



Loran Lines

December, 1998

Newsletter of the International Loran Association

Volume 98-2

Highlights:

President's message

— page 1

Congressional resolution

— page 1

1998 ILA Awards

— page 5

Bill Polhemus
Jim Culbertson

— page 3

News Release

— page 4

DARPA
Loran/GPS
test

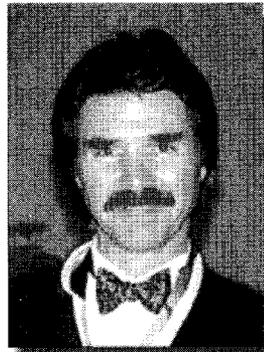
— page 4

President's message

OUR 27TH ANNUAL MEETING was unquestionably the most positive I have attended, and it is clear Loran and the ILA are in a transition period leading to a very bright future. Several themes emerged during the conference:

1. A complement to GPS is necessary, and Loran is the best complement.

As addressed by the Presidential Commission of Critical Infrastructure Protection and the Presidential Decision Directive, a sole-means GPS policy presents unacceptable risks to the US national infrastructure. Other countries have greater reservations regarding a sole-means GPS policy, particularly because of US control.



Linn Roth, Photo by Walt Dean
ILA President

**a sole-means GPS
policy presents
unacceptable risks**

Since GPS is used to synchronize massive telecommunication and power grid systems in addition to performing navigation, positioning and other functions, a GPS failure in a sole-means system would have profound implications in any country. Given the physical characteristics of the Loran signal, it is simply not subject to the same vulnerabilities as is GPS. In contrast to other mode-specific systems such as VORs and marine radiobeacons. Loran can be used in virtually all GPS applications and is extremely inexpensive to operate, making loran the most cost effective and best technical complement to GPS.

(Continued on next page)

FLASH NEWS ITEM!

It has just been announced that the 1999 ILA Convention will be held on November 1-3, in London, England.

Congress authorizes funds for capital improvements to Loran-C

THE FAA Facilities and Equipment portion of the Department of Transportation (DOT) Omnibus Appropriations Bill was passed by Congress and signed by the President in October. It includes \$7 million for further development of Loran-C in fiscal 1999, and authorizations for the U.S. Coast Guard of \$35 million for Loran-C in fiscal 2000.

Enacted in response to widespread concerns expressed by many in the user community about the proposed termination of Loran-C and the consequent risks of a sole-means GPS policy, these spending authorizations may serve to further encourage DOT to support Loran-C until at least 2008.

This legislation must be followed in Spring, 1999, by Congressional action to appropriate the necessary funds. It is expected that in February, 1999, DOT will send Congress a report based in part on a study made by Booz-Allen & Hamilton recommending that Loran-C should continue in place. This report, and possible support for Loran-C into the next century by DOT Secretary Rodney Slater, must await the completion of a review of the matter by OMB (Office of Management and Budget).

The Coast Guard authorization of funds for Loran-C are for capital improvements, not operating costs. Industry sources expect that this money, if appropriated by Congress, would be used for increased automation of the Loran-C system and the replacement of the remaining older transmitters with solid-state technology. DOT is required to report to Congress in six months the cost-sharing arrangements between the agencies involved.

Language in the FAA authorization specifically directs the FAA not to reprogram Loran-C funds to the WAAS (Wide Area Augmentation System), emphasizing again solid Congressional support for Loran-C. ■

President's message

(continued from Page 1)

2. Integrated GPS/Loran receivers can provide substantially better performance than either system alone.

Loran has made significant technical advances and can be synergistically combined with GPS, producing a hybrid system with unparalleled accuracy, availability, integrity, and reliability in all applications. When Loran transmitters are synchronized to UTC, an integrated receiver can treat a Loran station as a "pseudo satellite," greatly enhancing GPS availability and reliability. Hybridized navigation solutions can also substantially improve Loran's absolute accuracy to GPS levels without Selective Availability.

3. Eurofix provides needed redundancy, outstanding performance for WAAS, NDGPS, and other applications.

Recent US Coast Guard Eurofix tests essentially duplicated earlier European results, i.e., better than 3m absolute accuracy approximately 450 kilometers from the transmitting tower. Conservative estimates using a 1000 kilometer range show Eurofix could provide complete CONUS and northern European DGPS coverage with minimal costs, estimated at \$75M for the entire US.

