# DRAFT REPORT
# XVIth IALA Conference – Aids to Navigation in a Digital World

## Executive Summary

The IALA XVIth Conference – Aids to Navigation in a Digital World – was held from May 22-27, 2006 at the International Convention Centre, Shanghai, People's Republic of China, co-hosted by China MSA. The conference was attended by over 270 delegates, plus many staff from the host country. The delegates represented more than 42 countries, of which 38 were IALA members.

The conference provided an opportunity for presentations and discussions on issues with a focus on the concept of Digital Aids to Navigation and future developments. An excellent exhibition was included, with over 30 industrial members providing an opportunity to view the latest developments in aids to navigation technology.

The Conference identified 14 conclusions and 12 recommendations.

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# Aids to Navigation in a Digital World
# XVI$^{th}$ IALA Conference

## 1. Introduction

The XVIth IALA Conference was held from May 22-27, 2006 at the International Convention Centre, Shanghai, People's Republic of China. The theme for the conference was *Aids to Navigation in a Digital World*, and the technical presentations focused on these aspects. Over 270 delegates, representing 42 countries attended the conference. A list of participants is included in Annex 1.

As an introduction to the rich cultural tradition, delegates were welcomed to the conference with a display of Chinese dance. Following the dance display, the conference opening session began.

# 2. Opening Session

## *2.1 Welcome – Capt. Liu Gongchen, China MSA*

Capt. Liu Gongchen welcomed delegates to Shanghai, stating that it was a beautiful city, particularly in spring. He also welcomed the VIPs and said that there was representation from 42 countries at the Conference. He then invited Mr. Xu Zhuyuan, Vice Minister, Ministry of Communications, People's Republic of China, to address the Conference.

## *2.2 Mr Xu Zuyuan, Vice Minister, Ministry of Comunications of P.R.C.*

Mr. Xu Zhuyuan congratulated IALA and China MSA on behalf of his ministry. He then welcomed delegates and VIPs from all over world, stating that IALA had been contributing to compile policy and to promote safety of navigation and protection of the environment.

Mr Xu Zhuyuan added that IALA also promotes international cooperation and provides technical assistance and help to countries that need it. China has a long history of over 600 years of navigation and links with aids to navigation. He noted that China has a total of 3395 aids to navigation, which is an increase of 1347 from last year. China MSA has invested in AIS and has an AIS backbone throughout the countries waterways.

He concluded by saying that the Conference was a great event and provided an opportunity for exchange information and experiences and that it would contribute to world shipping.

A copy of the address by Mr. Xu Zuyuan is attached at Annex 2.

## *2.3 Clive Davidson, IALA President*

Mr Clive Davidson welcomed the delegates to the conference, and highlighted excellent venue provided in Shanghai. He noted that Shanghai was one of the world's biggest and busiest ports.

Aids to navigation have evolved from the old and traditional, to electronic, and Mr. Davidson noted that the hosts, China MSA, were very forward thinking when they selected the Conference theme three years ago – *Aids to Navigation in a Digital World*.

Mr Clive Davidson added that IALA is an important member of a family of organizations that work together for safety, efficiency and protection of the environment in the world maritime industry.

In introducing the Keynote Speaker, IMO Secretary General, Admiral Mitropoulos, Mr Davidson noted that the IMO Secretary General had quickly stamped his vision on IMO. Mr. Davidson then welcomed the IMO Secretary General, and invited him to address the Conference.

## *2.4 IMO SECRETARY GENERAL, Admiral Efthimios Mitropoulos*

Admiral Efthimios Mitropoulos congratulated IALA and China MSA on the theme of the Conference and the venue chosen.

He stated that IMO had a lot to thank IALA for, in particular, the IALA Maritime Buoyage System and its work on DGPS, VTS and AIS. Mr Mitropoulos stated that IALA's response to the immediate aftermath of the 2004 Indian Ocean tsunami had been excellent. IMO and

IALA had a long history of close cooperation and IMO's contribution to an IALA lighthouse rehabilitation project in Sri Lanka was the latest example of this, he added.

Admiral Mitropoulos said that the 'building blocks' for e-navigation, such as ENC, ECDIS, LRIT, GPS etc., were impressive and were available now. He was pleased to note that IALA was at the forefront of the development of e-navigation. Although the concept was in its embryonic stage, it would have an impact on safety, training, commerce and the international regulatory framework. The forthcoming changes would be fundamental and substantial. He added that technical aspects of e-navigation must be developed in a coordinated and structured manner.

A copy of the address by Admiral Mitropoulos is attached at Annex 3.

# 3. IALA Overview

Chaired by Torsten Kruuse, Secretary General, IALA

## *3.1 Overview of IALA Events - Torsten Kruuse, IALA*

T. Kruuse provided an overview of the main elements of work for IALA since the XVth Conference, held in Sydney, Australia, 2002. He began his presentation by reviewing the recommendations from the conference, and identified how each had been responded to by the Association.

In providing the overview, he recognized the effort of the membership in their participation in IALA, and noted that IALA headquarters in Saint Germain-en-Laye had welcomed over 1300 people to its meetings and events. The ongoing support of the membership is what enables IALA to continue in its work to foster safe, economic and efficient movement of vessels for the benefit of the maritime community and protection of the environment.

With particular reference to the effort of the membership, Mr. Kruuse recognized the fact that many members have translated IALA Recommendations, Guidelines and Manuals into their native languages, including Chinese and Spanish.

T. Kruuse provided information on the various initiatives and technical cooperation elements that IALA had participated in, including:

- IALA Risk Model
- E-ANSI
- Global Tracking of Vessels
- IALA and e-Learning / IALA World Wide Academy (WWA)
- Technical Assistance to Members
- Cooperation with sister organizations
- Tsunami Response

In presenting the involvement of IALA in the interagency response to the Sumatra Tsunami in the Indian Ocean, Dec. 2004, T. Kruuse noted the close liaison that IALA has with IMO.

## *3.2 IALA and IMO – Jean-Charles Leclair, IALA*

During the past four years IALA has been very active in pursuing the interests of its Members by continuing to strengthen its relationship with the International Maritime Organisation. J.

C. Leclair noted that IALA was represented at 20 meetings and submitted more than 30 documents between 2002-2006.

Security dominated the IMO work during the period in the aftermath of September 11, 2001. Very important amendments to the SOLAS Convention were adopted in December 2002 regarding this new item and even the motto of the Organisation was modified in 2003 to become: *"Safe, Secure and Efficient Shipping on Clean Ocean*". Of course, IMO and, in particular, its Maritime Safety Committee had continued its work on many different other important domains, such as the safety of passenger vessels, the safety of bulk carriers or the goal-based construction standards for new ships. But, in addition to the security matter, J. C. Leclair noted that the items of most interest for the IALA Members were:

- IMO Voluntary Members States Audit Scheme,
- Places of refuge,
- IMO Unique Company and Regular Owners Identification Number,
- Revised Performance Standards for Radar Equipment,
- Ships Routeing and Reporting System .

Technical Co-operation also was a matter of fruitful co-operation between IMO and IALA.

### *3.3 The IALA Risk Model – Peter Kent, IALA*

Mr Peter Kent report on the validation process for the IALA Risk Model. He noted the recent workshop held in Copenhagen, Denmark, which was co-hosted by the Royal Danish Administration of Navigation and Hydrography (RDANH). At the workshop, risk assessment was carried out using both the PAWSA (Port and Waterway Safety Assessment) and the IWRAP (IALA Waterway Risk Assessment Program) risk assessment models of the area of the Oresund between Denmark and Sweden from a line in the north from Kullen to Gilleleje and a line in the south from Falstervo to Stevns. The assessments were carried out simultaneously and the results compared.

Mr. Kent noted that the Oresund, an international waterway, was selected for several reasons, including:

- Complexity – the Oresund is a very complex waterway, with considerable traffic passing through the area, in both directions, substantial traffic crossing between Denmark and Sweden and busy ports on both sides of the waterway.
- International Agreement – this international waterway passes through territorial waters of two countries and is the subject of an international agreement.
- Assessment – Risks in the waterway are currently under review in both Denmark and Sweden.

The process for both the PAWSA and the IWRAP Risk Assessments was described, and the results highlighted. Mr. Kent noted that participants appreciated the process, and the validation process was a success.

As the PAWSA and IWRAP models use different criteria and methods to assess the risk, it was not expected that identical results would be obtained, but that both models would identify areas of the waterway where risk was greatest and propose mitigation measures for consideration and implementation by the Authority responsible for the waterway.

Good co-relation between the results of the two models was demonstrated by the identification of the following areas of major risk (or "Hot spots"):

*PAWSA Assessment*

Helsingør/Helsingborg vicinity
Landskrona vicinity
Copenhagen harbour
Drogden Channel

Malmo harbour
Flint Channel


*IWRAP Assessment*

Helsingør/Helsingborg vicinity
Vicinity of Ven Island

Drogden Channel
Southern entrance to Drogden Channel
Flint Channel

The executive summary of the validation process is attached at Annex 4.

### 3.4 Overview of IALA Seminars and Workshops – Jillian Carson-Jackson, IALA

J. Carson-Jackson provided an overview of the Seminars and Workshops that IALA had planned / held between 2002 and 2006. She noted the excellent participation by IALA members, with over 490 persons attending IALA workshops or seminars, representing on average, 18 countries at each event.

The difference between IALA Workshops and IALA Seminars was also explained. It was noted that the workshop process is used to develop IALA documentation on specific topics, while a seminar is more of a training and presentation forum where information on a specified aspect of aids to navigation can be presented.

### 3.5 IALA Industrial Members Committee (IMC) – Wang Qiang, IMC President

Mr Wang Qiang highlighted the active participation by IMC at IALA Council. He stated that IMC was part of the IALA Strategy Group. Mr Qiang added that during the past four years, all members had cooperated and worked well together . Under the leadership of IALA, they worked on the product certification process and offered practical suggestions to improve members' products.

A web site was used as a forum for members to exchange information. Such exchange resulted in more timely and accurate information.

With regards the finances, IMC was pleased to report that its income and expenditure were balanced.

