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INTERNATIONAL LORAN ASSOCIATION FAX

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FROM:

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Total pages, including this one, 4

Herewith, minutes of the 116th meeting of the Board of Directors by teleconference 8 February, 1996

INTERNATIONAL LORAN ASSOCIATION

116TH MEETING OF THE ILA BOARD OF DIRECTORS

The 116th meeting of the ILA Board of Directors was held by teleconference at 1330 EST on 8 February, 1996.

1. Directors Present

Directors attending the teleconference were;

Dale Johnson, President Walter Dean, Secretary Robert Lilley, Past President John Beukers Bill Brogden James Culbertson Bill Roland Linn Roth

Also attending:

Carl Andren Ellen Lilley Bill Polhemus

2. Agenda and Quorum

Dale Johnson had faxed an agenda to all board members.

The secretary determined that a guorum was established when seven board members were present at the meeting.

3. Approval of Minutes

Minutes of the 114th and 115th meeting were accepted without amendments.

4. Report on Recent Discussions

Johnson said Marty Shuey had reported that Congress is directing the Coast Guard to study contracting loran operation. The NBAA is reported eager to help with this.

The Boulder FRP meeting is regarded as critical in getting our message to that group.

The FAA is studying the concept of generic approaches, so that the pilot could use any appropriate nav system for NPA. Lilley, who has a contract with FAA for Flight Inspection criteria, likens the generic approaches as a TERPS problem, related to the "tunnel in space" concept. Moroney was expected to have some information on this, but could not make the meeting.

5. Report on February 5 FRF Users Conference

Beukers reported that over 100 had registered for the conference, but less than 100 appeared to be in attendance. The Omega people presented their arguments for continuation of operation, with unknown success.

Cost/benefit studies were being made by some of the new people in the FAA, resulting in a "no-brainer", all showing favorable to loran. AOPA was unable to attend the Feb. 5 conference, but sent a paper, with questionable results.

Representatives from France, NODECA, NELS and China were at the conference, and probably will not go to Boulder. Roland reports the French as commenting that the bureaucrats in the U.S. are not listening, and they have similar problems.

6. Boulder FRP Users Conference

It was felt very important to push user requirements at Boulder. Attendance at Boulder from ILA will be Bob Lilley, Linn Roth and Ed McGann. It was finally decided that Dale Johnson should also attend, assuming he can get to an airport from Hood River, not an easy task on 8 February.

7. Revised Constitution

The revised Constitution is being printed as approved, with minor editorial adjustments, and will be mailed to the membership for approval shortly. The By-Laws were approved by motion of the Board of Directors. All will be mailed out with the revised dues schedule to the membership for renewals.

8. GPS Policy Briefing at OSTP

Beukers reported on the GPS policy briefing at the Office of Science and Technology Policy. About 60-70 people, mostly press and strangers, attended. There was a 40 minute briefing followed by a 40 minute question period. Their study recommends continuing Selective Availability, and discouraging WA compensation systems. The report in the Wall Street Journal got the facts backwards. The President will decide how to go, independent of the OSTP study. The decision is already overdue.

9. Approval of Ellen Lilley's Contract

Renewal was approved unanimously.

10. 25th Anniversary Convention Report

The Catamaran Hotel has been selected, following a visit by Lilley, as having excellent ambiance and food. The icebreaker will be Sunday, November 3, and sessions will run through Thursday, 11/7. Negotiations are ongoing to hold costs to a minimum.

11. Megapulse Contract

Megapulse has received a contract from Japan for two high power transmitters, to replace the older equipments at Okinawa and Hokkaido. They should be able to pick up Larry Barnett's expenses starting in March. Larry is active maintaining contact with friendly legislators.

12. Loran Lines

the new Loran Lines should be out today (Feb. 8). It will be 16 pages, featuring the Convention and much more.

13. NTSB Public Forum

NTSB plans a public forum on Integrated Bridge Systems on March 6-7 at the Sheraton Premiere Hotel, Tysons Corner, VA. This is obviously an outcome of the Royal Majesty incident. Roland is distributing information.

14 Action Items

An effort must be made to get as many supporters to Boulder for the FRP meeting. It was decided that Johnson should go, assuming that he will be able to get to an airport in time, considering the Oregon flood situation.

15 Adjournment

The teleconference adjourned at 1452 EST.