4. Loran is an excellent example of an on-going and potential international radionavigation cooperation.

At the recent ICAO conference in Rio de Janeiro, GPS control and liability were identified as major international issues that will not be easily, if ever, resolved. In contrast, the Far East Radionavigation System (FERNS) and the Northern European Loran System (NELS) are cooperative international efforts that have functioned well for several years. This history is yet another reason why Loran is an ideal complement to satellite navigation, since Loran provides necessary radionavigation autonomy to countries along with individual national capability to optimize satellite radionavigation services, regardless of the provider.

It is clear a growing number of governments, agencies, and organizations are beginning to get an objective understanding of the unprecedented

benefits Loran can provide. Furthermore, these groups are beginning to appreciate this message is pro-GPS and GNSS, and supports the international growth of satellite systems. The resolution passed at the end of our convention summarizes the ILA's fundamental position: a mix of systems is essential for radionavigation safety, economic stability, and national security in every country.

In order to advance that position, ILA actions over the next year will be focused on a few key areas:

1. A US DOT announcement unequivocally confirming the continuation of Loran and infrastructure upgrades, including Eurofix, so Loran can perform at the substantially enhanced levels now possible with contemporary technology;

2. Active global cooperation with major government, professional, and user groups representing all radionavigation applications from telecommunications to aviation; and

3. Political activities directed toward objective cost/benefit and technical analyses demonstrating how integrated Loran and GPS/GNSS can provide enhanced capabilities well beyond any single system alone.

In conclusion, Loran is entering a new era and so must the ILA. We have made an enormous amount of progress over the last few years, largely because members worked diligently for the technical, economic, and political soundness of a balanced radionavigation policy not dependent upon any single technology. The ILA knows GPS is the best radionavigation technology yet

invented, but we also recognize neither GPS nor Loran nor any other system will ever be infallible or perfectly reliable by itself. Because GPS and Loran are so fundamentally different and remarkably complementary, the combination of the two will produce the highest performance, most reliable system that can be economically and technically achieved for many, many years to come.

1998 is the turning point!

As radionavigation systems become ubiquitous and pervade every nation's critical infrastructure, each country will become aware of the exposure, vagaries and dependence that a sole-means radionavigation policy entails. All political platitudes and best intentions aside, a sole means policy simply does not make common sense for the U.S. or any other country. I invite all ILA members to join with me and extend every effort to establish sound international radionavigation policies that represent true cooperative efforts necessary for the safe and reliable use of combined systems for all users, applications, and nations. ■

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

ILA Operations Center
741 Cathedral Pointe Lane
Santa Barbara CA 93111
Phone: +1 805-967-8649
Fax: +1 805-967-8471
e-mail: ila@illgen.com
<http://www.loran.org>

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:

Albert Frost
Kingsbury Hall
University of New Hampshire
Durham NH 03842
tel: 603-862-1306
fax: 603-862-1832
albert.frost@unh.edu

Otis Philbrick
Technical Artistry
323 Dover Road
Westwood MA 02090
tel: 781-326-0851
fax: 781-326-6974
ophilbrick@aol.com

Current advertising rates

For one year's insertions (generally four issues):
1/2 page: \$250
1/6 page: \$100
Other rates on request.

Maj. William L. (Bill) Polhemus USAF (Ret)

1924 – 1998

FOR THE FIRST TIME since the Wild Goose Association – now the International Loran Association – was founded, Bill Polhemus was not present at the annual meeting. A month before the convention, Bill was planning to join us and submitted the title of a paper he wanted to present, but it was not to be. Two weeks before the convention he passed away, leaving behind a legacy of achievements and dedication that will live on in the hearts of his many friends and admirers.

Most ILA members knew Bill through his long affiliation with the organization and his contributions to the field of navigation. He was widely recognized for his continuing efforts to advance loran technology.

