



## **Report of an Ad-Hoc Meeting on LORAN / Chayka**

**September 24 and 25, 2007**

**Norwegian Coastal Administration Office  
Haugesund, Norway**

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## **Report of an Ad-Hoc Meeting on LORAN / Chayka**

### **1 GENERAL**

An ad-hoc meeting on LORAN / Chayka was convened at the regional headquarters of the Norwegian Coastal Administration (NCA), in Haugesund, Norway on September 24 and 25, 2007, with Mrs Kirsten Selvig as Chair. The Secretary for the meeting was Mahesh Alimchandani.

Apologies were received from the following:

- 1) Japan
- 2) Turkey
- 3) China
- 4) India
- 5) Saudi Arabia
- 6) Spain
- 7) Sweden
- 8) European Commission
- 9) The Netherlands

#### **1.1 Opening**

The Chair, K Selvig, Director-General, Department of Fisheries and Coastal Affairs, Norway, opened the meeting by welcoming all participants to Haugesund and Norway, and said that they were gathered there to discuss an important issue. She then outlined the role and responsibilities of her department, which included the responsibility for electronic position fixing systems like LORAN and GALILEO.

K Selvig stated that Norway currently had four LORAN stations in operation, which were being kept operational until 2009 at the request of UK, Russia and France. Norway saw it important to keep the stations operational, as they were part of the LORAN chain in North West Europe. However, by the middle of 2008, Norway would have to decide whether to continue funding the operations of the stations.

K Selvig stressed that it was important to work in cooperation with IALA as it had the ability to deal with such matters at a strategic and global level. She then outlined the growing importance of the northern shipping routes. She also displayed a world map showing current LORAN coverage.

K Selvig concluded by saying she hoped there would be free and frank discussions on LORAN and Chayka.

The IALA Secretary-General, Mr Torsten Kruuse, said he was pleased to see so many participants. He said that the meeting was important for the future of radionavigation. He thanked NCA for hosting the meeting and said that the meeting was taking place at the NCA office because in the previous week, a meeting of the IALA e-Navigation Committee had also taken place there. IALA was keen to find out which administrations were planning to keep LORAN operational and which were shutting it down (and why).

T Kruuse stated that the IALA e-Navigation Committee had agreed that there were three main requirements for the development of e-Navigation. These were - adequate coverage by ENC, agreed ship-shore communications and redundant position fixing systems. Although GNSS was a key contributor, all GNSS were vulnerable to the same threats, he added. He said the e-Navigation Committee was also considering marine inertial navigation systems, which could be costly; but eLoran could be a very good candidate for e-Navigation.

T Kruuse said that the meeting needed to know what was realistic, and whether global coverage was feasible. He concluded by saying that an important task therefore was to update the IALA document, which records the current status of Loran systems worldwide.

Jarle Hauge of NCA provided a brief on health and safety issues. Mahesh Alimchandani of IALA gave details on other administrative matters.

## **2 INTRODUCTION OF PARTICIPANTS**

The Chair requested all participants to introduce themselves.

## **3 APPROVAL OF THE AGENDA**

The Chair asked for support to approve the agenda. The agenda was approved without any changes.

## **4 ANNEXES TO THE REPORT**

### **4.1 Agenda**

The agenda was adopted. A copy of the agenda is provided in Annex 1.

### **4.2 Participants**

A list of participants is provided in Annex 2.

## **5 UPDATE OF THE LORAN C / CHAYKA COVERAGE**

### **5.1 Update on USCG system**

T Thomsen of the USCG presented information on US Loran Status. Eighteen stations in the continental US have been modernised with solid-state transmitters and new control equipment. Kodiak Alaska has been modernised and St Paul is due in spring 2008. The remaining Alaskan stations still have tube transmitters. Time of Transmission control has been introduced on the Great Lakes on a trial basis and six stations are transmitting a data channel on a test basis. Seneca, NY is also sending out differential corrections. Cooperation is underway with USNO and NIST on precise timing and frequency.

A high-level decision is expected by December in DOT & DHS. Operations & Maintenance are still funded, but no new money has been granted for modernisation in 2007/8.