Interr	national Loran Association	ANATIONAL ION
Date:	4 February, 1996 Total Pages	: 12
To:	Board of Directors + Bill Polhemus	
From:	Dale Johnson, PresidentFax (503) 363-1285 Centennial Ct. SEcobra715@aol.Salem, OR97302Phone (503) 363-	2306 .com 5330
Advanced	l Navigation (503) 386-1747 Fax 386-	2124 SSOCIATION

The 116th Board of Directors teleconference will be held at 1330 Eastern time [1030 Pacific time] on Thursday, February 8. For domestic USA callers the number to call is **800 857-9720**. The operator will ask you for the pass code, **3956**. For international callers, call 1-319-369-5801 or 1-319-375-1930. You may call collect, or pay for the call at your end if you desire. You might want to make a note of the phone number and pass code in your daily schedule so you will have the number handy. Please call promptly at half past the hour to help us keep the cost of the call to a minimum. In the past it has usually taken us about 10 to 15 minutes to get the meeting started with late callers coming on line. After a few people are on line, I will announce names of people on line as new callers come up. As usual, there are a number of important issues to discuss, so please join us on the call if at all possible. It would help if you would send me an e-mail to **cobra715@aol.com** or a fax to **503 363-2306** to confirm you will be on the call.

REPORTS

I have tried to include as much information as I can so you can have time to review it prior to the teleconference. Hopefully this will save some time on line and help you to note any questions you may have.

JOHN ILLGEN -- Let me give you some information about John since he has been more or less out of touch for a while and was not able to make it to the November users conference. Both Illgen Simulation Technologies and the bank he started over 2 years ago are doing very well, which has kept him keenly focused. That and some family difficulties is why we haven't heard much from him lately. He was able to attend the first day of the ION meeting, so we had a chance to talk for a while. He had a serious automobile accident in Washington, DC a few weeks ago and says he owes his life to the drivers air bag. The other car ran a red light going about 50 MPH just as he entered the intersection. After looking at the rental car John was driving, the policeman at the scene first assumed the driver had been very seriously injured. He has a painful back injury so he has to move around very carefully. He will not be able to join us on the teleconference because he has back surgery for a situation not related to the accident scheduled for Wednesday. Feb 7th. He wanted me to pass this on to his Wild Goose friends, but he has asked that we not talk about the situation outside the circle. John has asked for our prayers during this difficult time. BILL POLHEMUS -- I also want to give you a brief update on Bill Polhemus. He is still on the ventilator part time and using a walk-around oxygen bottle, but he is anxious to keep touch with his Wild Goose friends. To that end I have invited him to join us on the conference call. He promised me he would not take over the meeting.

1995 RADIONAVIGATION USERS CONFERENCE -- I think it is safe to call the conference a real success for the Loran user community in that we were able to show policy makers how serious the users are about keeping Loran in operation for at least the next 10 to 15 years. But, as you all know the battle is far from over. The current budget situation in Washington has everybody running for cover and policy statements are being made that make absolutely no sense at all. The GPS proponents in Washington are attempting to furnel **all** of the available money for navigation systems into the GPS programs. Ellen Lilley will give us a preliminary financial report on the conference, but the exact numbers will not be available until all of the expenses are in. The audio tapes of the meeting are being transcribed into a proceedings document of the meeting. This document will be submitted to the DOT as user input to the 1996 FRP.

Prior to the conference, it was agreed that a resolution should be drafted and distributed after the meeting. This work began Friday afternoon at the end of the conference and about a dozen people gathered the following morning to complete the work. It was clearly impossible for the group to wordsmith the entire document, so John Beukers volunteered to collect all the input and formulate the document. He has done an outstanding job of capsulizing the essence of the meeting and formulating a resolution. The INA Board of Directors have reviewed the resolution and concur. Dr. Kane has had the draft resolution for 6 weeks now and on two occassions has told me he has scanned it, but has not given me any input. I talked with Will Johnson last week and faxed him a copy. I told him since we have not heard any negative comments on the resolution from Duke in 6 weeks, we will proceed with distribution. The resolution with a cover summary report of the conference is attached.

LORAN STATUS REPORT AT THE ION MEETING -- John Lavrakas. Program Chairman had invited me to give a status report as a part of the opening plenary session at the meeting in Santa Monica last month. I took a little editorial license and included some discussion on the need for a mix of navigation systems. My report is attached.

UPDATE ON CHANGES IN THE FAA -- Joe Dorfler has taken a position with the Air Transport Association. I have heard that he will be replacing Bill Russell. He will be replaced by Joe Fee, who was the project manager of TCAS when it became operational several years ago.