Born in New York City January 21, 1924, he was called up to active service in the fall of 1941 and went on to a distinguished military career. He was in the U. S. Navy during World War II and later joined the U. S. Air Force participating in over sixty combat sorties in Korea where his heroism and skill as a navigator earned him three awards of the Distinguished Flying Cross and the Bronze Star.

In the later stages of his Air Force career, Bill served in the Strategic Air Command. While the Cold War was at its peak, Bill was navigator of the B-58 bomber "Firefly." With Captain Polhemus as navigator, Firefly set a speed record over the same course that Lindbergh flew from New York to Paris. Firefly arrived just in time for the Paris Air Show and was a star attraction. This

flight was identified as the most outstanding international event in aviation during 1961 and was awarded the Harmon trophy by President Kennedy. In addition, the crew was awarded the MacKay Trophy for the most meritorious flight of the year by Air Force personnel. Both of these trophies, which provide an enduring national recognition of Bill's skill as a navigator, can be seen at the Smithsonian Air and Space Museum.

Following his retirement from the military, Bill continued to make notable contributions to the art and science of navigation. He published in numerous technical journals and held several patents. In 1967 he was navigator for the Pellegrino Flight recreating Amelia Earhart's flight around the world.

In the early '70s, Bill conducted a program for the U. S. Coast Guard to investigate the capabilities of loran for civilian uses. On the basis of the analysis of the data that he collected, loran was designated as the navigation system of choice for use in the U. S. coastal confluence zones. Bill has the foresight to see the vast potential of loran as a navigation aid for the general aviation community. He created a program to demonstrate that loran could meet the requirements of en route, terminal, and non-precision approach phases of flight in the National Airspace System (NAS), persuading RSPA, the Research and

Special Programs Administration of the U. S. DOT, to support this endeavor. From 1978 to 1981, Bill's team gathered thousands of data points using loran-equipped aircraft at airports in Vermont. The FAA officially recognized loran as a navigation aid for the NAS in a special ceremony at Hanscom Field in Bedford, Mass. He was subsequently a member a

member of the FAA/industry planning group charged with designating airports for loran approaches and establishing certification standards for loran avionics.

In addition to his military honors, Bill was a fellow of the Royal Institute of Navigation and a past president of the U. S. Institute of Navigation. He received numerous citations from the civilian community including

the Burka and Weems award from the Institute of Navigation, and the Medal of Merit from the International Loran Association. In recent years, Bill was active in numerous local and state technology forums.

The International Loran Association extends its sympathy to the Polhemus family and also its appreciation for Bill Polhemus' many contributions to the Association, its members and the art and science of navigation.

"Time does pass, but some people take on a permanence that fools us all until the last moment."

■



Bill Polhemus signs the first FAA-approved Loran-C approach in Bedford, Mass.

Capt. James Culbertson 1932 – 1998

JIM CULBERTSON passed away on November 9 while taking his morning walk at his home in Lompoc, California. He had been directly involved in the Coast Guard's Loran-C program since the early 1960's. He made major contributions to the installation and operation of the first stations in the Mediterranean

and North Sea. His assignments in the Coast Guard included Loran-C Branch Chief at EECEN Wildwood and Chief of the Systems Division in USCG Headquarters. He was a strong supporter of the ILA and served as president for two years. We will all miss his wit and wisdom.

Jim is survived by his wife Joanne, and sons Greg and Glen. We wish them well in this time of loss and wish Jim well as he navigates the approaches of the pearly gates. ■

NEWS RELEASE

Loran-C revitalization addressed at International Convention

BUOYED BY the U.S. Department of Transportation's (DOT) decision to continue the Loran-C service, participants at the International Loran Association's annual Convention and Technical Symposium focused on rebuilding the Loran infrastructure in the United States and expanding Loran with the Eurofix augmentation internationally. In his prepared remarks, Rear Admiral James D. Hull, U.S. Coast Guard and the senior representative from the DOT, was unable to make the long awaited formal announcement of the change in Loran policy. It was learned that following the DOT's and the Department of Commerce's approval, the decision, together with the Congressional-mandated report on Loran-C, had been passed to the Office of Management and Budget for review.