Mr Qiang pointed out that there were approximately 80 IMC members. At the Conference, members were prepared to exhibit at 60 stalls. The IMC planned an industrial members' night on 24 May, to express their thanks to all.

Mr Qiang concluded by thanking the IALA President and IALA Secretary General for their support and cooperation, and wished the Conference every success.

### *3.6 IALA VTS Committee – Mike Sollosi, USCG (Chair, VTS Committee)*

M. Sollosi indicated that, over the past four years, the IALA Vessel Traffic Services Committee pursued an aggressive work program. The results of these efforts can be seen in the information and guidance that has been provided to IALA members, VTS authorities and operators. Applying the collective skills of VTS managers, VTS operators, pilots, practicing mariners, professional educators and engineers; the committee produced their "vision of the future" for VTS.

The Committee organized itself into three working groups: Operations, Technical, and Personnel and Training.

The working group whose focus was operational matters produced an extensive Guideline on VTS Operational Procedures. In doing so, the group found an appropriate balance between providing the target audience with sufficient detail in order to be useful without being overly prescriptive. They also finalized work on categorizing VTS based on the services available to the user.

The working group formed of technical experts within the committee, particularly industrial members, produced guidelines on technical performance standards for VTS radar, communications and met/hydro equipment and began the work of defining standards for data exchange among VTS. These documents are intended to support VTS authorities, system integration specialists and equipment manufacturers. They will help a VTS authority determine what equipment is most appropriate their local traffic and environmental conditions.

Sound operational procedures and reliable equipment notwithstanding, the most important component of a VTS is its operating personnel. It is imperative that a VTS be staffed with the appropriate number of highly trained personnel. The Committee's Personnel and Training working group reviewed and revised IALA's V-103 model courses and produced a recommendation on how to determine an appropriate staffing level for a VTS. A useful and usable mathematical model on staffing is now available. This model leaves details of the staffing decision to the VTS Authority but provides a comprehensive list of the factors that could influence that decision.

M. Sollosi thanked the Committee members for their contributions and the Secretariat for their gracious and expert support.

### *3.7 IALA AIS / RNAV Committee – Nick Ward, THLS (Chair, AIS/RNAV Committee)*

N. Ward provided a report that highlighted the aims and achievements of both the AIS and RNAV Committees for the period 2002-2006. The overview also provided a hand-off to the future e-Nav Committee and noted that there would be continuity of effort as the new Committee was formed.

#### 3.7.1 AIS

During this period AIShas moved from development to operational phase. The Committee completed Technical & Operational Guidelines and Recommendations on AIS Shore Stations and AtoNs. Amid some controversy, the Class B version for non-SOLAS craft has been introduced. The Technical Working Group has made substantial progress with the major task of revising the ITU-R Recommendation, which provides the technical basis for the system. A

scheme for FATDMA slot allocations has been formulated as a new annex to the shore station Recommendation. Several inputs have been made to IMO.

With regards to Binary Messages, the use of AIS for Safety Related Messages has also been explored with IHO. Close co-operation with IEC has resulted in the establishment of very effective working groups which have prepared the test specifications for shore stations and aids to navigationContributions have been made to the discussions in IMO on Long Range Identification and Tracking and advice has been provide to the IALA WG on the proposed system for reporting the status of AtoNs, e-ANSI. Introductory information on AIS has been provided for the website and the Navguide has been updated.There has undoubtedly been resistance to the acceptance of AIS, mainly because of the lack of training and information resulting from its accelerated introduction. There have also been problems with the standard of onboard installations and with data integrity and the presentation of information. These are being overcome with installation guidelines, the integration of displays, data fusion and target matching. The potential of AIS as an Aid to Navigation has still to be developed. Apart from the obvious use for monitoring the position of floating AtoNs, AIS can be used on Fixed Aids to Navigation, on Offshore structures including wind farms, as Virtual AtoNs for warning of new wrecks, as Radar Reference Targets and possibly as a replacement for radar AtoNs. AIS data can also provide traffic data for a risk analysis approach to AtoN planning. So there is plenty of work still to do on AIS. **RNAV**

The main trend over the last four years in radio-navigation has been the increasing dependence on GPS, following the removal of SA. This has raised the level of concern about GNSS vulnerability, the need to consider alternatives and the importance of the DGNSS integrity function. The Recommendation on the Performance and Operation of DGNSS has been substantially revised and a recommendation produced on GNSS Vulnerability. The Racon Recommendation has been updated and advice given to Council on the future strategy for racons. Attention has been given to the future of racons, because of developments in radar technology. The IMO Maritime Safety Committee has approved new radar performance standards which remove the requirement for S-Band Radars to trigger racons from 2008. Radar technology is changing to improve clutter performance, taking advantage of improvements in processing technology and performance/price ratio of components. Future radars are likely to have modulated, longer pulses with lower peak-power (~10W – 1 kW). Althoughnon-magnetron S-Band radars may be introduced after July 2008, compatibility requirements have not been relaxed for X-band radars. Options for future radar AtoNs include independent range/bearing transponders, use of a narrow bandwidth at a pre-assigned frequency, different TX/RX bands and replacement of racons with AIS. New Technology racon requirements are to be prepared for the CIRM working group, and IMO are to be advised on the need for a mandatory carriage date for NT radars and the requirement for retraining on NT radars. If AIS is to be used as a replacement, the position information will need to be integrated with radar and ECDIS and more than one positioning source will be required.The future of DGNSS has also been considered in some depth, given the maturity of many existing systems. It has been concluded that the present service is still required and that consideration should be given to methods of renewing it, possibly with enhanced performance. The IALA beacon system is the international, maritime standard for DGNSS. It has been operational for several years in some countries and alternatives are becoming available, for example SBAS, AIS, RTK, e-Loran, pseudolites. A cost/benefit comparison indicates that the IALA system is still the preferred option, but a case can be made for providing an enhanced service (< 1 m accuracy, GPS L2C, L5, and Galileo) to meet the requirements of additional applications, for example hydrography, port/AtoN operations, berthing. A number of questions need to be resolved – in particular whether to provide

separate corrections for ionospheric and tropospheric effects, or use models. The likely time for implementing this renewal would be 2008. A study on the future of maritime radio-communications has been started and developments in non-radio-navigation position sensors have been monitored.

All of these matters will be of importance for IALA members in the forthcoming period. **e-Navigation Committee 2006-2010**

*"e-Navigation is the collection, integration and display of maritime information onboard and ashore by electronic means to enhance berth-to-berth navigation and related services, safety and security at sea and protection of the marine environment"*

*--IALA e-navigation definition*

The principal onboard components of e-Navigation areGNSS/DGNSS, AIS, ECDIS and

- Radar.

N. Ward noted that there are several challenges to be overcome in implementing e-Navigation:

- avoiding common-mode failures (for example of GNSS, using eLoran, inertial systems, integrity checks;integrating AtoN information, using standard data exchange formats;
- improving situational awareness, using coherent, possibly enhanced presentation;
- preventing information overload, by alarm management, prioritising information.

IALA and the maritime world have been well served by the hard work and expertise of the RNAV and AIS Committees over the past four years.

AIS and RNAV are key components of e-Navigation and this input must be maintained to ensure that IALA takes a leading role in its development.

### *3.8 IALA EEP Committee – Omar Eriksson, RDNAH (Chair, EEP Committee)*

O. Eriksson noted that the Engineering, Environment and Preservation (EEP) committee met regularly twice a year throughout the period, with a total of 7 meetings, all but one of which where held at IALA Headquarters in Paris. An average of 32 participants attended these meetings, representing between 15 and 20 countries.

He explained that the committee Scope encompasses the provision of recommendations and guidelines on all engineering and environmental aspects of Aids to Navigation Service delivery, to IALA members and includes lights, power systems, training, remote control and monitoring, fixed and floating aids, as well as providing guidance on preservation, conservation and possible alternative use of traditional Aids to Navigation and related objects of historical interest.

The work program undertaken by the committee during this work term was quite ambitious, but O. Eriksson indicated that he was proud to report that the objectives of the work program had been achieved. This included the review of a number of existing IALA recommendations and guidelines and the development of quite a few new guidelines.

O. Eriksson made particular reference to the revision of the Recommendation **on Surface colours used as signals on Aids to Navigation from 1980**, reflecting the most current CIE definitions of colour chromaticity regions for surface colours used for daytime signals. In addition, the revision of **Recommendation E-110 on the Rhythmic Characters of Lights on Aids to Navigation** was noted.

The Committee also created a number of new Guidelines, all with a practical approach to providing aids to navigation.

He also noted that, under the able Chairmanship of Larry Wilson from the Canadian Coastguard, Work Group 5 carried on the good work done by the Panel on Historic Lighthouses (PHL) in the preparation of Further Chapters of The IALA Preservation/Conservation Manual, published for the first time as a manual at the IALA Conference in Sydney in 2002, with a revised document published for distribution at this conference in Shanghai. The revision covers matters such as producing a national conservation plan, public access, alternative use, recording change, consequences of change and funding the conservation of historic lighthouses, and contains a number of check-lists and templates to provide a practical approach.

O. Eriksson indicated that, associated with the EEP Committee, and based on a recommendation from IALABATT / IALALIGHTS in 2004, a small group of experts was gathered to form a group called The Specialist Working Group on Colours of light signals, calculations of the effective intensity of flashed lights and the determination of luminous intensity. This group continues to look at the entire suite of IALA documents related to lights and colours, and is revising them to provide the best possible resource for the IALA membership on this issue.

He concluded by noting that the 2006-2010 work programme is quite ambitious, it can only be accomplished through continued dedication and hard work from Committee members. He thanked all the members, and indicated that he looked forward to seeing them in Saint Germain en Laye in October, 2006.

### *3.9 IALA ANM Committee – Duncan Glass, THLS (Chair, ANM Committee)*

D. Glass provided an overview of the work of the ANM Committee. He indicated each main task, and the response of the committee. In his presentation, he highlighted the key areas of work, and the expertise required to respond to the work item.

