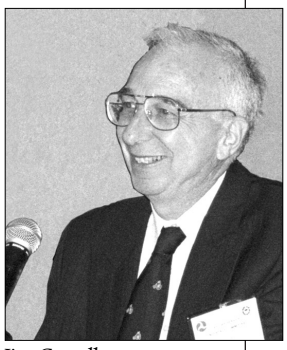
Loran Lines

September 2001 **Newsletter of the International Loran Association** **Volume 2001-2**

Highlights:

Volpe Vulnerability Study presented at CGSIC meeting in Salt Lake City

A CRITICAL STUDY of the vulnerability of GPS signals to intentional and unintentional interference was released by the U.S. Department of Transportation and presented by **Jim Carroll** of the DOT Volpe Center, Cambridge, MA at the 38th meeting of the Civil GPS Service Interface Committee (CGSIC) in Salt Lake City on September 10, 2001.



Jim Carroll

The importance of GPS to the national transportation infrastructure for position, timing and navigation has made it urgent that an objective evaluation of possible areas of vulnerability be carried out and steps to reduce or mitigate such effects be proposed. This is particularly important in the face of suggestions being put forward in some sectors of the government and industry that GPS be declared a "sole source" for navigation and timing purposes.

Unintentional sources of interference or interruption in service include ionospheric variability, the effects of solar activity (presently at a maximum level), spectrum congestion, and adjacent channel intrusion. Intentional causes of interference include the use of deliberate broadband jamming signals or "spoofing" in which a counterfeit GPS signal is radiated.

Awareness of the problem and changes in the design of future satellite systems such as greater transmitter power, increased receiver sophistication, and added operating

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ILA 30 Annual Convention and Technical Symposium October 8–10, 2001 in Saint-Germain-en-Laye, Paris, France See details below.

THE 30TH ILA CONVENTION will be held in the Henri Quatre Pavilion in Saint Germaine-en-Laye, 20-30 minutes from the center of Paris. The town is the headquarters of the International Association of Lighthouse Authorities (IALA), whose administrative staff are assisting in the convention arrangements.

This Convention and Symposium comes at a critical time for the selection of radio positioning and precise time distribution systems serving European land, sea and air users for the next several decades. In the absence of an European-wide plan and without multi-modal coordinating activity with surrounding states, the planning process is fragmented and the future unclear.

One aspect of the future of European Loran-C service became apparent at a May meeting of the Northwest Europe Loran-C System (NELS) Steering Committee. NELS was organized by treaty in 1994 for the purpose of providing Loran-C services in Northwest Europe, with possible future expansion to provide full European coverage. This treaty comes up for renewal in 2004 and the Steering Committee issued a statement expressing serious doubts that it would be renewed. This makes it necessary to plan for an alternative administrative and operating framework for the continued provision of Loran-C service in Europe.

While the future of Loran-C in Europe is uncertain, the member nations of the Far East Radio Navigation Service (FERNS) have signed a treaty for their Loran-C and DGPS radio-beacon services, and the Republic of Korea has

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Volpe study (continued from page 1)

frequencies can serve to mitigate some of these effects. But, as the report observes, system vulnerability, particularly to deliberate attack, can never be eliminated.

The message was clear and repeated several times. While modification to the present system parameters can reduce the effects of natural and inadvertent sources of noise and interference, calculated attempts to deny the international user community of the navigation and timing services of GPS are far more difficult to anticipate and combat.

GPS is vulnerable and if the potential for such malicious interference is present, then it can, and in time will, occur. This fact has seemed a serious possibility to many, but at this point in time, amid the grim tide of current events, hostile intent armed with the technical skills required is a certainty and efforts to disrupt the system will occur in the future. An active, robust Loran-C network, serving as a full-time backup system and working in close correlation with GPS is essential to the maintenance of these vital services.

The full report "Vulnerability of the Transportation Infrastructure Relying on the Global Positioning System" is available to the public on the U.S. Coast Guard Navigation Center website at

http://www.navcen.uscg.gov

DOT Schedules Volpe GPS Vulnerability Report for Open Public Meeting in October

IN AN ANNOUNCEMENT coordinated with the release of the Volpe report on GPS Vulnerability the U.S. Department of Transportation has scheduled an open public meeting for public comments, feedback and reactions to this analysis. The meeting will be held at the Headquarters of the FAA on October 5, 2001 at 1:00 p.m. The operating agencies within DOT have been required to review this report and report on the adequacy of existing backup measures. A subsequent meeting is planned in December or January to review the response of the Department to this study.