I have also heard a rumor is that Dick Arnold may also leave the FAA this year. That would remove the two people in direct line of management of the WAAS contract. Many of the GPS people in the FAA came from DoD. The result was a DoD-orientation to the GPS project group. That may change if a long-time FAA person comes in as a replacement. Another factor will be DoD approval to distribute accuracy correction information via WAAS messages. That permission had not yet been granted at the date of the House Committee hearing a couple of months ago. Several people that testified said

Dale E. Johnson

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that without the accuracy corrections there is no need to deploy WAAS at all (i.e., just for integrity messages).

AGENDA

- 1. Approve minutes of 114th & 115th Board meetings as sent earlier.
- 2. Report on any recent FAA, USCG, or DOT discussions Anyone with new info
- 3. Report on February 6th FRP Users Conference Linn Roth, Bob Lillev

Discussion items raised at the first FRP Users Conference and add input at the second meeting if appropriate.

4. Action items - All

Open discussion of suggested action items

- approved modes to constitute 5. Constitution status report - Bob Lilley -
- 6. Status of membership renewal & Constitution mailing Ellen Lilley
- 7. Report on the GPS policy briefing for the Office of Science & Technology Policy To PRESS - John Beukers NATUMAL SEWRICY NATPA/NRC
- 8. Approval of Ellen Lilley's contract Motion and vote

Last year we increased her salary from 8800 to 500 per month. Mare second ~ I recommend we continue at the \$900 rate.

- 9. 25th anniversary convention report Bob Lilley, John Beukers
- 10. Other items to be discussed All
- 11. Adjourn

Summary Report International Radionavigation Users' Conference Westfields, Chantilly, VA November 16-17, 1995

An International Radionavigation Users' Conference was convened by the GPS International Association, the International Loran Association, and the International Navigation Association in the Washington, D.C. area on November 16, 1995 for the purpose of discussing, in open forum, the requirements and concerns of users the world over relating to the future of radionavigation systems.

The conference was well attended by representatives of the international community, U.S. user organizations, and the U.S. government in spite of the government's temporary shutdown caused by on-going negotiations for a balanced budget.

Following the welcoming remarks by the Presidents of the three sponsoring organizations, presentations were made by Mr. Phil Boyer, President of the Aircraft Owners and Pilots Association, and Mr. John Olcott, President of the National Business Aircraft Association. Both speakers strongly supported a transition to satellite navigation but stressed the need to retain current systems while satellite augmentation systems for accuracy and integrity are being implemented. Further, both speakers endorsed the continued provision of Loran-C as a complement and back-up to GPS after full operation of GPS and its augmentations is achieved.

Other presentations on the first day covered timing applications by Dr. William Klepczynski from the U.S. Naval Observatory, and maritime operational requirements by Andrew Bass, Fleet Navigator, U.S. Naval Academy for Sailing. These were followed by a summary reports of the Radionavigation Planning meeting held in Moscow in June given by Mr. Beukers; the Royal Institute of Navigation's GPS Interference Workshop held in London during October provided by Dr. David Last; and the recent Far East RadioNavigation System (FERNS) Council Meeting held in Tokyo and provided by Mr. Peter Kent.

In the afternoon presentations covered intermodal operational requirements by Mr. Ken Kelly of Amtech Systems; railroad applications by Richard Shamberger from the Federal Railroad Administration; and the benefits of precision location in construction and mining by Mr. Adam Gudat from Caterpillar, Inc. The day concluded with a presentation on Differential Navigation by Andy Bogle of John C. Chance & Associates.

The second day of the Conference was devoted to presentations by officials from the Department of Transportation and other government agencies. This was followed by an open forum for questions and discussion.

The Conference ended with a plenary session, moderated by David Scull, at which conclusions were established and recommendations made. In addition, suggestions for the text of a Conference Resolution were proposed and discussed. The final text of the Resolution with Observations, Concerns and Recommendations is attached to this summary report.

International Radionavigation Users' Conference Washington, D.C. November 16-17, 1995

Resolution and Conclusions

An International Radionavigation Users' Conference sponsored by the:

GPS International Association International Loran Association International Navigation Association

was held in Chantilly, VA, on November 16-17, 1995. Participants in the conference included members of the above organizations and members of aviation, marine, and terrestrial user organizations and interests. In addition, a significant number of non-U.S. positioning, navigation and timing users attended the conference representing the international community's requirements and concerns relating to the continuity and quality of future radionavigation services.