Just like the EEP, the ANM Committee was newly formed after the 2002 Sydney Conference. The Committee had specific terms of reference which guided their work:

- The Committee is to take a high level view of the management of marine aids to navigation
- Providing the 'mariner' input to all aspects of safety on navigation enhanced by aids
- Working closely with the other IALA Committees to ensure continuity of approach
- Responding to the Council, Members and Secretariat in producing Guidelines and Recommendations to meet the requirement

The Committee responded to these terms of reference, and completed their ambitious work program.

Some specific items were identified, including:

- Development of a Guideline to assist in identifying the need for aids to navigation for different classes of vessels, including high-speed craft;
- Assisting in the development of a recommendation on the use of AIS for Aids to Navigation, extended to include the use of AIS Information by AtoN Authorities;
- Development of Guidelines on the provision of AtoN in built-up areas, with particular reference to conspicuity of AtoN lights in the presence of back-ground lights; and
- Development of Emergency Marking of Wrecks.

D. Glass noted that the work on the Emergency Marking of Wrecks, along with the work on the provision of AtoN in built up areas, led to discussion on the use of blue lights in AtoN. A recommendation providing the introduction, for trial purposes, of an Emergency Wreck Marking Buoy – using a blue and amber flashing light – was approved in December 2005.

Other aspects of the work of the ANM Committee included developing recommendations and guidelines to respond to offshore developments (including wind farms and offshore energy extraction devices) and working with the other IALA Committees on the development and revision of a number of documents.

The coordination of the review of the IALA Navguide was a major element of the past 4 year work programme, and D. Glass noted that the excellent cooperation of all the Committees has resulted in a high quality document that will be useful for all members. In addition to the hard copy version, he noted that there was a CD included with a pdf of the document and, for the English version, a read-only MSWord version that had hyperlinks to IALA documentation as it is referred to in the Navguide.

In closing, D. Glass thanked all the members of the ANM Committee, and indicated he looked forward to working with them in the 2006-2010 work term.

# 4. Technical Sessions

Ten (10) technical sessions were held. The rapporteurs for the technical sessions were Mike Hadley and Mahesh Alimchandani.

## *4.1 Technical Session 1 – Training of Aids to Navigation and VTS personnel*

Chair: Terry Hughes (UK)

### 4.1.1 A discussion on recruitment and training system of VTS personnel in China, Shen Hongpei and Genlin He, Shanghai Maritime Safety Administration, China

Presented by H. Genlin

H. Genlin noted the IMO and IALA guidance on the subject and outlined the evolution of VTS in China from the 1980's onwards. China MSA was the overall responsible entity, he added. He outlined the training regime for new recruits, stating that VTS personnel were recruited from the maritime university (e.g. those with a major in navigation). An overview of Shanghai VTS and its history was then provided, with statistics that highlighted the fact that, over time, more and more university qualified people were being recruited.

H. Genlin outlined the training needs for personnel. Key elements were an ability to communicate clearly, knowledge of the English language and the COLREGS, the capability to foresee situations developing and to respond to emergencies. He noted that VTS must establish a recruitment system, a training system and a system for certification of VTS personnel.

With an eye to the future, H. Genlin indicated that VTS personnel had to be 'knowledge rich' and 'provide higher service to traffic'.

In response to a query on the failure rate of operators, he said that every year, two weeks of training was provided to VTSOs, either at the VTS or at a university. The Chairman added that in theory, if students were properly assessed, there should be no failures.

### 4.1.2 Action instructions for VTS personnel - Arno Christiansen and Hans-Heinrich Callsen-Bracker, Federal Ministry of Transport, Germany

A. Christiansen outlined the work done so far and pointed out that there was no common position on how dangerous situations ought to be handled by VTS personnel.

He gave the example of a collision in River Elbe in March 2004 (an overtaking vessel brushed past the other on its port side). German investigation authorities focused on the hydrodynamic interaction between vessels and added that speed and communications between vessels were contributing factors. The VTS role was also important in this regard, he added. A recommendation was that the role of VTS was important and that its activities should be defined clearly.

The definitions of 'congestion', 'dangerous situation' were questioned, and A. Christiansen wondered how they were to be identified. He said that IALA Recommendation V 127 was designed to provide guidance in developing operational procedures, but was silent on this aspect. He added that V-127 ought to address the assessment of developing dangerous situations.

A. Christiansen stated that it was the VTS responsibility to prevent collisions and dangerous situations ought to be detected in good time. He then outlined how the aviation industry

handled such situations using horizontal and vertical separations. He stated that VTS must forward plan and avoid congestion. This task can only be done by a common understanding of what is congestion. Agencies representing VTS should have a common understanding of what is required.

In presenting the concept of standard passing distances, he noted that the criteria could include certain vessel parameters (size, type, draft, channel parameters etc). In specific instances, action instructions should be given to ships. He added that a working group, possibly involving academia, must be set up to develop objective criteria.

In response to a question on changing the system, A. Christiansen stated that, while it was not possible to copy the aviation model, a common understanding must be reached. The Chairman added that VTS Operators were not skilful shiphandlers like pilots and that VTSO's could become more familiar by making trips with pilots. He added that the use of message markers should be encouraged.

### 4.1.3 Appropriateness of the qualification gained by a VTS instructor - Wim H. M. van't Padje, MSR, Netherlands and Tony Chan, Hong Kong Marine Department

W. van't Padje discussed the term 'appropriately trained' and 'qualified'. He listed the relevant sections of the STCW code and the IMO model course for seafarers which touched on minimum requirements. He said that appropriately was also used in V-103. The word "suitable" was also used liberally in training guidance.

He noted that training altered behaviour to what was expected to do the job properly. Training meant changing behaviour. But training was of no use if the attitude of a candidate was not right. He explained how behaviour was linked to personality and he then elaborated on the role of instructor.

W. van't Padje explained how training was perceived in theory and practice, noting how the trainer could use simulators effectively by altering the exercise to suit the candidate, thereby delivering more focused training. The ASK methodology – attitude, skills and knowledge - were critical elements in a training program.

With reference to different cultural backgrounds, W. van't Padje indicated that different background often required different methods of imparting knowledge. Being aware of cultural differences would ensure that VTS training provided was uniform and he concluded by underlining the fact that it was vital to ensure that VTSOs were effectively and appropriately trained. Refresher training and continuous improvement were necessary to ensure skills are maintained and improved throughout a VTSO's career.

## *4.2 Technical Session 2 – The integration of aids to navigation and VTS systems with other maritime operational and safety services, including AIS*

Chair: Mike Sollosi (United States Coast Guard)

### 4.2.1 Application of shore-based AIS network in ZhujiangKou water area - Jie Fang and Liang Yang, Guangdong Maritime Safety Administration, China

Presented by Yang Liang

Y. Liang first outlined his system's configuration, which has four (4) base stations and a control station. He reported seeing over three hundred AIS targets daily and that the actual coverage achieved had been stringently tested and evaluated.

AIS services are provided by TCP/IP protocol with radar data and AIS being fused. AIS data is shared, supporting a routeing and reporting system and accident investigation.

AIS application to AtoN had been trialled on a lightship and a buoy with real-time position monitoring every three minutes, together with characteristics and performance monitoring. Y. Liang then showed an example of a status display.

System assessment had taken place from the viewpoints of multiple coverage and support to VTS. From this exercise, multiple coverage, with overlapping base stations had been found necessary.

Problems encountered, include:

- Message capacity inadequate
- Language limitation
- Poor situation awareness of the seafarer

Experience so far has indicated that it is necessary to take into account when planning:

- AIS coverage greater than voice
- Derivation of factors affecting antennae siting
- The IMO coverage formula is adequate for calculation in only good conditions.

Y. Liang concluded by saying that continuous dialogue is necessary between adjoining authorities.

### 4.2.2 The Italian National VTS as an example of network-centric integration of maritime operational, safety and security services - Piero Pellizzari, Italian Coast Guard

P. Pellizzari said that current developments call for an integrated approach to data gathering and dissemination. He then outlined the role of the Italian Coastguard.

P. Pellizzari indicated that VTS is developing beyond control of vessel traffic in ports and their approaches and must now also take security into account. With this in mind, Italy is now looking at a regional as opposed to port approach and towards a national system.

He then stressed the need for vertical integration and gave an overview of Italy's network centric architecture, which covers the Italian coast. He also stressed the need for a multi-sensor approach to detection.

P. Pellizzari also indicated that the latest technology allows complete digitisation. Redundancy is provided, allowing system operation from any physical node and continuing functionality after removal of the central control node. He then comprehensively covered data integration and its applications.

In the presentation, it was indicated that the Italian system has been designed for interoperability with SafeSeaNet and to play its part as a regional system in the Mediterranean, including with the EU and North African countries.

### 4.2.3 The implementation of a coastal-wide AIS service -Jan-Hendrik Oltmann and Stefan Bober, Federal Waterways and Shipping Administration, Germany

Presented by Stefan Bober

S. Bober covered the German Waterways AIS service user and technical requirements, saying that the system is required to provide the essential description of an object.

He covered a methodical, object oriented approach to determining what the user wants from an AIS service and then went on to discuss its translation into a Maritime Traffic Technology Service and where AIS fits into it. It was indicated that use cases, at three levels, were extensively involved in assessing the AIS service. S. Bober then went on to cover the interaction of the AIS service with other services.

The presentation continued with a review of the components of the AIS service and its design requirements and concluded with a short statement on the methodology used.

### 4.2.4 AIS as a management tool in a waterway - Raul S Escalante, Hidrovia SA, Argentina

R. Escalante began with a geographical overview of the waterways being discussed and an overview of Hidrovia SA and its AtoN, including AIS AtoN on spar buoys and conical frame buoys. He also stated Hidrovía's other sensor responsibilities, including tidal sensors and the use of AIS connected to weather sensors.

The presentation included an overview of the planned AIS coverage for the waterway from Montevideo to Sante Fe. It was indicated that trials had involved three different transponders and their specifications were given. A sample display was shown and the website on which the data can be viewed given. R. Escalante then mentioned the additional coverage available from AISLive and that neither AIS service receives Message 21 (AtoN).

The AIS system is used to detect passing ships, by means of a trigger area, by which means charges are levied by the Argentinean government, via the Coast Guard. This process took advantage of a free service provided by AISLive.