### ***Discussion***

- NDGPS was funded by DOT, but it was assessing support for inland stations. USCG would continue to operate maritime and inland waterways DGPS stations.
- The Programmatic Environmental Impact Assessment was a legal requirement to assess the environmental effects of new structures for security and safety, resulting from de-manning.
- The Federal Register Notice attracted nearly 1000 responses. Eighty (80%) percent supported a national backup to GPS, and 92% responded in favour of retaining Loran.
- The announcement would take the form of a policy statement on a joint DOT/DHS decision. The FRP process would be too lengthy.
- The missing link in coverage of the N. Atlantic was noted and the importance of the link between N. American and FERNS coverage was stressed. Equipment had been purchased for the Alaskan stations. Discussions with Canada and Russia were waiting on the decision.
- A second satellite navigation system was not considered an adequate backup, because of the similar failure modes.

The presentation will be made available electronically along with the documentation of the meeting.

### **5.2 Presentation by Jim Doherty, Independent Assessment Team, US**

The work of the Independent Assessment Team on Loran was described, although the results could not be reported at this stage. The IAT reported directly to senior levels in DOT & DHS and was a study of existing reports. A deep study of the finances concluded that even in the worst case Loran was affordable - \$60m p.a. declining to \$40m p.a. after 7-8 years. It was agreed that other GNSS could not provide a backup to GPS because of similar failure modes. The need for a standardised, multi-modal system was emphasised, independent of GPS, but inter-operable. J Doherty stated that the term “reliable GPS” had been coined for marketing purposes.

The presentation will be made available electronically along with the documentation of the meeting.

## **Discussion**

- On the question of meeting IMO requirements for position fixing in restricted waters, studies indicated accuracy levels between 10-20m, 10m close to monitors. Differential corrections would be used for temporal errors, surveyed corrections for spatial errors.
- Trials at Harwich had shown sub 10 m accuracy and this was supported by real time results on the East coast of the US.
- It was noted that a previous IMO initiative on Loran-C had failed, but pointed out that eLoran was a system, different from Loran-C. It could not be sold as a standalone backup. The need for standards was agreed, eLoran as an alternative should meet the IMO requirements. If it was really a new system, should it have a new name?

### **5.3 Presentation by Canada**

Stephen Lord reported that three stations were operating in Newfoundland covering the East coast into Labrador and two stations were operating on the West coast in conjunction with US stations. All were being maintained on a minimum investment basis until 2010. Decisions in Europe and the US were being monitored. Two options were being considered under the AtoNs for the 21<sup>st</sup> Century Project and a final decision was expected early in 2008.

## **Discussion**

The degradation of GPS performance in high latitudes was noted. It was confirmed that the Northern part of Canada was not covered by Loran, although there was some VTS coverage.

The presentation will be made available electronically along with the documentation of the meeting.

### **5.4 NW Europe - Presentation by France**

Francis Hubert pointed out the configuration changes for amendment of the IALA document. A single coverage map was recommended to take account of all-in-view mode of use. There was no longer a need for CD figures, only ED. The information for Loop Head should be replaced with that for Anthorn and the 8940 chain data removed. Coverage diagrams should take into account the improved performance of modern receivers: -20 or -25 dBm tracking rather than -10.

## **Discussion**

There was no technical reason for a second control centre. The coverage of Anthorn would not be greatly different to Rugby, but previous maps were based on chains and all in view operation would improve accuracy and coverage. The cost of providing new coverage maps was discussed

The presentation will be made available electronically along with the documentation of the meeting.

### 5.5 Presentation by Norway

W Grepstad stated that the revision of the Norwegian Radionavigation Plan was underway. The increase in maritime activities in Northern Norway was noted, with LNG being transported to the US and the possibility of using the North West Passage. The NELS Agreement had been denounced at the end of 2005, but nine stations would still be operating, with the one in the UK. The future in NW Europe depended on the user requirement, e-Navigation development, the need for redundancy and the European Radionavigation Plan (ERNP).

### 5.6 Presentation by UK

S Basker stated that the UK position had been set out in “2020 – *The Vision*” document and the opportunity for the Rugby trial had been provided by the availability of the masts. However, they needed renewal, hence the move to Anthorn through a Public Private Partnership with VT Communications on a 15 year contract. The GLA Radio Navigation Plan and the GLA Work Plan included commitment to eLoran, with full operational capability scheduled for 2011. It needs to have multi-modal use and a cross government meeting was being held.