Referring to the Volpe Vulnerability study, **DOT Secretary Mineta** stated that the report provides a roadmap for addressing possible vulnerabilities of GPS. Further he stated "The Department of Transportation takes this report's finding very seriously and we will be working to ensure that GPS will fulfill its potential as a key element in the national transportation infrastructure."

Among recommendations contained in the report were suggestions that increased awareness of the problem of vulnerability be encouraged, and that efforts should be made to:

- reduce signal degradation
- implement systems to monitor and locate sources of unintentional interference
- include in the modernization program techniques that will combat interferences.

Most important DOT divisions are charged to identify and to encourage the development of appropriate low cost backup systems

Clearly the national Loran-C system, presently active, on line and currently being updated for even more effective operation, represents a prime candidate as a GPS backup in both the USA and overseas. Development of integrated GPS/Loran-C receivers should be encouraged.

In concluding his comments on the report, Secretary Mineta pledged that the DOT will take appropriate steps to address GPS vulnerability and assure safe, secure transportation. ■

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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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National Boating Federation meets in Alameda, CA

A MESSAGE OF GREETING from **John Beukers**, ILA President, to the National Boating Federation on the occasion of their 2001 Annual Meeting and his brief summary of the status of Loran both in the United States and Europe was presented by ILA Secretary Robert Lilley on April 27, 2001:

"There is some very good news, but this has to be modulated with the recognition of the continuing challenges facing the Loran community. First the good news: As a direct result of strong bipartisan support in Congress, Loran-C is getting a major face lift using funds specifically appropriated for this purpose. New solid-state transmitters are to replace the old tube-type transmitters, and a complete upgrade of timing equipment will provide a substantial improvement to the Loran service. At the same time, unattended transmitting station operation will result in a substantial reduction of operating costs.

"Many of you will now be using GPS and reaping the benefit of the elimination of the Department of Defense Selective Availability. We have seen the accuracy of GPS improve by almost an order of magnitude from in excess of 100 meters to 10-20 meters. Many of you still use Loran and are familiar with the repeatable accuracy that approaches the absolute accuracy of GPS but may wonder why we still require the Loran service when GPS can provide superior performance. The answer is GPS availability and the vulnerability of the GPS service to interruption. A recent study conducted for the Department of Transportation by the Volpe National Transportation Systems Center identifies these GPS shortcomings, but because of the sensitivity of the study report it has been withheld from the public.

"Loran and GPS make superb partners, not only to assure continuity of service but also to comply with the navigator's fundamental rule of not being totally reliant upon a single system, especially one that has identified vulnerabilities. GPS can calibrate Loran's offset and provide accuracy similar to GPS. During a GPS outage Loran acts as the flywheel and the systems used in concert provide the required accuracy.

"However, there are challenges both in the United States and Europe. We do not have a Loran policy to ensure Loran longevity that is essential to give industry the confidence to make the investment to provide combined Loran-C/GPS receiving equipment. We are about to get a first-class Loran-C service but without a supporting manufacturing, marketing and after-sales service infrastructure. The NBF and user community can make a significant contribution to change this situation by supporting the provision of redundant systems and making their views known to Congress.

"In Europe four of the Loran-C stations are transmitting differential GPS and GPS integrity using a data communications channel. Known as Eurofix, the International Telecommunication Union has recently adopted the specification for the data channel on a worldwide basis. But, as in the United States, Europe still lacks a coherent Loran-C policy.

"In this brief statement it is not possible to cover the subject of precise time. Suffice it to say that redundancy in the provision of precise time is essential to United States national security.

"The ILA welcomes anyone, business or individual, who can contribute to the promulgation of a long-term Loran-C policy." ■

Bob Lilley, ILA Secretary, also presented at this meeting an interesting and informative review entitled "Loran-C and the ILA in 2001." A wide range of topics included:

- the past history of Loran
- the challenges of GPS
- the controversy about depending on a "sole means" despite the demonstrated vulnerabilities of GPS
- how support by the Congress and user groups such as NBF is essential as the Loran community looks forward to Coast Guard system updates and the evolution of combined Loran-C/GPS receivers.

See a copy of this excellent summary of where we are and where we hope to go on the ILA web site: **www.loran.org**

Royal Institute of Navigation awards its Bronze Medal to ILA President Beukers.