It was stated that the system is also used to identify ships colliding with buoys, with a view to recovering cost of damage and that this improves on the existing verbal reporting by pilots / ships.

R. Escalante then said that the system is also used to assess actual channel width requirements, by monitoring which part of a given channel is actually used.

It was then mentioned that Hidrovia faces a penalty if their AtoN fail and that AIS is now used to monitor AtoN and is also being used to reduce the cost of inspecting AtoN.

It was pointed out that coastal stations should be able to display message 21 and that Hidrovia are negotiating this with the Argentinean Coastguard.

Discussion – Technical Session 2 – Papers 1 through 4

In response to a question on how many vessels in the area can receive AIS concerning AtoN (Message 21), R. Escalante noted that most ships in the area of Argentina fitted with AIS, usually some 300 at any given time. Small vessel tend not to be fitted, and do not use the main channel. W. van der Heijden noted that the question as to how many vessels can display message 21 will be further discussed in Session 9 – Discussion forum on AIS.

A further question concerned the benefits of FATDMA and RATDMA, and the possibility that AtoN be able to reserve their own slots, S. Bober noted that in Germany a base station is set to organise AtoN where there is a need for the most coverage. He believed that the answer to the question may depend on the traffic density and actual coverage range, hence the likelihood of AIS message collision. He concluded by indicating that there could be some danger in allowing AtoN to reserve their own slots.

In response to a question related to the reporting by pilots of groundings and collisions, R. Escalante said that pilots do report groundings, which are readily identifiable from the AIS display, but that they tend not to report the hitting of a buoy. This is believed to be due to the bureaucracy involved in declaring such a collision. An attempt is being made to overcome this by making it clear that the pilot will not be prosecuted when the report is made. However, he noted that it is difficult to change behaviour. In R. Escalante's view, port economic pressures, not pilotage competition has had the greatest effect.

In response to a question on the possible need for an additional AIS frequency, all speakers indicated that the existing two AIS frequencies are currently adequate.

### 4.2.5 An Integrated System of Long Range Identification and Tracking (LRIT) for Safety, Efficiency and Environmental Protection – William R. Cairns, Office of Navigation Systems, Waterways Management Directorate, U.S. Coast Guard

Presented by Ed LaRue

E. LaRue provided the presentation on behalf of W. Cairns, and elaborated on the IMO definition of LRIT. The presentation also provided an outline the evolution of LRIT. He then expanded on the intersessional work on LRIT that took place under the auspices of IMO. He added that MSC 81 (May 2006) approved the LRIT performance standard and SOLAS amendments. The Committee also agreed on a 1000 NM limit, within which Coastal States could get LRIT information. He also mentioned the limits that other countries had sought in this regard.

With specific reference to the United States E. LaRue indicated that they had considered their own options if LRIT was not approved at IMO. Voluntary LRIT was to be implemented, by asking shipowners to provide positional information every 24 hours. The US has also considered bi-lateral agreements and obtaining information from commercial systems. Yet another option was to obtain AIS data using NOAA buoys as a receiver platform.

With respect to satellite-based AIS, E. LaRue advised that the Orbcomm project is underway. However, there are concerns that due to its large footprint, an overload of AIS data may result.

### 4.2.6 Sharing AIS Data Between Countries, Pia Ankerstjerne and Per Christian Engberg, GateHouse A/S, Denmark

P. Ankerstjerne displayed a large amount of traffic data in the Baltic and pointed out that it was hard for authorities to pin-point a vessel of interest. This was due to the vast amount of AIS data flowing in. Different stakeholders had different needs for data. The challenge was to make the right data available to the right entity at the right time.

The sharing of data across countries could be hampered due to political issues. AIS data validation could be done by shipping databases. Software solutions permitted easy filtering to show, for example, speeding vessels or those straying from traffic lanes. She indicated that it was also easy to identify tankers, for example, and there could be value added if this data was compared with HAZMAT.

P. Ankerstjerne noted that AIS could also help with accident investigation, as past vessel tracks could be clearly replayed. To demonstrate this, she replayed the AIS tracks of a collision that took place in the Danish Straits recently and explained how the AIS information helped in the analysis and investigation of the incident.

### 4.2.7 How to make the most of your Coastal VTS, Mike Hadley, UK, Cees Glansdorp, CETLE, The Netherlands

M. Hadley provided an overview of the MarNIS project, pointing out that the sponsor (the European Union) was keen to use the results for the formulation of new initiatives.

The use of AIS data was a key. LRIT and new radar technology were also important. Another important factor was the formation of the European Maritime Safety Agency, which has become a key player in the execution of maritime policy.

In touching on the concept of e-navigation, M. Hadley said that the term was being interpreted differently by different people. Moreover, he felt that the current understanding of the term e-navigation seemed to go beyond the meaning of navigation.

M. Hadley explained that the MOSS concept involved adopting a proactive (rather than reactive) approach to safety. It built upon the existing capabilities of MRCCs and covered Vessel Traffic Management, protection of the environment and the remedial measures necessary when an incident occurred. MOSS could possibly include e-navigation in the future.

He outlined the pros and cons of different sensors and said that the move to a MOSS concept also involved the requirement to identify high risk vessels and dynamic MEHRAs. He also elaborated on the organisation of a MOSS Centre and its possible future role.

M. Hadley outlined the legal implications for the operation of vessel traffic management outside territorial waters.

There was on going discussion on the use of AIS data for LRIT and it was felt that although this was sound in-principle, there was more work to do in this area.

In response to a query on the legal aspects of VTM beyond territorial waters, M. Hadley noted that maritime lawyers were being consulted at every stage.

### 4.2.8 SPATIONAV: Surveillance des approches maritimes et des zones sous juridiction nationale, Xavier Bertrand, CETMEF, Brest, France

X. Bertrand noted that recent events had led the French Navy to monitor traffic around its coastline for terrorism, pollution and illegal trafficking of drugs. These were the origins of SPATIONAV version 0. This subsequently evolved to version 1. Plans were already underway for version 2.

He said that the concept was to share a common surface picture and thereby improve the function of agencies and coordination between them.

X. Bertrand explained that, for version 1, the area was expanded to include the English Channel (including the traffic separation schemes), the Atlantic Coast and the French West Indies. AIS was used, there was improved interoperability and the number of users was increased. Agencies could access near real time data. Approved external agencies could also get data via the Web. Different criteria were used to evaluate the sharing of data, using the 'need to know' principle. Maritime Affairs would be in charge of some 40 AIS stations that provide coverage of the French coastline, he added. This would be deployed progressively, with completion expected in 2007. The network would become the defacto French homeland security system.

In conclusion, X. Bertrand stated that version 2, which was already in the planning stages, would have increased detection ranges. The use of new sensors such as HF radars, UAV, satellite or weather buoys equipped with AIS was being considered.

## *4.3 Technical Session 3 – Risk Management – Chaired by Gary Prosser, AMSA / Vice-Chair Ian Gillis, CCG*

### 4.3.1 Risk assessment of the Torres Strait using the PAWSA and IWRAP models, Mahesh Alimchandani, AMSA

Presented by David Jeffkins and Brian Ries, AMSA

The presentation reported a workshop in 2004 covering risk management in the Torres Strait. It gave details of the workshop, focussed on the use of PAWSA and IWRAP and called on the experience of a wide range of stakeholders. It was noted that the IWRAP team sat in on the PAWSA discussions and that this was felt to have been useful in aiding the development of the PAWSA model.

A scene setting video was shown, stressing the ecological sensitivity of the Torres Straits, the marginal conditions experienced and tight underkeel clearances being used. This leads to a need for careful passage planning.

An overview of PAWSA and IWRAP was given, leading to an evaluation of the application of PAWSA and IWRAP to the Torres Strait. It was observed that the outcomes were consistent with each other.

The workshop conclusions were then presented, showing that there was considerable benefit to be achieved by using the results of applying the outcome of the two models, including enlarging the declared environmentally sensitive area and the further introduction of compulsory pilotage.

In conclusion it was noted that the outcome of using PAWSA and IWRAP has been found to be compatible and their use in the Torres Strait, based on an IALA workshop, proved beneficial.

### 4.3.2 Risk Management and Emergency Procedures in the Turkish Straits, Capt. Tuncay CEHRELI, Manager of Istanbul VTSC, Turkey

T. Cehreli noted that the purpose of the paper was not to inform about how the risk management should be done in a narrow waterway but how it is applied in The Turkish Straits. He noted that risk can be managed in many different ways and defined as the combination of the probability of an event and its consequences (ISO/IEC Guide 73). In all operations, there is a potential for events and consequences that constitute opportunities for benefits or threats to success.

Before discussing the Turkish Straits, T. Cehreli outlined the process of risk management in general.

Turning to particulars, he outlined the participants in the process and the inputs, leading on to the process itself.

T. Cehreli then went on to give a brief description of the geographical and environmental conditions and statistics about the usage of the Straits, including a significant instance of equipment failure. He then summarised the composition of the VTS, which entered into service in 2004 and provided s presentation of responses to specific incidents.

### 4.3.3 The Use of Risk Concept for the Monitoring of High Risk Vessels and an Automated Detection of High Risk Crossings, Thomas Degré – INRETS, France

T. Degre noted that the European Parliament and the Council have decided, in Directive 2002/59/CE issued on 27 June 2002 "relating to the establishment of a community vessel traffic monitoring and information system" to monitor "hazardous" ships. The research and development on this subject, which falls within a framework on which public opinion is very sensitive – the preservation of the environment – has started in the framework of the European projects EMBARC of the 5th FP and is going on within project MARNIS (6th FP). In this paper we will define the concepts of high risk vessels and high risk crossings and show how the latter can be characterized and assessed by mean of a risk index.

T. Degré stressed that the two pillars of EC action were Port State Control and the VTM Directive. He then went on to outline the use of HRV and their different meanings in PSC and VTM. Having, mentioned the previous presentation on MarNIS as an instance of HRV in VTM, he went on to discuss the use of HRV in PSC, including the fact that this usage does not involve the element of probability. He provided an overview of his work on how the PSC methodology could be revised, before going on to present some preliminary results of applying his proposed revision.