Keynote speaker, former FAA Administrator Langhorn Bond, stressed the ongoing need for a mix of satellite and terrestrial systems, stating that the known vulnerabilities of satellite systems precluded total dependence of these services. "Sole means GPS is a dead issue, back up systems are required, and Loran-C is an inexpensive and proven candidate for all modes of transportation," he said.

In a luncheon speech, John Kern, VP for Regulatory Compliance and Chief Safety Officer for Northwest Airlines, reviewed radionavigation needs for aviation. Addressing the avionics carried by Northwest, he said: "At present, one half of Northwest's fleet is equipped with INS and none have either GPS or Loran." He further stated that no new equipment would be purchased until it becomes clear what the future systems would be, and whether their use would be cost effective.

Addressing the Banquet audience, Phil Boyer, President of the Aircraft Owners and Pilots Association, confirmed the membership needs for the continuation of the Loran-C service and for a mix of systems in the future. The shortage of student pilots was the main theme of his speech, citing the decline in new general aviation aircraft as a major contributing factor. Mr. Boyer described the promotional campaign to enlist new students which AOPA believed, in the long run, would ease the critical shortage of airline pilots.

Conforming with the Congressional mandate to upgrade the Loran-C transmitting facilities, representatives of the United States Coast Guard described the various projects currently under way, in particular those concerning aviation and timing requirements. Further upgrade plans were revealed with the cautionary note that the FY 1999 DOT Appropriations Bill for funding this work was still in Conference with the House and Senate Appropriations Committees.

The GPS/GLONASS wide area augmentations system using Loran-C transmitters to communicate GPS/GLONASS differential corrections was the subject of several presentations and a workshop. Called Eurofix, when fully deployed the system is projected to provide a position accuracy of less than 5 meters throughout all of Europe. Results of tests conducted by the U.S. Coast Guard in the United States and presented at the meeting confirmed the European findings.

The meeting ended with the adoption of a RESOLUTION reaffirming the Association's determination to use all means necessary to assure a global mix of terrestrial and spaceborne systems for Positioning, Navigation and Timing for the 21st century.

The newly elected President, Dr. G. Linn Roth of Locus, Inc., closed the Convention on an upbeat note, with participants looking forward to the next Convention to be held near Paris, France during October of 1999.

The International Loran Association draws its membership from manufacturers, users, governments, national and international organizations, and academia who adhere to a policy of maintaining a mix of terrestrial and satellite radionavigation services. The Association firmly believes that Loran-C should be part of the mix and is an advocate for the continued provision and expansion of the system and its augmentations. ■

DARPA demonstrates combined GPS/Loran-C unit

BASED ON BEN PETERSON'S work at the U. S. Coast Guard Academy, a unit was developed in response to the need to know the location of a foot soldier in an urban environment. The equipment consists of an inertial guidance unit and integrated GPS/Loran-C/ DGPS receivers combined with a data transmitter in a single backpack unit. The tests were sponsored by DARPA (Defense Advanced Research Programs Administration), Lt. Col. Beth Kaspar, USAF Program Manager.

The demonstration at Ft. Benning, Georgia, used a simulated terrorist vehicle covertly tagged with a transmitter and Loran-C receiver. An ASIC chip preprocessed all signals including notch filtering and cross rate interference reduction, and a Kalman filter integrated the data from all navigation sources to provide a best position estimate. This data was then transferred to a position computer and communicated to the control center. In this way, the vehicle movement is tracked and the probable points of terrorist infiltration and attack identified. Soldiers entering the area to counter the threat use the developmental position systems under guidance from central control.

A real-world signal environment existed in the test: When a soldier was located close to buildings some GPS signals were lost, and movement of the personnel caused the Loran-C signal to vary with antenna orientation. A GPS jammer was used to demonstrate the effect of denial of GPS on the system operation.

It appeared to observers that there was a great potential benefit to the integration of a multi-sensor system, and that the technology is now available to develop a new class of Loran-C receivers with performance exceeding that currently available on the low-cost market. ■

International Loran Association – 1998 Awards Presentation

Medal of Merit: G. Linn Roth, LOCUS, Inc.

President's Award: Langhorn Bond

Bill Brogdon
presents ILA's
Medal of
Merit to Linn
Roth.