THE BRONZE MEDAL of the Royal Institute of Navigation is awarded each year to the author or authors of the most notable paper published that year in the Journal of Navigation. This year it has been awarded to **John Beukers** for his paper "Global Radionavigation – The Next 50 Years and Beyond."

John Beukers

The International Loran Association has known John for many years as an articulate and effective proponent of a balanced navigation plan in which the assets of terrestrial based and satellite systems are combined as mutually supporting resources. His award-winning paper in the Institute Journal discusses many of the issues facing Europe, and the acknowledgement by the Council of the RIN of its excellence will surely add weight to what he has to say in this connection.

"Global Navigation – The Next 50 Years and Beyond" is an attempt to define the future of global radionavigation based on a mix of terrestrial and satellite systems. The time it takes for satellite systems and augmentations to mature and the reasons for this extended period provide the foundation of the paper. Discussed is the time to achieve a full constellation of space vehicles having signal specifications that meet the requirements for safety-of-life.

The political complexities to achieve international harmonization of service and the use of a common worldwide protected frequency spectrum are also discussed. The need for terrestrial complements is presented from the standpoint of supporting satellite systems and as a backup in the event of the loss of satellite services.

The paper discusses the transition to new global systems and stresses the importance of stability and longevity to enable manufacturers and users to reap the benefits of the provided services. ■

Senators urge DOT Secretary to announce long-term support for Loran-C

AS REPORTED in previous issues of *Loran Lines*, Congress has recognized the wisdom of maintaining a diversity of navigation systems and supported the upgrading of the Loran-C infrastructure for at least 15 years. In spite of these actions, support for Loran at the administrative level of the DOT under the previous administration was reluctant and limited to an expression that Loran-C would continue for the "short term."

Such limited and conditional support is inadequate to provide guidance to all sectors of the user community, or to encourage the development and updating of equipment and the pursuit of system integration. In addition, overseas users reading the present FRP are understandably uncertain of the future of Loran-C in the US. A clear and definitive statement of sustained support is required from the Secretary of DOT and needs to be a part of the next issue of the Federal Radionavigation Plan.

Realizing that a full revitalization of the terrestrial based Loran navigation system to work in conjunction with satellite systems as they evolve requires positive DOT backing, the attached letter was recently sent to Secretary Mineta from Senators Kohl, Feingold and Kerry urging him to make such an announcement (See page 5). ■

We hear that – – – – –

➡ **John Beukers** reports that as of the first week in July, 2001 Loran-C data communications transmissions from Lessay France were resumed with differential GPS data being generated at a new monitor site outside the main transmitting facility. The original station was moved to reduce multipath and masking by the transmitter building and antenna complex. Analysis of the data shows significant improvement over results obtained earlier. DGPS 2-dimensional Standard Deviation is under 1 meter and DGPS 3-dimensional Standard Deviation is 2.1 meters. The Eurofix message integrity is better than *99.999*%. The RTCM reconstructed message conforms to the recently adopted ITU-R specifications covering the worldwide use of Loran-C for the transmission of DGPS and DGLONASS corrections and integrity.

➡ The US Coast Guard Authorization legislation S 951 was introduced in late May. Section 103 of the bill Authorizes US $44 million in 2002 for re-capitalization of Loran-C.

➡ Global Positioning Satellite PRN22 is reported as suffering a clock failure on July 28 but continued to broadcast erroneous data. Transatlantic aircraft flying in the Icelandic Ocean Control Zone reported severe GPS outage problems in their navigation systems. It apparently took over an hour to rectify the problem even though the satellite in question was in view of the Colorado Springs monitor station. ■

United States Senate

WASHINGTON, D.C. 20510

May 7, 2001

The Honorable Norman Y. Mineta
U.S. Department of Transportation
400 Seventh St., SW
Washington, D.C. 20590

Dear Secretary Mineta:

We are writing concerning the importance of an announcement by the Department of Transportation (DOT) confirming the long-term continuation of the Loran-C navigation system. We believe this is the ideal time for such an announcement because of your recently expressed views about the importance of utilizing both satellite technology and existing navigation systems to meet national transportation system safety needs. Such an announcement is long overdue, it warrants your immediate, positive leadership, and it will be welcomed by users here and internationally as well as our colleagues.