He concluded by saying that the process is an improvement but that further work and use of wider statistical ship sampling is necessary.

### 4.3.4 Application of Risk Management in the Emergency Marking of Wrecks, Bao Jianbo and Jiang Jianyu, Shanghai MSA, People's Republic of China

B. Jianbo began with a brief introduction of the application of risk management in China MSA, with particular reference to AtoN, where a focus has been on wreck marking. This was followed by an explanation of the application of risk management in emergency marking.

He then showed a video of the high density of traffic in Shanghai harbour and then displayed shots of high coastal traffic density, both of which almost inevitably lead to collisions and occasionally wrecks.

He outlined the risk management process used in wreck marking, stressing that obtaining accurate position data is a significant problem. This calls for judgement by experienced technical personnel. B. Jianbo then outlined some risk control options before presenting how decisions are made, and actions taken. He showed how a magnetised contact can be used to attach a marker buoy to an unstable wreck and use of small buoys, capable of being laid from a small boat above a wreck with unknown depth clearance.

B. Jianbo concluded with some suggestions for improvement in wreck marking.

Discussion – Technical Session 3 – Part 1 (papers 1-4)

It was noted that China obviously has high shipping density and obvious difficulties with wrecks. In response to a question regarding the possible use of the new Emergency Wreck Marking Buoy (yellow and blue), B. Jianbo indicated that the work in China had been conducted in conjunction with IALA and that the new buoy needed more time to be assessed. The stressed that the EWMB, and the 'marker buoy' were serving two different purposes.

With regards to the use of the IALA Risk Assessment tool, J-C Leclair said that there is an IALA proposal to send a questionnaire to the NAV Sub-committee on the subject. Regarding risk management, he asked it Turkey and Australia intend to make proposals to amend international treaties in order to improve safety in International Straits. The Chairman of the session responded that Australia had worked with the IMO process to use the MSC recommendation to introduce compulsory pilotage into domestic law.

T. Ceherli noted that with respect to risk management Turkey was still learning and would not be making any recommendation for the moment. With regard to pilotage he indicated that the Montreux convention did not allow unilateral action and so Turkey was looking for assistance from other countries and organisations such as IALA and IMPA.

The Secretary-General then said that with tools such as PAWSA and IWRAP available it was no longer possible to hide behind existing conventions. He stressed that the IALA risk management tool can assist responsible authorities to assess the level of risk in their areas. Archaic international conventions should not constrain the maritime world, if risk and its consequences are to be discussed and acted upon. He went on to indicate that, as the model is provided *gratis*, the results of any assessment should be made available to IALA, to ensure the maintenance and overall integrity of the risk management tool.

### 4.3.5 A Strategic Planning and Design Approach for a Coastal-Wide Network of Aids-to-Navigation, Hendrik Eusterbarkey, Civil Engineer, Traffic Technology and Telematics Division

H. Eusterbarkey started by posing the question 'Which type and how many Aids-to-Navigation do we need?' He then went on to outline the project set up to answer this question, including the methodology used, which was based on use of IALA Guideline 1033. He stressed the importance of the project's final step – Quality Management.

H. Eusterbarkey then ran through the criteria and parameters needed to define navigational requirements, giving some examples of the values attached to them. He then said that, so far, only one scenario had been examined and gave an overview of it and the provisional results.

### 4.3.6 A Risk Management Approach to Defining Remote Monitoring and Control Policy, Seamus Doyle, Commissioners of Irish Lights (CIL), Ireland

S. Doyle began by demonstrating that risk is all around us and that the message emerging from this is not to avoid risk but to manage it. He then went on to pick out the major corporate risks controlled by monitoring of AtoN and the potential consequences, thus bringing out the fact that risk is a combination of probability of an event happening and the consequence of the event.

S. Doyle then itemised some of the measures taken, indicating that automation has superseded manpower, leading to the establishment of a Remote Control Monitoring System (RCMS). Having then introduced RCMS he itemised the 'drivers', he noted the IALA risk management approached advocated by IALA through the PAWSA and IWRAPS models.

S. Doyle then defined risk terms before itemising the steps taken by CIL to reduce risk, mentioning that this can be coloured by an organisation's appetite for risk.

The process is considered simpler than the IALA models and a change to the traditional approach of defining RCMS policy and the growing assumption that, unless otherwise advised, a user will assume that an AtoN is working correctly calls for a proactive approach.

### 4.3.7 AIS in a Functional Perspective, Jens Peter Hartmann, RDNAH, Denmark

Presented by Omar Eriksson

O. Eriksson set the geographic context for the presentation and gave details of the Danish AIS network, including an overview of HELCOM.

HELCOM data is of considerable international interest, but is only distributed nationally. Difficulties, including legal concerns, are still being tackled. However the concept has already begun to spread.

O. Eriksson then introduced a FATDMA planning tool, which is standalone, before going on to itemise use cases which he used to answer the question what benefits have an AIS network brought. This was followed by details of a specific example of the use of AIS to provide a shipping density plot, which can be filtered by ship type and other characteristics.

O. Eriksson then went on to describe the use of PAWSA and IWRAP in the recent workshop held in Copenhagen and how the data from the AIS network was applied to them.

He concluded that the data now available provided a major leap forward in safety planning.

### 4.3.8 Digital Simulation of Navigational Requirements, Duncan Glass, THLS, UK

The presentation began with acknowledgements to TRANSAS and Shell Renewables.

D. Glass proposed that digital simulation should precede risk assessment and introduced the concept of 'As Low As Reasonably Possible' or ALARP. The use of simulation is enabled by digital charts and data gathering, providing detailed analysis. D. Glass provided a short video simulating the sailing of two hampered vessels in a narrow channel encountering a disabled sailing vessel, resulting one going aground and the other experiencing a close quarter situation. The video then showed how introducing AtoN and other measures can assist the risk Assessment process.

D. Glass then showed six short clips illustrating wind farm simulation in varying weather and light conditions, again with a view to preceding formal risk assessment.

In conclusion, D. Glass noted that the use of simulation was in line with SOLAS and IALA recommendations. He stressed the importance of using simulation to identify risks, and indicated that IALA should take this into consideration in future documentation.

Discussion – Technical Session 3 – Part 2 (papers 5-8)

China MSA provided a statement on the concept of RCMS, noting that they have been mentioned in the presentations and a number of AtoN are being monitored. However the reliability of the RCMS has not been mentioned and is not included in the IALA guidelines. It was suggested, therefore, that the reliability of RCMS, i.e. system plus datalink, needs to be included. S. Doyle indicated that agreed with the suggestion and added that the reliability of the RCMS needs to be at least as high as that of the AtoN's being monitored.

A question was asked with regards to the use of AIS data being used for prosecution of vessels, specifically with regards to the Gatehouse presentation of a collision off Denmark. In response, the Director-General of the RDANH indicated that there had been two cases where AIS data have been used to prosecute vessels. One of the cases involved assisting in suing a ship which had damaged an AtoN, while another assisted an insurance company to recover damages.

A general question was asked of the delegates - As 60% of the world's oil passes through the Straits of Hormuz, is anyone aware of a risk assessment being carried out for those waters? With no direct response from the audience to the specific question, the President of IALA indicated that IALA would be conducting assessment of important waterways, and the Straits of Hormuz was high on the list.

## *4.4 Technical Session 4 - Future and role of conventional AtoN*

Chaired by Omar Eriksson, RDNAH / Vice-Chair Lu Yonqiang, China

### 4.4.1 Future Trends in Shipping and its Demand on Aids to Navigation, Jeremy de Halpert et al, UK

Jeremy de Halpert, Chief Executive, Trinity House, UK
Sally Basker, Director of Research and Radionavigation, General Lighthouse Authorities, UK
Alex Parkins, Research Student, University College London, UK

Presented by Jeremy de Halpert and Sally Basker

J. de Halpert described the sinking of the car carrier *Tricolor* in the English Channel in 2002. He listed all the actions taken by the UK and French authorities to prevent other vessels from running into the wreck. Despite these actions, several vessels collided with the wreck of the *Tricolor*.

J. De Halpert highlighted the findings from the accident investigations. They were, among other things, poor standards of watch-keeping, lack of situational awareness, partial processing of navigational information and fatigue. He then showed two more examples of collisions in good weather conditions.

S. Basker said many new ships were being built. These were bigger and faster than ever before. A 2005 UN review of shipping showed that the global economy was growing and the world fleet currently had little spare capacity.

S. Basker then showed an example of a framework within which a service provider operated and outlined some of the key factors – these included cost effectiveness, new technologies and the regulatory environment.

J. de Halpert contrasted the layout of an 'older style' bridge with a 'newer' one, the latter having all navigational aids within easy reach. He added that future displays would have AIS, radar, ECDIS etc. outputs all in one location, perhaps on one integrated display.

The presenters concluded by saying that whilst size, age and type of the world's fleet varied, service providers had to cater for both older and newer vessels. A concerted effort was required by industry to retrofit ships to take advantage of new technologies. New imperatives like the growth in the leisure travel market, and off-shore activities would challenge service providers.

### 4.4.2 Do we really want Aids to Navigation? The candid truth - The wider context and prospects for AtoN, Marten Koopmans, The Netherlands

M. Koopmans started by discussing maritime safety using a 'top-down' approach. He stated that in a democracy, it was the public that decided. But they were unaware of the importance of shipping in their daily activities. However, when an accident occurred, deficiencies in ships or their crews came under the spotlight.

M, Koopmans found it odd that environmental disasters were considered worse than the loss of human lives. He suggested regulators use more 'carrots' than 'sticks'. An example was the Green Award scheme run by some countries. He also suggested that policy makers ought to capitalise on the brief increase in public interest in shipping, whenever an accident took place. Regulators could exploit such opportunities to pursue policies, as the public would be seeking results at any cost.

As regards e-navigation, M. Koopmans said technology should not be used because it was there, but because it was needed. Technology should be used to identify certain ships and high risk vessels. Then, higher standards could be applied to poorer quality vessels and vice versa.

Traditional aids to navigation had become less essential for certain user groups and more important for others. Radionavigation would eventually become the primary means of navigation, he said. Technology would have a dual impact – that is, AIS and ECDIS would improve the functioning of VTS', but increased use of AIS and ECDIS on board would reduce the need for VTS.