Photo by Walt Dean

Outstanding Service Awards:

John Butler, General Chair, 1997 ILA Convention and Technical Symposium

Dirk Kügler, Technical Program Co-Chair, 1997 ILA Convention and Technical Symposium

William Roland, Technical Program Co-Chair, 1997 ILA Convention and Technical Symposium

1997 Technical Symposium Best Paper Award:

"Magnetic Loop Based LORAN Receiver for Urban Canyon Applications"

Benjamin B. Peterson, U. S. Coast Guard Academy

Yukie Nivick and Kenneth U, Dykstra, Integrated Systems Research Corporation, USA

Lance C. Miller, Science Applications International Corporation, USA

Best Student Paper Award:

"Regional Area Augmentation Concept for Eurofix"

R. F. van Essen, G.W.A. Offermans, A.W.S. Helwig, and D. van Willigen

Delft University of Technology, The Netherlands

ILA RESOLUTION

Concerning the Future Mix of Systems for Positioning, Navigation and Timing

Recognizing that total dependence on spaceborne systems for Positioning, Navigation and Timing introduces unacceptable risks to the safety of life, national security and economic stability;

Recognizing that an appropriate combination of space and terrestrial radionavigation systems can provide greater services and benefits than either system alone;

Noting that the European Union, the United States of America, and other national governments and international institutions are currently engaged in determining the future mix of systems for Positioning, Navigation and Timing;

Noting also that in the United States of America the current policy to transition to, and become solely dependent on, GPS for Positioning,

Navigation and Timing is being reviewed;

Noting that legislation passed by the United States Congress has directed the United States Department of Transportation to upgrade and maintain the loran system;

Noting that the United States Department of Transportation has made the decision to extend the operation of loran beyond the year 2000 and that the official announcement of the extension of loran operation is pending;

Therefore, the International Loran Association, at its 27th annual Convention and Technical Symposium October 11-15, 1998 at Danvers, Massachusetts:

1. Reaffirms its determination to use all means necessary to assure a global mix of terrestrial and spaceborne systems for Positioning, Navigation and Timing.

2. Pledges to support and cooperate with national governments, regional and international organizations, and the Positioning, Navigation and Timing user community to seek necessary legislation, policies and funding for loran as part of the radionavigation system mix.

3. Recommends that the United States Department of Transportation announce, without further delay, the continuation of loran service.

4. Resolves to ensure that United States Congressional mandates are fulfilled and to cooperate with federal agencies in upgrading the loran service.

5. Invited the European Union, national governments and international institutions to take account of the change in the radionavigation policy of the United States.

International Loran Association

1999 Officers

President:

G. Linn Roth
LOCUS, Inc.
1842 Hoffman Street
Madison WI 53704 USA
tel: 608-244-0550
fax: 608-238-2297
roth@locusinc.com

Vice President:

Dale E. Johnson
Morrow Aircraft Corp.
5862 Rhinestone Ct. S.E.
Salem OR 97306 USA
tel: 503-365-0200
fax: 503-362-7374
dale.johnson@morrowaircraft.com

Treasurer:

Martin C. Poppe
Cambridge Engineering
P.O. Box 3099
Burlington VT 05401-3099 USA
tel: 802-860-7228
fax: 802-860-7183
poppe@cameng.com

Secretary:

Walter Dean
7309 Apple Hollow Loop
Roseville CA 95747 USA
tel: 916-773-9016
waldean2@aol.com

Ex President:

William J. Brogdon
553 Neptune Drive
Swansboro NC 28584-8910 USA
tel: 252-393-7917
fax: 252-393-7917
brog@clis.com

Directors: (term expires 1999)

John Beukers
Beukers Technologies
East Ridge, Longborough
Moreton-in-Marsh
Gloustershire GL56 OQX
United Kingdom
tel: +44 1451 870777
fax: +44 1451 870222
jb@iu.net

Harold Chadsey
U.S. Naval Observatory
3450 Massachusetts Ave, N.W.
Washington DC 20792 USA
tel: 202-762-1456
fax: 202-762-1511
hc@planck.usno.navy.mil

Terje Jørgensen
NELS Coordinating Agency Office,
Oslo
Mil/Akershaus
0015 Oslo Norway
tel: +47 23092701
fax: +47 23092391
thj@ftd.mil.no