We and many others have a strong interest in this issue because of growing evidence, including the President's Commission on Critical Infrastructure Protection, the two recent Rumsfeld Reports and other studies, warning that our country should not rely on sole-means technology such as the Global Positioning System (GPS) for our navigation needs. Because of uncertainties about satellite navigation, Congress on a bipartisan basis has supported numerous steps and approved funding of more than $53 million in recent years to undertake recapitalization and revitalization of the Loran system and infrastructure. In addition, the Booz-Allen & Hamilton report submitted to DOT in April of 1998 states that keeping Loran-C operational until the year 2015 would save $291 million in comparison to shutting the system down.

In summary, the continuation of Loran-C well into the 21st century makes sense from both a navigational safety and a budgetary perspective. Such an announcement will be widely supported by mariners, aviators, and even the telecommunications industry where it is used for timing purposes. We urge you to make a prompt announcement confirming the long-term continuation of Loran until at least 2015 to remove lingering uncertainties among users and manufacturers about its role in the future navigation mix and to stabilize the domestic and international market for Loran services. Thank you for your consideration of this request.

Sincerely,

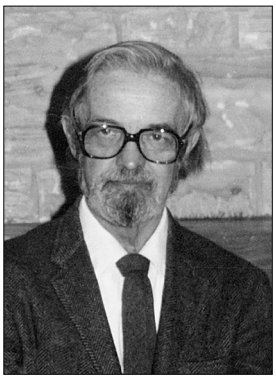
Herbert H. Kohl

Russ Feingold

John F. Kerry

Ralph Burhans 1922–2001

Ralph Burhans, a long-time member of the International Loran Association and retired research engineer and lecturer at Ohio University, passed away in Athens, Ohio, on April 27. Born in Cleveland, Ohio, he served as a radio and radar technical sergeant in World II flying in 33 combat missions. A graduate of Oberlin College, he took part-time graduate studies at Case Western. While a research associate at Sohio Research in Cleveland, he was granted eight patents, The most notably concerned microballons, hollow plastic or silicon spheres used as an insulating material and ablative heat shielding on spacecraft. While at the Avionic Center at Ohio University, he authored over 70 technical reports and articles.



Ralph Burhans

In addition to the ILA he was also a member of the Audio Engineering Society, the Institute for Navigation and the honorary scientific society Sigma XI. He is survived by his sister Nancy Theibert, his sons Mark and Dirk, and grandchildren Emily, Jane, Ryland and Shawna.

Ralph Burhans — an appreciation

I remember welcoming Ralph to Radar Hill in 1964. For the next 20+ years we worked closely together on one project or another, and I credit Ralph with teaching me many of the "bench skills," the practical side of engineering that many of us miss while hitting the books. At his urging I became a member of the Wild Goose Association. His leadership of the joint University Program at the Avionics Engineering Center is a part of the Center's legend. I can't guess at the large number of students who benefited from his experience and his willingness to pass it on. Together with student interns we built and flight-tested Omega and Loran-C receivers, applying microprocessors before they were "cool." Ralph maintained a vital interest in analog circuitry necessary at a time when the emphasis was moving to digital devices. His Omega and Loran-C front ends and preamplifiers were supportive of many papers at ILA and other conferences.

I feel fortunate indeed to have known Ralph and to be able to call him colleague and friend.

Bob Lilley ■

ILA 30th Convention (continued from page 1)

taken the initiative to evaluate Eurofix as a preliminary to establishing Loran-C data communications in the area. In the USA, funds have been provided by the Congress to ensure system availability for years to come.

The selection and operation of radio positioning and precise time distribution services is a complex interaction of political, economic, commercial and technical issues. These issues in turn impact economic stability, national security and the safety of life. It would appear that the far reaching long-term effect of today's decisions are often poorly understood at the ministerial level.

The conference theme "Provision and Use of Loran-C and Chayka Services" is reflected in the program organized by the Conference Committee whose efforts have been coordinated by ILA President John Beukers. There will be paper sessions concerned with the Status and Plans of Providers of Loran-C services, Multi-modal Loran-C Use, and an Update of Policy. There will be an extended consideration of new developments and review of user requirements. The conference will close with a panel discussion of the Future Role of Worldwide Loran-C

Further information, travel and reservation information is available from ILA Operations Center, 741 Cathedral Pointe Lane, Santa Barbara, CA 93111 USA

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■

LORAN Technology for the 21st Century

New Linear Averaging Digital (LAD) – Loran-C Timing and Navigation Receivers

Linear Averaging Digital (LAD) LORAN LRS IIID

- Incorporates digital signaling processing (DSP) technology in a monitoring/control receiver.
- Provides complete PC interface/control to support remote operations and diagnostics.
- Accepts Cs clock input.
- Provides Time of Arrival and Time Difference data.
- Includes local phase code interval (LPCI) resolution.
- Used by USCG to monitor/control US Loran-C systems.