M. Koopmans concluded by saying that society was generally not interested in shipping. A policy of using incentives and leveraging of accidents must be adopted.

### 4.4.3 A New Marking System for the 21ST Century? Gary Prosser, Nick Lemon, Iain Kerr and Mahesh Alimchandani, AMSA

Gary Prosser, Nick Lemon, Iain Kerr and Mahesh Alimchandani
Maritime Safety and Environmental Strategy
Australian Maritime Safety Authority

Presented by Gary Prosser

G. Prosser outlined the history of the buoyage system from the early 1900s to the advent of the IALA Maritime Buoyage System. He noted that radio navigation was now the primary means of navigation. Also, external support was available in the form of VTS. There is now better situational awareness and navigational accuracy.

In the presentation, the question as to whether buoys today were an aid to navigation or an aid to pilotage was raised. G. Prosser noted that the shipping profile had changed with ships getting bigger and faster, with reduced crew numbers, fatigue and poor watch-keeping standards characteristic in the current scenario.

The function of buoys was presented, indicating that they had evolved from being an aid to navigation to being a 'cross-check' tool. It was underlined that buoys were just as important today as in the past, only they were used in a slightly different context. The challenge was to allow for the new factors that are influencing shipping.

G. Prosser stated that there was clearly a case for reducing 'multiple level interpretative thinking processes' in the conduct of navigation. Today, it would be advantageous if the mariner could be provided with a more intuitive system of buoyage to help make clear and unambiguous the track they should take.

He showed two videos of vessels in the Torres Strait misinterpreting buoys and transiting on the unsafe side. The video highlighted the fact that buoys should really only confirm what the mariner already knows by other means, and should be presented in a manner that does not allow for misinterpretation. The availability of new technologies, such as LEDs , synchronised lights, and AIS triggered lights offer options to improve the current system.

G. Prosser concluded by saying he did not want to provide or suggest a solution. He merely wanted to stimulate debate. Therefore, he suggested that the ANM Committee should seek Council approval to review the MBS. He also hoped that the world would eventually have a single, unambiguous buoyage system.

### 4.4.4 Technological Evolution of The Marine Signalling and its Impact on Aids to Navigation, Commander Antonia Amigo, Chilean Maritime Signaling Service, Chile

A. Amigo described the geography of Chile and highlighted its isolated and remote spots. He said that the Chilean navy was responsible for the safety of navigation and that there were 1042 'signals' emitted by the Chilean aids to navigation service.

The history of lighthouses in the world was outlined, starting with the earliest ones in Egypt and Europe. Similarly, the history of maritime signalling in Chile, focusing on six important lighthouses, was provided including the evolution to more efficient lighting methods.

A. Amigo noted that new technologies would cause the biggest impact, due to improved maintenance intervals and reduced staff. However, loss of expertise was an issue. Currently, there are two major projects underway in Chile – improvement in the traffic control capacity in the Straits of Magellan and an upgrade of the radars in all the ports. This would enable better management of traffic.

A. Amigo concluded by saying that aids to navigation had been adopted as per Chile's geographical needs and that Chile maintained a network with high availability which contributed to safer and cleaner seas.

### 4.4.5 Aids to Navigation as Information Systems, Nick Ward, THLS, UK

N. Ward highlighted the importance of aids to navigation, stating their purpose was to give information and this must get to users quickly and reliably. Aids to navigation would be the key to systems such as e-navigation. He noted the benefits and components of e-navigation and stated that e-navigation was really an integration of systems. The challenges were to

avoid common mode failures, improve situational awareness and prevent information overload.

He then reported on the research work carried out to develop a generic display enabling a wide range of information and messages to be relayed.

The importance of displaying integrated information was crucial. In order to do this, data was required in a standardised manner. XML was the preferred format. The project also looked at new presentation methods, including 3D and augmented reality. He explained the format for data exchange. Software developed as part of this project had ability to interact with other applications for example GNSS and service prediction tools. On-board trials, obtaining feedback from mariners and finalization of data issues were future tasks.

N. Ward concluded by saying that by making AtoN data available in a standardised format, IALA would assist in the future integration of AtoN's into the e-navigation concept.

### 4.4.6 Optimising the Deployment of Buoy Layers in the Coastal Area of the North and Baltic Seas, Frank Hartwigsen, Germany

Presented by Hendrik Eusterbarkey

H. Eusterbarkey described the German coastal area and said that there were over 2000 buoys which had to be serviced and maintained. The program was developed due to the need to replace older buoy tenders and improve cost effectiveness.

He noted that, as planned and unplanned visits were generally not in the same location at the same time, a computer program was required to optimise efficiency. Further, the call-outs were spread unevenly over the year.

The developed algorithm takes into account specific assumptions and generates optimal journeys (minimum number of journeys and unproductive time is reduced to a minimum). The process was to first enter the coordinates, depth of water and weight for each buoy. This enables the program to generate a network of possible routes.

The algorithms including those for repairing faults and failures, conducting annual maintenance, regular returns to base for restocking and daily time of deployment were listed. Fault data for 2002 was used as a basis. The model and program can be used to generate a multitude of scenarios.

H. Eusterbarkey summarised by saying that the model provided valuable information for decision making and capacity planning.

### 4.4.7 AtoN 2005 - An Australian Symposium for AtoN Organisations, Bryan Ries and Nick Lemon, AMSA

Presented by Gerry Brine

G. Brine gave details of an aids to navigation symposium that Australia conducted in March 2005 in Canberra. Relevant national interests attended.

The object was to bring together the various national service providers in order to foster cooperation, promote awareness of each others role and activities and share information on innovative approaches.

G. Brine outlined the Australian situation, with its Federal /State system of responsibilities. He discussed the roll-out of AIS in Australia, its licensing regime and the logistics of AIS data exchange.

He noted that topical issues were the voyages of passenger vessels to remote areas and the large increase in the number of recreational craft. Another issue discussed was the provision of up-to-date information to the hydrographer. He then indicated that one of the outcomes was agreement amongst stakeholders to work collaboratively on sharing of information. A web forum incorporating the use of GIS has been established for this.

G. Brine summarized by saying the symposium was a successful first step in a move to setting up a multi- jurisdictional framework. Some measures had been put in place for on going cooperation and it was hoped that this would continue to evolve.

### 4.4.8 e-Loran, Sally Baskar, THLS, UK

S. Basker provided an overview of the GLA's *eLORAN* programme. She stated that a modernised and rejuvenated LORAN system would be capable of providing signals to support navigation during harbour approaches. The need to do this stemmed from the *2020* vision document, which discussed the concerns with the over-reliance on the GPS system. The GLA was currently conducting trials and undertaking an economic assessment.

The presentation noted that, with modern receivers, they envisioned a system that was integrated with GPS, allowing the mariner to use a single receiver. She added that GNSS would be the dominant sensor in e-navigation and that despite the advent of GALILEO (which would improve interoperability), GNSS could not guarantee redundancy.

Further, many services such as synchronised lights would depend on GNSS.

From time to time, there are credible threats made to the availability of GPS signals. Intentional and unintentional interference also occurs. e-Navigation needs a very high level of availability and reliability. Therefore, a second dissimilar system is required. eLORAN was a very good option.

An eLORAN trial conducted in Harwich, UK was presented, and it was noted that an accuracy of below 10 metres was consistently achieved. This threshold was important as it was the level of accuracy required by IMO for navigation in ports.

S. Basker summarized by stating that eLORAN must make sense to governments and service providers and users. It met the IMO and IALA requirements. Further work was to be done on a cost benefit analysis and its use specifically in e-navigation.

## *4.5 Technical Session 5 - Light and Vision*

Chaired by Jin Shengli, China / Seamus Doyle, Ireland

### 4.5.1 Conspicuity for signal lights, Malcolm Nicholson, GLA, UK

M. Nicholson started by defining conspicuity. It was a parameter used to convey how well an object stood out in its surroundings. Among the many factors that affected conspicuity were adaptation (eye state), colour visibility and flash profile of the light.

He then elaborated on each factor that affected conspicuity. As regards colour, there was anecdotal evidence that LED lights appeared brighter. M. Nicholson explained Allard's law in visibility calculations. He also explained that intensity was a complicated factor and that the current Schmitt Clausen method was inadequate for complex flashes.

With relation to contrast and background lighting, he indicated that video footage would be used to capture complex scenes to permit later analysis.

M. Nicholson then described a model where the eye, the atmosphere and the target constituted three functions. Factors that affected conspicuity could then be allocated to these functions. The model was two-tiered. The top tier was based on current recommendations and the second tier used enhanced effects. When enhanced effects were proven, they will be migrated to the top tier.

### 4.5.2 Perception of Marine Aids to Navigation Lights using LED, Xavier Kergadallan, CETMEF, France

X. Kergadallan started by explaining how and why LED lights were different to incandescent lamps. He noted that visual observations shows that conspicuity is better, and that LEDs work better because their luminous efficiency is better

The details of a laboratory test done to compare the two (LEDs and incandescent lamps) was presented. Several observers and statistical methods of interpretation were used. The tests found that for red colour, there was no visual difference between lamps and LED. However, a disparity was found in relation to observer range.

Following the tests, a formula is being developed for conspicuity factor, however more work is required to finalise this formula.

In conclusion, X. Kergadallan said work must continue on eye behaviour with pulsed lights and the LED threshold of perception.

### 4.5.3 Effective Intensity of LED Based Light, Tadayoshi Imai, Japan Coast Guard

T. Imai said that Japan Coast Guard has established a Committee of experts in cooperation with JANA to study this subject. He then explained laboratory tests with LED pulse width ratio modulated lights studying duty factor ratio and frequency.

The purpose of this research was to evaluate methods for determining effective intensity of such lights and to establish the conspicuity of PWM light in flicker frequency region. It was envisaged that the future use of PWM lights would be as a measure for power saving, visibility improvements and as a countermeasure against background lights.

In reporting the results, T. Imai said that fixed lights and PWM lights were perceived equally. He added that the effective intensity of Pulse Width Modulated light could be evaluated by Talbot's law. He said that Schmidt-Clausen's formula may underestimate effective intensity of LED flashing lights.