### 5.7 Presentation by Ireland

C Day stated that the CIL position was, like the other GLAs, to support eLoran, but the official Irish Government position was to keep an open mind; a station in Ireland was not being considered. CIL was looking at the possibility of a mini-Loran station and the situation could be influenced by the ERNP.

### **Discussion**

The different timescales were noted: UK 2011, France 2015-2020, Norway 2009, and the imminence of an ERNP was questioned.

### 5.8 Presentation by Denmark

O Eriksson stated that the Danish position was that Loran was not needed; reliance was placed on satellite navigation. Ejde continued in operation under an agreement with France to cover the costs. The situation with eLoran and the ERNP would be monitored and there were national discussions on GNSS vulnerability.

### **Discussion**

The contract with France was for five years from the end of 2006.

### 5.9 Presentation by Germany

J H Oltmann stated that the termination of the NELS agreement was based on a user-consultation process and an analysis of obligations. Sylt could be made available for future use, its continued operation depends on agreement with the private service provider, with the costs being met by a third party. Otherwise it would be switched off, but preserved until the outcome of the ERNP was known. There was an agreement on funding until 2009 with the UK. The proposals to IMO had failed due to a lack of support; plans for a new station in the East, linking up with Chayka was not being pursued.

### 5.10 Presentation by Russia

V Tsarev stated that a letter was being provided updating the IALA document. Transmitters and control systems were being modernised with solid state technology. The Chayka SNS, similar to Eurofix, was being installed. There were plans for a Barents Sea/Boe chain and a link between the European Chayka chain and Sylt. Integrated user equipment for GLONASS/Chayka/Loran was under test. Talks were taking place with Kazakhstan on new stations to form part of the European chain. The Russian Radio Navigation Plan would be distributed by the end of the year.

### **Discussion**

Chayka was important to the Russian Federation because it served all classes of user, including timing. The 1995 MOU with Norway was to be reviewed, because of interest in oil and gas developments in the far North. VTS centres would provide warning and information systems.

The GLONASS constellation should be replenished by 2009, giving full coverage and improved accuracy. It would be updated after 2009 and would become inter-operable with GPS in 2015. Talks were taking place with ESA on EGNOS, but no decisions had been made.

### 5.11 Presentation by Finland

R Backstrom stated that Finland was following the eLoran discussion, but had concerns about its viability in archipelagos with poor ground conductivity and large seasonal variations. The need for a backup is fully supported, but it needs to be shown whether eLoran is the answer. Sweden takes a similar position.

### 5.12 Presentation by Korea

Korea confirmed that all 6 FERNS chains and 16 stations were operating and notified a correction to the name of one of the Chinese stations.

### 5.13 Information from Italy

Written statement provided. LOC1-04-07 refers

### 5.14 Information from Saudi Arabia

Saudi Arabia had declined to attend and had not provided an update. It was not known whether their chain was still in operation.

### 5.15 Information from India

The Indian chains were understood to have been switched off.

## **6 DEFINITION AND DESCRIPTION OF ELORAN, INCLUDING COMPONENTS AND PERFORMANCE**

N Ward, of Trinity House, UK, provided a definition of Enhanced Loran (eLoran). He said that it was a high-level definition for policy makers, service providers, and users. It was developed in November 2006 at the United States Coast Guard Navigation Centre by an international team of experts.



eLoran was defined as

*...an internationally standardized positioning, navigation, and timing (PNT) service for use by many modes of transport and in other applications. It is the latest in the long-standing and proven series of low-frequency, Long-Range Navigation (LORAN) systems, one that takes full advantage of 21st century technology.*

*eLoran meets the accuracy, availability, integrity, and continuity performance requirements for aviation non-precision instrument approaches, maritime harbour entrance and approach manoeuvres, land-mobile vehicle navigation, and location-based services, and is a precise source of time and frequency for applications such as telecommunications.*

*eLoran is an independent, dissimilar, complement to Global Navigation Satellite Systems (GNSS). It allows GNSS users to retain the safety, security, and economic benefits of GNSS, even when their satellite services are disrupted*

*International Loran Association Definition Document (LOC1-05-01 refers)*

N Ward stated that eLoran was also a precise source of time and frequency for applications such as telecommunications. He described the core system and explained how it was different from LORAN C. He also gave details on the provision of an eLoran service.