Presentations on a wide range of user requirements were made, followed by a discussion of the Federal Radionavigation Plan in open forum with officials from the U.S. Department of Transportation. The conference concluded with the adoption of the following Resolution:

Resolution

Noting significant technological advances in systems for radio positioning, navigation and timing, and,

Acknowledging the trend towards the use of common systems worldwide endorsed by member States of the primary international organizations,

Calling Attention to the Letter of Promulgation in the foreword to the U.S. Federal Radionavigation Plan (the FRP) signed by the U.S. President's representatives, the Secretary of Defense and the Secretary of Transportation. and,

Noting that the Letter of Promulgation states that the FRP represents the official radionavigation policy of the U.S. government,

Recognizing that governments throughout the world consider the FRP to be a statutory document fully supported by the U.S. administration and depend upon it in developing their own national radionavigation policy. Further noting the radical policy changes that have appeared in the last two successive biennial issues of the FRP, and,

Recognizing that such changes are: (a) unresponsive to user-expressed requirements; (b) an indication of the need for better coordination within the Administration and government agencies; (c) disruptive to users and governments worldwide; and (d) responsible for the loss of confidence in the FRP, the process for its development, and those responsible for its adoption,

Calling attention to the United States and international user requirements, concerns, observations, and recommendations as expressed at this International Users' Conference and summarized in the Meeting Conclusions attached to this Resolution,

Resolves:

1. That a recommendation is made to the Director of the Office of Science and Technology Policy that, in accordance with Title 22 of the U.S. Code of Federal Regulations, Section 2656b, he/she assume responsibility for the oversight and guidance of strategic planning aspects for the Federal Radionavigation Plan including provision of specific services, for the process of coordinating all national and international interests, and for the establishment of the FRP under the Federal Regulatory Process.

2. That this Resolution be transmitted to government departments, international organizations, user organizations, and others involved in the evolution of radionavigation systems for national and international use.

Observations, Concerns and Recommendations follow this page:

Observations, Concerns and Recommendations

At the final session of the Conference, delegates expressed their individual requirements and concerns and made a number of observations and recommendations. These are presented in the paragraphs that follow, in no particular order of importance:

1. Government-Supplied Services

The many benefits that have accrued to a user community of millions over years of government (taxpayer) support of radionavigation services was acknowledged.

It was accepted that governments have a responsibility to provide services in an efficient and cost-effective manner.

2. Satellite Technology

It was recognized that satellite technology as applied to positioning, navigation and precise timing is providing significant worldwide social and economic benefits and that the technology offers capabilities not available from previous systems.

It was also recognized that a global, centralized satellite-provided positioning, navigation, and precise timing service was being planned by the United States to become an alternative to a multitude of currently operating terrestrial services.

3. Worldwide Systems

It was noted that most long-range terrestrial systems and all services based upon satellites are inherently international and have a direct impact on governments and users. It was recommended that international agreements in force must be respected.

4. Transition Plans

Attention was called to the need for the transition from terrestrial systems to a mix of terrestrial and space-based services to be based upon the provision of an assured service and not upon an arbitrary schedule.

It was noted that the transition to a satellite service from nationally owned, decentralized, terrestrial services raises substantial legal, financial, political, and technical issues that require time to resolve.

5. Government Competition

Attention was called to the issue of the Government competing with the private sector in providing differential satellite services.

6. Mix of Systems

It was noted that aviation associations including AOPA, NBAA, EAA. HAI, ALPA and NASAO; Boat U.S. representing marine users; the European Union and international organizations: ICAO, IALA, IMO, IAIN, and other national organizations have all expressed a requirement for a mix of positioning systems to insure availability for all services and integrity for safety-critical applications. Many European and Far East states have already taken action to meet these requirements.

The provision of more than one independent means for deriving position information to ensure safe navigation was acknowledged as a mandatory requirement. The current activity within IMO to identify the requirement for a second independent navigation input to electronic chart displays (ECDIS) was also noted.

There was support for complementary satellite and terrestrial systems to ensure continuity, availability, and integrity of service.

7. National Plans

The regional and national activity around the world to develop long-term radionavigation plans was noted.

8. U.S. Federal Radionavigation Plan

In considering the 1994 Federal Radionavigation Plan, deep concern was expressed over the decision to transition to satellite technology in the short-term, and the decision to terminate all terrestrial services without input from the Department of Commerce and Department of State. It was noted that the adverse impact on international trade, the weather services, and other non-navigation users had not been thoroughly assessed.