As regards flickering lights, owing to the large amount of gains and excellent conspicuity, it could be possible to use it as a countermeasure against background lights. However, it may be uncomfortable for some people and thus must be treated with care.

### 4.5.4 Application of LEDs in Sector Lights, Frank Herman and Christophe Mauel, Germany

Presented by Rainer Strenge

R. Strenge touched on the evolution of LED lights. He summarised the complexity of optical sector lights and suggested an alternative system using coloured LED, mixing the colours optically to create white light where required.

In the LED design, three aspects were considered – optimising the optical system, selecting the most suitable LED and developing an electronic controller.

As regards the electronic controller, the configuration program and user interface were on a personal computer.

In summarising, R. Strenge said that the use of LEDs in sector lights had many advantages - for example, low maintenance, long life, low power consumption and saturated colours. However, the development of these lights is still in progress. IALA industrial members were invited use their expertise for further improvements

### *4.6 Technical Session 6 - Development and introduction of digital techniques in aids to navigation*

Chaired by Ma Jianshe, China/ Vice-Chair – Michael Rambaut, CIRM

#### 4.6.1 Integration of Aids to Marine Navigation – the Indian Scenario, D.K. Sinha, Ministry of Shipping, Road Transport and Highways, India

D K Sinha outlined the evolution of aids to navigation in India and talked about lights, sound signals and radar technology. He discussed the need for changing requirements as the shipping traffic profile had altered over the years.

The question 'what should be the optimum mix of aids and how can one get the best solution?' was asked, and it was noted that the answer lay in analyzing the standards set by authorities, new technologies and catering for future traffic patterns.

D K Sinha then showed how navigational accuracy requirements had become stringent over the years. He discussed trade data, geography and port statistics of India and touched on the administrative framework in India and the number and type of aids to navigation. Details of the how the aids to navigation network in India had been modernised over the years were presented.

A specific project was discussed in detail – provision of aids in the State of Gujarat and the Sethu Samudram Ship Channel project, the Channel that lay between India and Sri Lanka.

In conclusion, D.K. Sinha stressed that no single system enjoyed a superior position. Aids to navigation must compliment each other. Industry must accept the challenge and provide multi-receivers on board to serve mariners.

#### 4.6.2 Digital Aids to Navigation – New Era of AtoN, Zhou Yizong, Shanghai Maritime Safety Administration, PRC

The presentation focused on how digital aids would lead to the birth of a new system. Z. Yizong outlined the history of aids to navigation development in China from the 1990's and said that in the last decade, a remote monitoring system, a nation wide DGPS system and an aids to navigation and hydrographic information system were constructed. The network concept has digitized and computerized the production, management and service of AtoN.

He then went on to explain that VTS centres, GMDSS and China Ship Reporting Centre had been established in 22 ports around the country. By 2005, almost complete coverage of the coastline of China was achieved.

In summarising, Z. Yizong restated technological developments will bring in a new era of aids to navigation, with intelligent, digital AtoN. He concluded by noting that China will take on more and more responsibility in the new era and supports the concept of digital aids to navigation.

### 4.6.3 Aids to Navigation go Digital, Clive Quickenden, Tideland Signal Corporation

C. Quickenden outlined the evolution of buoys, lanterns and beacons and asked how new technology could be used to best meet the mariners needs and maintain a cost effective system.

Discussing AIS as an aid to navigation, he said they were designed to provide information. He then described a framework for e-ANSI and remote monitoring using AIS. He showed some examples of augmented reality and indicated that these provided mariners with virtual representation of aids to navigation and related information, enabling mariners to perceive virtual objects as if actually located in the operating environment.

C. Quickenden noted that, owing to the evolution in digital navigation, the specifications of traditional AtoN can and will change, whilst still allowing the service provider to maintain safety for their users.

In concluding, C. Quickenden stressed that conventional and digital aids ought to compliment, support and above all improve our service to today's navigator now and into the future.

### 4.6.4 The Digital Fairway, Anders Bergström and Magnus Nyberg, True Heading, AB, Sweden

A. Bergstrom said that that the marine community was undergoing rapid change, which would have profound effects. The availability of new applications and data sources would make new services available for the mariner in several areas.

In this context, A. Bergstrom elaborated on individual topics such as navigation safety, pilotage, SAR, pollution response, security hydrography and risk assessment. He pointed out that there had been efficiency gains in all areas and gave examples of identifying polluting ships, reduction in voice reporting etc.

On the human machine interface (HMI), A. Bergstrom said this ought to be developed in a harmonized manner.

In conclusion, A. Bergstrom underlined the fact that the maritime community must be prepared to adapt e-navigation. Much co-ordination between organisations and industry remains to be carried out.

### 4.6.5 AIS as an Aid to Navigation – Adding Value for the Mariner, Michael Card, Zeni Lite Buoy Co., Ltd., Japan and Guy Platten, Northern Lighthouse Board (NLB), Scotland

The presentation began with G. Platten explaining the nature of the collaborative work undertaken between Zeni Lite and NLB, aimed at providing added value services via AIS. He then went on to explain the capability of AIS with regard to AtoN.

This was followed by a list of issues that need dealing with, with special attention being given to the Minimum Keyboard and Display (MKD), fitted to many ships of the SOLAS fleet. The limitations of the MKD mean that upgrading is necessary to gain the full benefits from AIS.

M. Card then started to address the economic benefits of the work, through three examples, including the Maritime Electronic Highway in the Malacca Straits. He showed the infrastructure and shipboard equipment and then itemised the AIS messages used (6, 8 & 21).

He then indicated the constraints on ships using this data and mentioned the 'invisible data' now available on board ships.

G. Platten then continued with two examples from the North Channel in UK and off Haugesund, Norway.

M. Card then itemised some practical issues associated with AtoN AIS installations.

The presentation concluded with the following points:

- Most ships cannot display M21 and M8
- AtoN AIS and met/hydro broadcasts are available now
- Ship owners must be shown the benefits

### 4.6.6 The Northern Lighthouse Board's Operational Experience with AIS as an Aid to Navigation, Alan Stewart, NLB, Scotland

A. Stewart began by showing the liaison note from the ITU-R working party to IALA, thanking them for their contribution to work on AIS. He then went on to set his presentation in its geographic context and indicating that NLB have 3 years operational experience to draw on. The presentation then turned physical installation issues.

Various applications were provided, including:

use of AIS in the context of a missile testing range and in marking the world heritage site of St Kilda; and

met-hydro collaborative work with the Norwegian Coast Directorate, which is ongoing.

A. Stewart then covered the problem of coping with power consumption and the potential cost savings in this area, before describing the work being done on the Stranraer – Belfast ferry route.

He then touched on the use of the pseudo target message (M16) and the current confusion in documentation between ITU-R and IMO and concluded by recommending that IALA maintain a register of messages to avoid this type of confusion in the future.

### 4.6.7 Using Bayesian Networks in Aids to Navigation Engineering, Ómar Frits Eriksson, RDANH, Denmark

O. Eriksson began by indicating the technical nature of his presentation, before introducing Bayes theorem. He then illustrated a simple Bayesian network before moving on to their application to AtoN.

He then posed a problem concerning the probable detection range of a lit buoy at night before talking the delegates through the outline of the Bayesian network used to provide the solution.

He indicated that the network was relatively straightforward to determine but that the statistical data concerning the variables was the real challenge. He then focussed on a specific location; the sound between Denmark and Sweden and the data gathering exercise.

O. Eriksson then showed how numerical values and equations are combined into the network, so that a result can be achieved.

He concluded by noting that Bayesian networks are:

- useful;
- simple to use and flexible;
- capable of modelling complex problems;

In addition, work is required to provide better probabilistic models in certain areas.

With regard to the example cover he remarked that Nominal range is insufficient when a high degree of probability of detection is required.

### 4.6.8 Geographic Information Systems and Aids to Navigation, Nick Lemon AMSA and Ralph Talbot-Smith Government of Western Australia

Nick Lemon
Australian Maritime Safety Agency
Ralph Talbot-Smith, Senior Cartographer
Department of Planning and Infrastructure, Government of Western Australia
Australia

Presented by Nick Lemon

N. Lemon outlined the facility of GIS to add value to the management of AIS information for and from AtoNs. He then defined GIS and then outlined the present context of navigation and the problems being faced in several aspects of navigation and possible developments to overcome them.

The GIS and AtoN network were presented, including both planning and review and focussing on the availability and quality of ship position data. This was illustrated by several screen shots showing stored ship position data from different sources and discussing the limitations involved. He then cited the sheer volume of AIS data now available and how AIS can provide a density of data that can make analysis meaningful. From this he was able to show how the positioning of AtoN and anchorages can be planned.

Four specific examples were used to illustrate how traffic patterns can be used to review and plan AtoN dispositions and how it can be used to complement environmental planning and concerns.

N. Lemon concluded by presenting the use of GIS in maintenance of AtoN.

Discussion – Technical Session 6 – Part 2 (papers 5-8)

In discussion, T. Hughes noted that the mariner must be at the centre of all aspects of AtoN. N. Lemon responded by indicating that the mariner has a proliferation of electronic equipment placed on the bridge of the vessel, and there is a need to co-ordinate and integrate these aspects.

It was noted that, although AIS is promoted for safety of navigation and anti-collision, some AIS assisted collisions have been reported already. The training element for the end user is critical, especially with regards to the limitations of the equipment.

In response to a question regarding Bayesian Networks, and the example provided with a buoy at a fixed inclination with no sea influence, O. Eriksson indicated that this was provided as a simple example. He explained that, in practice, the effect of sea conditions can be inserted into the model.

### 4.6.9 Basic Research on The Development Of New Technology Radar Beacons - for New Type Radar to be met the more Stringent Standard on Unwanted Emissions in Out-Of-Band, Tadayoshi Imai, Japan Coast Guard

Presented by Ryozo Shigematsu

R. Shigematsu began by outlining the background to Racon development. He noted that current Racons could not react with the new technology radars, which led to a study of how this situation could be rectified. This was the basis for the project presented, and the project's timeline, leading to the production of a prototype, was provided.