A copy of his presentation is available electronically along with the documentation of the meeting.

## **Discussion**

- Questions were asked about the use of reduced antenna heights and receiver concepts. The relationship of antenna height to efficiency is a third power of the height ratio, therefore the output decreases rapidly with height.
- The two approaches to user equipment architecture are integrated receivers (e.g. GPS/Loran) or integrated navigation systems (e.g. GPS, GLONASS and eLoran engines feeding one workstation).
- Additional Secondary Factors (ASF) and Signal Propagation Corrections are both terms used to account for effects of ground conductivities.
- ASF can be obtained by measurement or modelling or a combination of the two.
- The GLAs plan to fund a PhD research project on coverage modelling.
- Acceptance by users might be achieved by promoting the benefits, such as authentication, guaranteed levels of service or overcoming signal blocking spoofing or jamming. Weaknesses of the system are the infrastructure requirements.
- The specification should be open and have no Intellectual Property Rights (IPR) restrictions. The Interface Control Document should be publicly available. Eurofix IPR Issues were understood to be resolved by the Gauss foundation and the 9<sup>th</sup> pulse specification was in the public domain.
- It was suggested that the cost of deploying the infrastructure could be offset by integration with other installations, such as AIS and DGNSS.
- The situation at the start of AIS was recalled and it was suggested that eLoran should be accepted as part of e-Navigation.

- Whether eLoran could be accepted in IMO as part of the WWRNS was still to be determined, but there were three levels at which it could be proposed. It was unlikely that it would replace DGNSS in the short to medium term.
- The ERNP was proposed as a means of acceptance.
- Meeting the IMO requirements for position fixing better than 10m, was not necessarily a problem and the plan was for eLORAN to meet these requirements.
- There was agreement to stay with the name eLORAN, despite there being some aversion to the name Loran.

## **7 STANDARDISATION OF LORAN**

N Ward gave a presentation on the work required for the standardisation of eLoran. He listed the various organisations that would need to be involved and outlined their role in this process.

The presentation will be made available electronically along with the documentation of the meeting.

### ***Discussion***

There was discussion on the role that IALA could play in this process and how proposals could be submitted to IMO. T Kruuse said that it was possible to use the IALA e-Navigation Committee to develop the standardisation plan further and submit it to IMO via the IMO Correspondence Group on e-Navigation.

The group was of the view that it was premature to take this to IMO now, as this was still the ‘fact-finding’ stage. They noted that there was a degree of opposition to eLoran at NAV 53 (July 2007).

## **8 REQUIRED MODIFICATIONS TO LORAN / CHAYKA STATIONS TO IMPLEMENT ELORAN**

### **8.1 Information from FERNS**

S Gug of Korea presented information on the status and future of the FERNS chains. He provided an overview of FERNS, including its history and its activities. He also provided detailed information on the six chains.

S Gug stated that in order to move to eLoran, a national policy and an operational doctrine were required, among other things. A key question was to determine the users that eLoran would provide a service to. LORAN C was used mostly by the military, he said. Further, cooperation with other countries was important as was a revised FERNS agreement. S Gug concluded by saying that if the two stations in Korea were upgraded, it would cost approximately 6.3 million US Dollars.

### ***Discussion***

The Chair pointed that it was significant that the military was a big user. It was very important to identify who were the potential users of eLoran and why it was important to them. The group noted the costs mentioned for upgrading were quite high and that this could be a major hurdle.

A copy of his presentation is available with the output documentation of the meeting.

## 8.2 Information from France

F. Hubert provided an update on the status of the various components of the European Chain. He also listed the components that needed to be upgraded to move from LORAN C to eLoran. He said that in the future, users should not have to concern themselves if their units were tracking GNSS, Loran or anything else. They will be offered a position with a given accuracy and integrity. The eLORAN signal will carry the identity of the LORAN site and the user will no longer have to select GRI, chain, master, leap second or anything else.