The lack of involvement and coordination with the Department of State throughout the FRP process was also noted. The announcement in the 1994 FRP of termination of Loran-C by the year 2000 in the United States has resulted in confusion and mistrust within those states (nations) which had, just one year previously, received encouragement from the U.S. government to take possession and financial/operational responsibility of Loran-C assets overseas.

9. Loran-C Service

The strong bipartisan support for continued funding and support for the Loran-C radionavigation system by the Authorizing and Appropriations Committees and by other key policy makers in the U.S. Senate and the U.S. House of Representatives, as reflected in statutory and other provisions advanced in H.R. 1361, H.R. 2002, and S 1004 was noted.

There was a strong recommendation that the Department of Transportation and its agencies, in active consultation with users, fully comply with the statutory provisions and Congressional intent reflected in the above Bills as acted upon by the respective bodies during the first session of the 104th Congress of the United States.

It was also noted that Loran-C for the Coastal Confluence Zone was formally adopted through notice in the Federal Register. It was recommended that termination of the system should follow this same formal procedure.

10. Omega Service

Concern was expressed over the imminent termination of the global Omega radionavigation service. It was noted that some airline operators do not have time to reequip, and weather station operators throughout the world do not have an economic equivalent.

11. User Consultation

Users of current and proposed institutionally-provided services recommended that they be consulted and become intimately involved in matters concerning:

- A. The radionavigation planning process and the development of radionavigation plans.
- B. Establishment of a defined period of concurrent operation for any proposed service transition, based upon assured service.
- C. Development of a transition plan and schedule.
- D. Provision of complementary systems.
- E. Dissemination of technical and non-technical limitations of a centralized positioning, navigation and precise timing system.
- F. Exchange of information within the international community to facilitate international planning and setting of standards.

12. Government Intervention

The recommendation was made that no government departments, whether United States or any other states (nations), should obstruct by political, diplomatic, or commercial means, efforts to enhance peacetime performance of satellite navigation systems. Such enhancements were noted to include GPS augmentations, use of GLONASS, and the provision of an independent satellite constellation.

Current Status of Loran-C

Delivered at the Institute of Navigation meeting, January 22, 1996 By Dale E Johnson, President, International Loran Association

It is clear that satellite technology is here to stay and will be the heart of positioning and navigation systems for as far as we can see into the future. Still, many governments and international navigation organizations recognize the need for a mix of navigation systems to meet integrity and continuity-of-service requirements. Coverage of Loran and its Russian equivalent, Chayka, is being improved and expanded in Europe, Russia and the Far East. Other nations are considering the use of Loran as a low cost component of their navigation infrastructure. Even today with the rush to adopt GPS technology, Loran has the largest navigation user base of any system available with over one million users. The user base is still growing as a result of the expansion of Loran coverage outside the US.

At a meeting of the International Association of Lighthouse Authorities in Cape Town, South Africa in November 1995; the primary focus was on providing a proper mix of satellite and terrestrial technologies to meet acceptable navigation requirements for marine users. Scandinavian, European, and United Kingdom representatives made it very clear that Loran will definitely be included in the navigation system mix for their part of the world. There is a strong feeling among the international community that relying solely on one technology, or system, is simply unwise. Further, the application of a mix of systems offers the best way of meeting navigation requirements for all users.

Following the Cape Town meeting, an International Radionavigation Users Conference was held in Washington, DC. This conference was jointly Sponsored by the GPS International Association, the International Loran Association, and the International Navigation Association. The conference was opened by the Presidents of the Aircraft Owners & Pilots Association and the National Business Aircraft Association. Both delivered a strong message that their membership wants to keep Loran in operation well into the next century as a partner and backup for GPS. An informal poll of AOPA members during town hall meetings indicates that about 80 per cent of their members use Loran regularly for navigation. The National Association of State Aviation Officials representative made it clear that NASAO supports a plan to maintain a mix of terrestrial and satellite systems to assure a high level of performance, reliability and safety.

The second day of the conference was devoted to Department of Transportation presentations and an open forum with users and user representatives. Many user concerns were raised about the plan to quickly shift to total reliance on a single technology which has yet to reach maturity. It was agreed that a resolution should be written to state the user requirement for maintaining a mix of navigation systems, and that this document should be sent to appropriate government agencies. This resolution is in final draft form and will be published in the near future.

The Northwest Europe Loran System was placed into operation last year. The NELS consortium consists of France, Germany, Denmark, Norway, The Netherlands, and Ireland. The Far East Radionavigation Service joint Loran Chayka system will be

operational early this year. The FERNS group of nations consists of Russia, Japan, Korea, and The Peoples Republic of China.