Edward McGann
Megapulse, Inc.
8 Preston Court
Bedford MA 01730-2380 USA
tel: 781-275-2010
fax: 781-275-4149
megapulse@megapulse.com

Maurice J. Moroney, Jr.
Volpe National Transportation Systems
Center
55 Broadway, Kendall Square
Cambridge MA 02142 USA
tel: 617-494-2026
fax: 617-494-2628
moroney@volpe1.dot.gov

Nick Ward
Trinity House Lighthouse Service
East Cowes
Isle of Wight PO32 6RE
United Kingdom
tel: +44 1983 292651
fax: +44 1983 294317
nicw@this-rad.demon.co.uk

Robert Wenzel
Booz-Allen & Hamilton
McLean VA 22012 USA
tel: 703-902-5787
fax: 703-902-3242
rwenzel@erols.com

Directors: (term expires 2000)

Walter Dean

Robert Lilley
Illgen Simulation Technologies
741 Cathedral Pointe Lane
Santa Barbara CA 93117 USA
tel: 805-967-9394
fax: 805-967-8471
rlilley@illgen.com

William F. Roland
Megapulse, Inc.
8 Preston Court
Bedford MA 01730-2380 USA
tel: 781-275-2010
fax: 781-275-4149
roland1@banet.net

Durk van Willigen
Delft University of Technology
P.O. Box 5031
Delft 2600 GA The Netherlands
tel: +31 15 278 6186
fax: +31 15 278 1774
dvanwilligen@its.TUdelft.nl

Directors: (term expires 2001)

Langhorne Bond
Bond and Associates
1066 Fearington Post
Pittsboro NC 27312 USA
tel: 919-542-6614
fax: 919-542-5461

Margo J. Brown
NBF
3217 Fiji Lane
Alameda CA 94502-6918 USA
tel & fax: 510-523-2098

Dale E. Johnson

Martin C. Poppe



LORAN Technology for the 21st Century

New Linear Averaging Digital (LAD) — LORAN Module for OEM Applications includes:

- Integrated Eurofix Capability
- Automatic ASF Correction through Eurofix
- Multichain Tracking (40 stations, 8 GRI's)
- Simultaneous LORAN/Chayka Operation
- Adaptive Interference Cancellation
- Digital Crossrate/Skywave Identification/Lockout
- 20+ dB SNR Improvement over Hard-limited Receivers
- H-Field Antenna Option

LAD-LORAN OEM Module — ideal for integrated GPS/LORAN receivers

LAD-LORAN Monitoring Receivers also available

Locus, Inc.

1842 Hoffman Street
Madison, WI 53704

Phone: 608.244.0500
Fax: 608.244.0528
E-mail: locus@locusinc.com
Website: <http://www.locusinc.com>

EDI's LCS-212 Dynamic Loran Simulator Offers The Best Value For Your Money.

- Variable speeds to several hundred knots
- .1 μ sec resolution
- Output levels: 10 mV to 1V, P-P across 50 ohms.
- Three separate isolated outputs
- Pulse envelope calibrated to less than 1.5% rms distortion
- ECD error less than .1 μ sec
- RS-232 option allows for full control of GRI/TD's from your PC

The LCS-212 is an excellent tool for production, training, and service applications. Alignment of loran driven auto-pilots, loran interfaced plotters and other integrated navigation systems becomes a snap instead of a major chore. And all EDI products are fully guaranteed for 1 year and come



Period.

with a 30-day money back trial period. Call 1-800-421-2968 today to find out just how far your money can go. **Electronic Devices, Inc. EDI**
PO. Box 15037 Chesapeake, VA 23320 Phone/Fax 1-800-421-2968



Technical Artistry provides full-service writing, illustration, and production of instruction manuals for electronic products.

Services include prototype quantities of manuals for preproduction, beta testing and trade shows.

For information, contact Otis Philbrick at (781) 326-0851 or at ophilbrick@aol.com.



ILA Operations Center
741 Cathedral Pointe Lane
Santa Barbara, CA 93111

Bulk Rate
U. S. Postage
PAID
Permit No. 234
Needham MA