A copy of his presentation is available with the output documentation of the meeting.

## 8.3 Information from Russia

A Choglokov provided an overview of the four chains in Russia and also on the chain that was in operation in cooperation with US. He explained why Chayka was being modernised and which components were yet to be modernised (and the timescale thereof). He also outlined the DGNSS coverage, provided by Russia. Russia had no plans to close Chayka or the LORAN / Chayka activity. Russia stated that they had proposals for new chains in the northern part of Russia.

The chair reiterated that it was important to identify all users of the system. She also wondered about linking the LORAN and Chayka systems. She said this was unclear at this point, but that discussions were taking place with Russia.

A copy of his presentation is available with the output documentation of the meeting.

## 8.4 Information from US

T Thomsen provided an update on the status of the US Loran chains, and outlined what was required to move to eLORAN.

Costs were the main challenge, particularly so in the case of the older stations in Alaska. He said that there had been no funding for modernisation for the past two years and hoped there would be funding provided soon.

As regards the way forward, two studies had been completed in the US. The Loran Integrity Performance Panel (LORIPP) and the Loran Accuracy Performance Panel (LORAPP). LORIPP proved that eLoran can meet aviation integrity requirements, and LORAPP proved the technical feasibility of Loran enhancement to meet Harbour Entrance and Approach (HEA) requirements for maritime transportation. In order to arrive at a decision, all users and modes must be taken into account, not just maritime users. These two studies had confirmed the eLORAN approach. Only 9<sup>th</sup> pulse modulation techniques were evaluated in these studies. EUROFIX was not evaluated.

Another challenge was to meet the IMO positional accuracy requirement of 'better than 10m' in restricted waters (the Federal Radionavigation Plan currently had this requirement as 8 to 20m).

A key element of eLORAN was the availability of the data channel and the use of the ninth pulse for differential corrections. The data channel would be an issue in any standardisation plan, he said, as the 9<sup>th</sup> pulse approach was considered necessary to meet the requirements.

A copy of his presentation is available with the output documentation of the meeting.

## **8.5 Information from Canada**

S Lord provided an exhaustive list of the Canadian LORAN – C stations, including the control and monitoring stations.

He said that the Canadian assessment was that the equipment could function until 2010, however significant work would be required to support it with minimal investment. Estimates were being prepared and were expected to be available by the end of October 2007. Canada was also looking at the longer term implication of costs associated with implementing eLoran - estimates for this should also be available by the end of October. All this information would be used to inform a subsequent decision on the longer-term vision. Any decision will likely be linked in some manner to the USCG decision.

He said that in the late 1990's, a survey of the users showed the majority were not using LORAN –C.

## **9 DEVELOPMENT OF LORAN C / CHAYKA TOWARDS LORAN**

N Ward provided discussion points on the development of eLoran, in response to the questions in the program.

Regarding the question ‘what is required to get a universal eLoran system?’ He said that acceptance of the need for a backup to GNSS, supported by a risk analysis, was the first requirement.

Other aspects were an agreement on the choice of a backup, proof of performance and cost/benefit, plans for universal coverage and regional agreements.

Addressing a second question, ‘what is the plan of action for standardisation?’, it was suggested and agreed that the presentation given earlier in the meeting had answered this.

A modified version of the paper, taking account of the points raised during the discussions, would be included in the output documents.

Responding to the third question ‘is global/adequate coverage by eLoran realistic?’ N Ward said there were economic, planning and environmental issues to consider. One approach was to make use of existing service providers, and the performance of modern receivers should be taken into account. Linking up ex NELs chains with Chayka and restoring the Mediterranean chain(s) should be the most straightforward steps.

In discussion, it was pointed out that from the global coverage diagram of 2005, it was evident that a large part of the world did not have coverage, in particular the southern hemisphere. It was also pointed out that two other existing systems had worldwide coverage – the DGNSS beacon system and the AIS shore stations. DGNSS corrections could be transmitted over the AIS data link cheaply and these corrections could be used by all classes of vessels.