In contrast to the international focus on expanding Loran coverage, the 1994 Federal Radionavigation Plan (FRP) calls for the phase-out of Loran in the United States after the turn of the century, but this is still subject to validation of a continuing requirement. Many user groups are complaining that this is a drastic change from the commitment in the 1992 version of the FRP, which indicated there would be a 10 to 15 year advanced notice given for the phase-out of any navigation system.

As of December 1994, all Loran stations outside the United States had been turned over to host nations for ownership, operation and control. European host nation reaction to the US announcement to phase out Loran early has been one of strong disappointment. This is a sensitive issue to many people in the international community. It is important to remember the fact that the United States has agreements with Canada and Russia for joint operation of Loran chains which cross our shared international borders. I am sure we can expect a similar negative reaction from these neighboring governments as well.

At least six Senators and several House members have stated their concern about safety and making an orderly transition to the best use of satellite technology; they have indicated strong support of the GPS / Loran partnership concept. User organizations which support maintaining Loran as a part of the navigation system mix include virtually all of the US aviation and marine user organizations and the National Association of State Aviation Officials.

A document has just been released by The General Lighthouse Authorities for the United Kingdom and the Republic of Ireland to identify navigation aids and user requirements for the 21st Century. This document states "the assessment of requirements recognizes that: (1) no aid to navigation should be relied upon in isolation, (2) there must always be cross-checks between systems, and (3) cost and efficiency are important factors". Earlier this year, a cruise ship ran aground off Nantucket Island en route to Boston Harbor as a result of total reliance on one navigation system without maintaining an adequate cross check of other navigation aids. If there was ever any doubt about the need for maintaining a long-term mix of systems, this incident proves the validity of their point.

The annual operating cost of the domestic Loran system is \$17 million. If the system were optimized, this cost could be reduced to \$14 million, resulting in improved service and a total payback within 12 years. Loran is the least expensive, and most cost-effective, area navigation system available. Latest Loran technology developments promise improved accuracy and coverage, with the ability to receive stations from up to 5000 miles away, and track as many as 40 stations simultaneously. This new receiver technology has proven the ability to offer repeatable accuracy comparable to the Wide Area Augmentation System in primary coverage areas, which includes all of the domestic USA. It also offers acceptable accuracy to provide a backup for GPS using skywave over the North Atlantic and North Pacific oceans. A more detailed report on this new Loran receiver technology will be given by its developer this afternoon in the Integrated Navigation session.

The use of a GPS Loran partnership for precise timing is equally as important as the application of both technologies for navigation. Precise timing is an absolute requirement of almost all communications systems, including telecommunications, television, and radio. Precise timing is also critical for maintaining electrical power grids to the standards required by our modern computerized equipment. Some large companies have been using Loran for many years and now that GPS is available, they want to use both systems for improved integrity and continuity-of-service.

Both the House and Senate versions of the FY '96 Coast Guard Authorization bill include language requiring user input and a plan for the operation, maintenance, and upgrade of the Loran-C navigation system. This includes mechanisms to make full use of compatible satellite and Loran technology by all modes of transportation, the National Weather Service, and the communications industry. This language also calls for ensuring that Loran receivers purchased before the year 2000 will have a useful life.

We now know that geomagnetic storms, which usually result in ionospheric storms, affect navigation systems, but in different ways. Papers written by Mr. Joe Kunches of the Space Environment Laboratory in the National Oceanic and Atmospheric Administration lay out important facts for all navigators. His work has shown that large increases in the total electron content of the ionosphere will directly affect the accuracy of satellite systems, while having a minimal affect on Loran in primary coverage areas. Conversely solar flares, a different phenomenon, may affect low frequency systems such as Loran, but are not a problem for the high frequency satellite systems.

It is clear that a large number of users and policy makers around the world agree that utilizing a mix of terrestrial and satellite systems is the wisest, safest and most prudent course to follow for as far as we can see into the future. United States policy should reflect the input and wisdom of these distinguished groups and individuals.

Keeping Loran in place makes good sense from an operational perspective for marine aviation and precise timing users. It also makes good business sense to the federal government as the provider of safe and reliable positioning services. It is important to carefully consider the degree to which terrestrial radionavigation systems will be abandoned in favor of the new satellite technology. A quick answer might be to make these decisions purely on budgetary grounds. A closer study of the situation reveals that political, legal, and technical issues are even more important and will result in significant long term economic benefits.