Cs Sync Timing Applications

- Offers true Stratum 1 timing performance indefinitely, including UTC generation, and operates in deep urban canyons or areas where line of sight blockage prevents GPS penetration.
- Requires minimum installation, so cellular base stations can be located where they are needed.
- Offers indefinite system redundancy and reliability wherever GPS blockage, interference or jamming might occur.
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SatMate Navigation Applications

- An ideal complement to GPS in all marine, aviation and terrestrial applications eliminating the vulnerabilities of a sole-means system.
- Can be integrated with a GPS receiver and controlled by a single user interface, making operation cost effective and transparent to the user.
- Built-in Eurofix capability means DGPS corrections can be continuously supplied, whatever and wherever the need.

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Affinity City

What is Affinity City?

A web-based collaboration space allowing groups of individuals to share data, products, processes, services, and other resources in a controlled and secure way.

Who uses Affinity City?

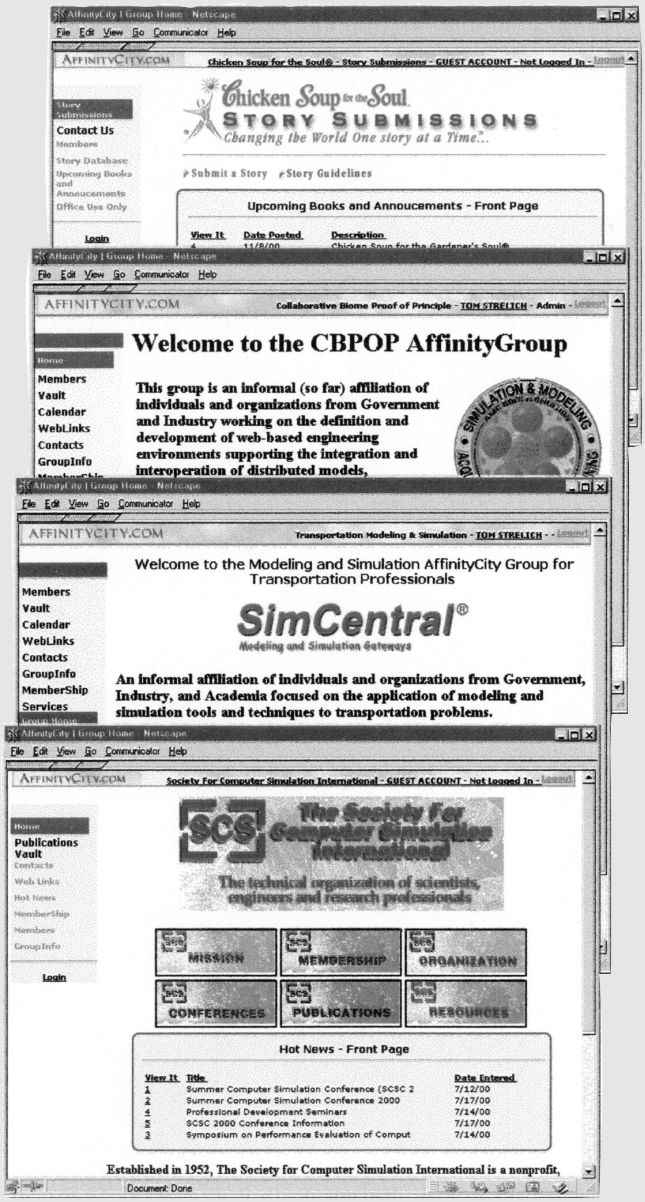
Teams, groups, organizations, institutions, enterprises — any formal or informal affiliation of individuals working toward a common goal.

How is it used?

An unlimited set of customizable functions to create an open-ended variety of web-accessible collaboration capabilities.

What's Unique about Affinity City?

Not just file sharing, but a web-database supporting three enterprise collaboration levels: User-User, User-Tool, and Tool-Tool via Si3.



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