## **10 ANY OTHER ELORAN RELATED BUSINESS**

### **10.1 Presentation on the Vulnerability of GPS**

S Basker presented information on the vulnerability of GPS. She stated that GPS had revolutionised positioning, navigation and timing information. S Basker added that GPS was very reliable and therefore thought was generally not given to mitigating the risk of non-availability of GPS. However, the Volpe Report, released in 2001, stated that GPS was vulnerable interference and that this risk could be reduced but not eliminated. She then provided many cases to show the ease with which GPS signals could be jammed and the impact thereof.

S Basker said that the key to driving down costs was to focus on the benefits for multi-modal users and to roll-out Loran using public private partnership.

In discussion, it was agreed that the human element must always be considered and that complementary, but dissimilar system must be considered as an alternative to GPS,

A copy of her presentation is available with the output documentation of the meeting.

### **10.2 Miscellaneous**

Russia is preparing standards for their version of the loran data channel. They undertook to share this information with others in the group.

## **11 CONCLUSIONS, RECOMMENDATIONS AND ACTIONS**

### **11.1 Conclusions**

1. The IALA publication titled *IALA List of Radionavigation Services 1996* needs to be updated as a matter of urgency. The set of diagrams contained within the current document should be discarded in favour of a single, new global coverage diagram. Improved coverage prediction methods and specifications for new reference parameters need to be developed.
2. Proof of concept trials have demonstrated that eLoran will meet the IMO performance requirement for navigation in restricted waters (better than 10 m accuracy).
3. Any new eLoran system which performs to the minimum operational performance standards must be free of intellectual property rights. This applies to both service providers and receiver equipment.
4. There is no market for stand-alone eLoran receivers in the maritime world. eLoran receiving capability should be part of any integrated user equipment.

### **11.2 Recommendations**

1. A concept for a world-wide maritime radionavigation plan should be developed, leading to a multi-modal plan.

2. The definition of eLoran, as provided by IALA (LOC1-05-01 refers) was noted by the group. This definition should be considered as a working definition of eLoran.
3. The action plan for the standardisation of the eLoran, as presented at the meeting, should be supported.

### 11.3 Actions

1. The IALA Secretariat is requested to update the *IALA List of Radionavigation Services 1996*. The USCG (T Thomson) and Trinity House, UK (N Ward) are requested to assist with this process.
2. The IALA e-Navigation Committee is requested to note the IPR and system compatibility issues.
3. IALA is to explore the concept of creating a world-wide maritime radionavigation plan and will place it on the work programme of its e-Navigation Committee.
4. The IALA Secretariat is requested to forward the report of this meeting, highlighting the working definition of eLoran, to the IALA Council, in time for their December 2007 meeting.
5. The IALA Secretariat is requested to forward the report of this meeting to the FERNS Council meeting, scheduled for Oct 2007.
6. The IALA Secretariat is requested to forward the report of this meeting to the International Loran Association (ILA), in time for their October 2007 meeting.
7. The General Lighthouse Authorities of UK and Ireland are requested to forward the results of their trials on ascertaining the capability of eLoran to meet the accuracy requirement of better than 10 m for position fixing to IALA. France and USCG are also requested to provide similar results to IALA.
8. The IALA e-Navigation Committee is requested to commence work on an action plan for the standardisation of eLoran.
9. Russia is requested to forward the results of their standardisation efforts to IALA.

## 12 CLOSING REMARKS BY THE IALA SECRETARY GENERAL

T Kruise, the IALA Secretary General, said that it had been a very interesting meeting. He said that it was very important to keep the needs of the user in mind. Loran was a system set up for the military and the civilian world had inherited it. He added Loran had to be made attractive to SOLAS vessels. Any development of eLoran within IALA would be part of the e-Navigation concept, he said. The time to develop eLoran was

short, and it was important to note that Norway would have to make a decision on its stations by the middle of 2008. He said that IALA's e-Navigation Committee would work on a standardisation plan.

### **13 DATE AND VENUE OF THE NEXT MEETING**

If the group was of the opinion that they should meet again, IALA identified the 11<sup>th</sup> and 12<sup>th</sup> of March 2008, as suitable dates for a similar meeting at the IALA HQ in France. The Chair, K Selvig, was requested to confirm this to IALA as soon as practicable.

