all the others who made this Convention a success.

While the U.S. Administration still shows strong opposition to continuing Loran-C, the Congress is supporting the needs of navigators. Congress has directed the Secretary of Transportation to prepare "...a plan prepared in consultation with users of the LORAN-C radionavigation system defining the future use of and funding for operations, maintenance, and upgrades of the LORAN-C radionavigation system."At the Convention, members voted to approve the resolution printed in this issue. The ILA remains an important voice of the navigators who use electronic navigation systems.

Analysis of the U.S. Coast Guard's Differential GPS system shows low levels of usable time, nearly a year after Secretary of Transportation Frederico Pena declared that it achieved Initial Operational Capability on 30 January 1996. Dropping the two stations with the worst records, it was available 96.3% of a recent 47 day period. Dropping the four worst stations gives only 98.2% usable time, about six times the outages of the design goal of 99.7%.

Loran-C technology is advancing rapidly to the best available GPS augmentation for civil navigation. Countries outside the United States continue to expand Loran-C coverage. They are leading the way in establishing a logical mix of systems that have no common failure mode, and that meet the requirements of safe navigation. I hope to

expand the international aspect of our organization significantly in this year. We in the U.S. have been fighting to keep our Loran-C system, and I as editor of the newsletter have given less attention to developments in Europe and Asia than they deserve.

Mike Braasch, co-author of an excellent paper describing the impressive performance of a modern LocUs Loran-C receiver integrated with GPS, will be the new editor of Loran Lines. Please help Mike by submitting articles and photographs.

Our 1997 Convention and Technical Symposium will be in Ottawa, Canada, beginning 6 October. We have long admired the excellent performance record of our northern neighbors, and are delighted that they will act as hosts for the convention. The Commissioner of the Canadian Coast Guard plans to address the Convention.

ILA continues to be a member of the International Association of Lighthouse Authorities, the worldwide organization of providers of all types of marine aids to navigation. IALA develops recommendations for policy, and supports a mix of terrestrial and satellite navigation systems. ILA has become a member of the National Boating Federation, a group of associations that represents some two million recreational boat owners. NBF supports Loran-C strongly, and has joined ILA as well.

Bill Brogdon
President

Jim van Etten addresses the conference attendees.

Professor Durk van Willigen accepts the Medal of Merit Award.

Capt. Jim Doherty, on behalf of the Department of Transportation, accepts the President's Award given in recognition of 25 years of outstanding Loran-C Service

Dick Arnold, FAA, discusses the U.S. policy on Loran-C.

President Bill Brogdon addresses the banquet attendees.

# *Scenes from the Silver Anniversary Symposium*

(Look for a full report in the soon-to-be-published proceedings)

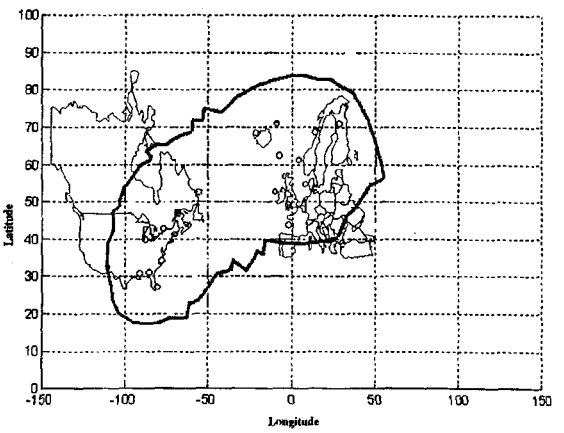
## ILA Coverage in Japan

Mr. Katayama of the Japan Association for Aids to Navigation published an article in the January 1997 issue of LIGHTS publishe by the Japan Lighthouse Association. In his article, Mr. Katayama reported on the ILA Silver Anniversary Symposium and highlighted the following four areas:

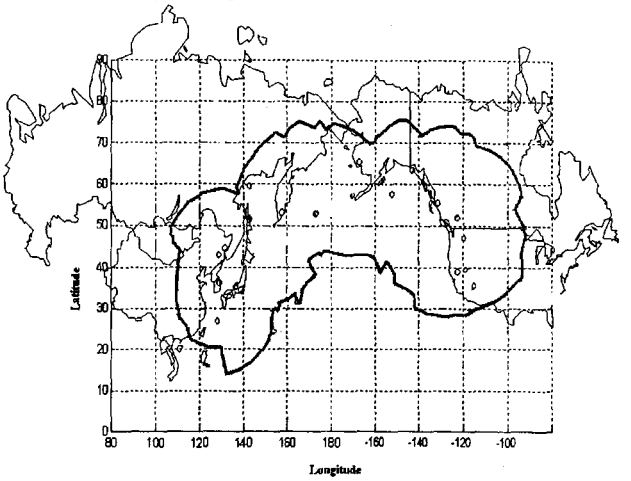
- Difference of policy in coping with Loran-C between the U.S. and Europe
- Credibility of the FRP
- Present status and plans to link NELS with Chayka
- Economical operation and maintenance of Loran-C

# Loran-C = Global Coverage?

With the advent of modern digital Loran-C receivers, the traditional notions of coverage are fading rapidly. Current receivers are able to track ground waves far beyond the normal range to which many are accustomed. Recent work performed by Ohio University indicates that 2 nautical mile accuracy or better (sufficient for oceanic navigation) is available virtually one hundred percent of the time for the busy North Atlantic and Pacific air routes (see diagrams below). With this kind of accuracy, Loran-C is an equal partner (and possibly better) than inertial as a complement to GNSS.

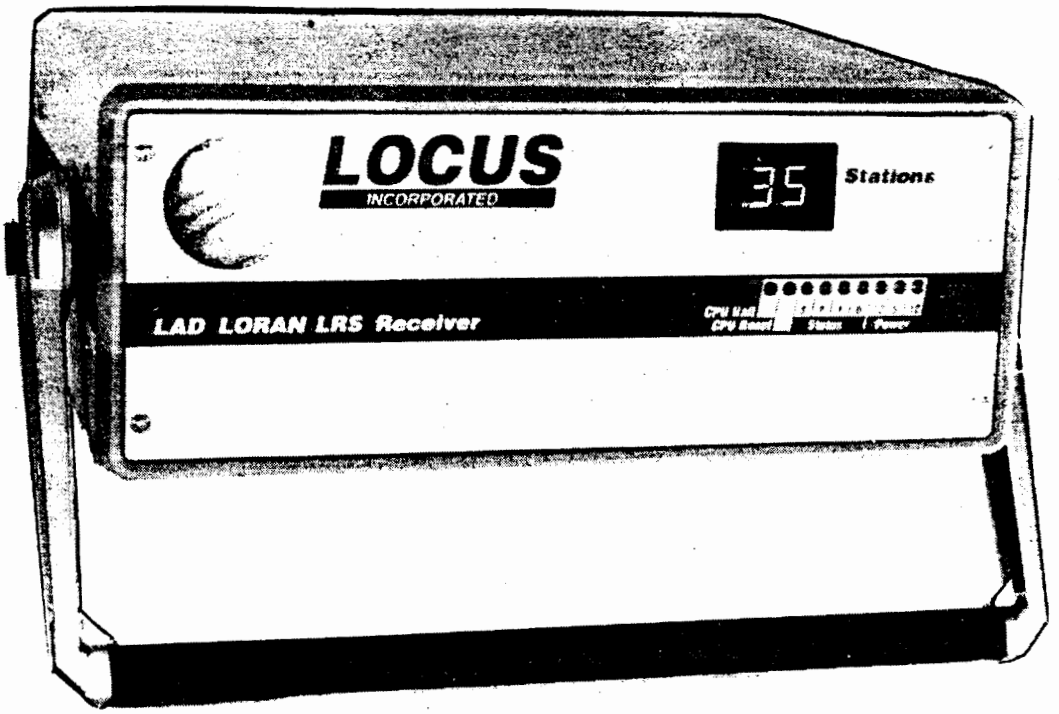



Loran-C coverage prediction for oceanic navigation in the Atlantic ocean area.




Loran-C coverage prediction for oceanic navigation in the Pacific ocean area.

*The New Gold Standard LORAN-C Receiver*

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