### **14 CLOSING REMARKS**

The Chair thanked everyone for travelling to Haugesund to attend the meeting. She also thanked IALA for arranging the meeting and the team at the NCA office for all their support and excellent arrangements.

As there was no further business to conduct, the Chair closed the meeting and wished everyone a safe journey home.

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# Annex 1: IALA Ad Hoc Meeting on LORAN / Chayka

## ***Provisional Agenda***

**September 24-25, 2007  
Haugesund, Norway**

An Ad Hoc Meeting on LORAN / Chayka will be held on 24<sup>th</sup> and 25<sup>th</sup> September 2007 at the NCA Headquarters in Haugesund, Norway.

The meeting will start at 0900 hrs on 24<sup>th</sup> and will finish at approximately 1700 hrs on 25<sup>th</sup>.

### PROVISIONAL AGENDA

- 1 Opening of the meeting
- 2 Introduction of participants
- 3 Approval of the agenda
- 4 Update of LORAN C / Chayka coverage, with reference to the IALA document *IALA List of Radionavigation Services, 1996, Edition 1*.
  - Update of N American LORAN C Chains
    - *Check for validity of Table 1*
  - Update of NW Europe LORAN C Chains
    - *Check for validity of Table 2*
  - Update of Commonwealth of Independent States Chayka Chains
    - *Check for validity of Table 3*
  - Update of FERNS Chains
    - *Check for validity of Table 4*
  - Update of Mediterranean and Middle East LORAN C Chains
    - *Check for validity of Table 5*
  - Update of Indian Loran C Chains
    - *Check for validity of Table 6*
5. Definition and description of eLoran, including components and performance.
6. Required modifications to LORAN/Chayka stations to implement eLoran, including costs and implementation time.



- a. From Far East
- b. From Russia
- c. From N America
- d. From Europe

7. Future developments of LORAN C / Chayka

- a. What is required in order to get a universal eLoran system?
- b. What is the plan of action for standardisation?
- c. Is global coverage by eLoran realistic?

8. Any other eLoran related business

9. Review of draft conclusions

10. Closing of meeting

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## Annex 2: List of Meeting Participants

<b>No.</b>	<b>Participants</b>	<b>Organisation / Country</b>
<b>1</b>	Alimchandani, Mahesh	<b>IALA</b>
<b>2</b>	Bäckström, Rolf	<b>Finland</b>
<b>3</b>	Basker, Sally	<b>UK</b>
<b>4</b>	Braute, Tom	<b>Norway</b>
<b>5</b>	Bruborg, Torgeir	<b>Norway</b>
<b>6</b>	Choglokov, Alexander	<b>Russia</b>
<b>7</b>	Day, Colin	<b>Ireland</b>
<b>8</b>	Doherty, James	<b>USA</b>
<b>9</b>	Eriksson, Omar	<b>Denmark</b>
<b>10</b>	Feshin, Gennady	<b>Russia</b>
<b>11</b>	Giske, Lars	<b>Norway</b>
<b>12</b>	Grepstad, Willy	<b>Norway</b>
<b>13</b>	GUG, Seung-Gi	<b>Korea</b>
<b>14</b>	Hauge, Jarle	<b>Norway</b>
<b>15</b>	Hubert, Francis	<b>France</b>
<b>16</b>	Ivanchuk, Nikolay	<b>Russia</b>
<b>17</b>	Kruuse, Torsten	<b>IALA</b>
<b>18</b>	Leclair, Jean Charles	<b>IALA</b>
<b>19</b>	Lord, Stephen A.	<b>Canada</b>
<b>20</b>	Manchard, Jacques	<b>France</b>
<b>21</b>	Oltmann, Jan-Hendrik	<b>Germany</b>
<b>22</b>	Selvig, Kirsten Ullbæk (Chair)	<b>Norway</b>
<b>23</b>	Thomsen, Thomas	<b>USCG</b>
<b>24</b>	Tsarev, Victor	<b>Russia</b>
<b>25</b>	Tsikalova, Elena	<b>Russia</b>
<b>26</b>	Ward, Nick	<b>UK</b>
<b>27</b>	Aarmo, Roger	<b>Norway</b>