Before giving a brief overview of the operation of current frequency agile Racons and their specifications, R. Shigematsu showed the distribution of Japanese Racons. He then described the design concept for a new Racon.

R. Shigematsu provided an overview of the evaluation of the prototype, including the different types of signal input and the desired output pulsed code produced in each case.

He concluded by:

- Noting that a way ahead had been established;
- Showing what future studies would cover;
- Providing information available since his paper had been written; and
- Indicating activities expected with other bodies

### 4.6.10 Detection of Small Floating Targets by Adaptive Clutter Suppression Technology, Jan Kleijweg and Jeroen Bergmans, TNO Defence, Security and Safety, the Netherlands

Presented by Jan Kleijweg

J. Kleijweg began by describing the functions of TNO. He then stated the problem being tackled, which is the detection of small boats in clutter, an item of particular interest to the Dutch Navy. He defined clutter as being produced above sea state 2, where the speed of the small object is slow with respect to the wave speed.

He introduced the solution by using adaptive clutter filtering with SHIRA (SHIp's Radar – a digital X-band radar with a rotating antenna and PCbased processing capability), which is based on VTS radar and uses technology that is commercially available.

J. Kleijweg then talked the delegates through a SHIRA block diagram before illustrating the environment in which it would work and the sort of objects it would be trying to detect.

He described clutter, and the problems that it poses for radars, and how SHIRA solves these problems. This was illustrated with a screen shot taken at the entrance to Rotterdam and a comparison of raw radar and SHIRA displays, followed by an illustration of combining AIS with radar, which allows for the detection of non-AIS fitted ships.

Both defence and civil applications were then listed before the use of a clutter map was shown and the application of SHIRA in bathymetry and water current profiles and the impact that the latter can have on SAR. He then showed how SHIRA can be used to detect oil slicks.

He concluded that SHIRA improves situation awareness in a coastal environment, that it has applications in VTS and that a demonstrator is now available.

### 4.6.11 An Information Database for Safety In Shipping, George Barclay, Equasis

G. Barclay first described the way in which EQUASIS is organised and its history. He then showed how the use of its database had increased as knowledge of it spread. This was followed by a description of the principles of its use, with Mr Barclay saying that it currently had a total of 42 data providers, covering about 72000 ships. He added that all but one of the data providers did so free of charge.

The future developments for EQUASIS were outlined, including development of EQUASIS version 2, which is due to appear in the second half of 2006. This was followed by a description of the database's main user groups and a live demonstration of the system, with a strong recommendation that the database is queried by means of a ship's IMO number.

### 4.6.12 Defining AtoN in the 21st Century, Jillian Carson-Jackson, France

J. Carson-Jackson began her presentation by saying that it was her intention to draw the link between the digital aspects of AtoN and future technology. Her premise was that AtoN are required and exist to aid the mariner. But, she asked, what are the mariner's requirements?

Using an interactive process, J. Carson-Jackson the conducted a survey amongst the delegates to demonstrate who the waterway users are. This showed that the delegates considered that pleasure craft and then work craft far outstrip SOLAS users.

She then turned to evaluating AtoN programs and posed four questions to stimulate further discussion, stressing that the distinction between AtoN and navigation aids is blurring in the digital era. This led to a description of evaluation forms and tools and a suggestion that any evaluation of aids to navigation should be developed using the science of program evaluation, and developed at a global level.

J. Carson-Jackson concluded her presentation by posing a challenge for providers and users to work together for a systematic and logical global evaluation of AtoN systems.

Discussion – Technical Session 6 – Part 3 (papers 9-12)

In response to a question on the future of RACONs vs AIS AtoN, R. Shigematsu indicated that there was not yet enough information to determine if it would be best to have a new technology RACON or AIS AtoN station, or both.

In response to a question on the SHIRA clutter suppression tool, Mr. Kleijweg noted that the filtering mechanism can deal with wash from a ship's wake.

## *4.7 Technical Session 7 - Future Developments and New Technologies*

Chaired by Nick Ward, UK/ Vice-Chair – Juan Francisco Rebollo, Spain

### 4.7.1 User Requirement Driven Design and Deployment of Aids-to-Navigation Services (including VTS), Jan-Hendrik Oltmann, Germany

Presented by Dirk Eckhoff

D. Eckhoff noted that J-H Oltmann was unable to attend the conference and that he was honoured to provide the presentation on his behalf. D. Eckhoff then stated that data can be put into a computer but, with regard to getting out of the computer what you want, you need to know what the user requirement is. This was the basis for the task now being reported on.

He explained that the starting point were seven 'trigger events', which he then itemised. The geographic context and the background maritime statistics were provided, with a resulting conclusion 'We must do something'. However, economy of effort and standardisation were determined to be important and a holistic approach was taken.

D. Eckhoff then introduced the Object-Oriented Paradigm and the use of Unified Modelling Language. He itemised the functions and attributes of the holistic system, leading to the use of the Object-Oriented Engineering Process and the application of use cases. He stressed that it was important to focus on function rather than the technology and that a requirement was for the final result to be modular but of a manageable size and explained the benefit of concentrating the system's technical components.

After giving an overview of the Technical Services 'Black Box' D. Eckhoff concluded by itemising the main characteristics of the new system.

### 4.7.2 Long Range Technologies – Maximising the Advantages to the Maritime Sector, Neil Trainor, Kerri Abercrombie and Jim Huggett, AMSA, Australia

Neil Trainor, Kerrie Abercrombie and Jim Huggett
Australian Maritime Safety Agency
Australia

Presented by Neil Trainor

N. Trainor began his presentation with an overview of REEFVTS, which consists of an IMO mandated ship reporting system and integrated monitoring systems, including radar, AIS, Long Range Identification and Tracking and VHF Voice, to deliver a coastal Vessel Traffic Service. The system also makes extensive use of GIS and electronic corridors to monitor and interact with traffic within the region. A short video clip illustrated this. He then set the geographic context of REEFVTS and the remote and arduous conditions in which it operates.

N. Trainor then went on to describe why LRIT was first introduced in 2002 and illustrated the way in which LRIT, AIS and radar positional data is integrated, analysed and presented to the VTS operators using a short video clip.

The benefits of implementing LRIT information within a coastal VTS environment were highlighted. These included the reduction in the burden of ship reporting requirement by the mariner and the adoption of Inmarsat C as the preferred communications medium by the mariner for delivery of routine information.

N. Trainor then described additional value added benefits and efficiencies that have subsequently been extended to allied services, such as

- Pilotage;
- Protection of the environment
- AtoN planning and maintenance

He concluded by summarising his presentation and itemising the benefits accruing to the maritime sector.

Looking to the future, N. Trainor speculated that the introduction of LRIT in 2008 would form another input to e-navigation and urged that the potential benefits to the mariner should be considered as LRIT is developed and embraced.

### 4.7.3 "A Pilot In A Box?"; Traffic Management Innovations on the River Scheldt, Frans Mol, Ministry of Transport, Public Works and Water Management, Zeeland Department, the Netherlands

F. Mol began with the question and answer Is the Scheldt Navigator Marginal Ships (SNMS) for vessels with marginal keel clearance a pilot in a box? No, but it is most certainly a novel and innovative development. He then set the scene for the development of the SNMS and the marginal conditions and need for dredging present ion the River in the Scheldt. He also explained that a major accident rate of one per year and the increasing size of vessels were driving factors.

F. Mol then described the development of the Scheldt ECS, involving collaboration between Belgium and the Netherlands. He itemized valuable lessons learned throughout the building and distribution process.

CASTOR, the portable pilot equipment, which was then developed into SNMS was presented. The component parts of SNMS and its installation were discussed, stressing the accuracy of the position and rate of turn outputs. The operation of SNMS was then displayed by a simulation in passage, pilotage and docking mode.

A look ahead and 3-D capability and how they can assist the pilot led to the conclusion that SNMS is not a 'pilot in a box' but an aid to the pilot.

### 4.7.4 Future shipborne displays, Mike Rambaut, CIRM, UK

M. Rambaut began with two comments. The first was to thank IALA for a view of what is going on off the ship. The second was that the clever displays, many of which have been described / demonstrated during the week, may not be possible on board ship due to the regulatory framework. He then gave a brief overview of CIRM and its work and relations with various bodies.

Displays were discussed first, with a focus on the work of IECTC80. TC80 takes forward IMO performance standards and also includes non-IMO equipment. In particular, IECTC80 WG13, is looking at navigation related displays and is working towards integrated navigation systems. The work has highlighted current display problems, including radar and ECDIS issues.

M. Rambaut described the input of IEC TC80 WG13 into Res MSC191(79) and noted that this work is ongoing. He then provided a demonstration of radar with chart overlay and an ECS with radar overlay, highlighting the differences between them.

In discussing possible future uses of ECDIS, he stressed the word *information* and remarked that ECDIS was still not a mandatory carriage requirement. In covering the functionality of ECDIS and he presented his view of the reality of the equipment, stressing current deficiencies. This then led to how ECDIS could be developed as part of e-Navigation.

M. Rambaut illustrated possible, future 'tide aware' displays, acknowledging the assistance derived from Dr A. Norris and Dr L. Alexander. M. Rambaut concluded by stating that there was more work to be done, and urging that mariners stop looking at the display and look out of the window.

#### Discussion – Technical Session 7 – Part 1 (papers 1-4)

In discussion, it was noted that VTS provides a contributory service, complementing information available onboard the vessel.

In response to a question on head-up displays, M. Rambaut indicated that that there have been two workshops with the Nautical Institute where head-up displays have been discussed and demonstrated. However more work is necessary before going to IMO, not least due to the training issue.

Discussion included aspects of ENC, and M. Rambaut noted that, although ENCs are not yet available worldwide, he felt they will be available in the time scale envisaged and added that great progress is being made. He then noted a query about the relevance of ECDIS when there is ENC data at the start and end of a voyage but nothing in the middle. M. Rambaut noted that IMO is assisting nations with financial difficulty in producing ENC and added that he does not see the raster chart as an effective replacement for an ENC. As a follow-up discussion, with specific regard to a time-line for a mandatory carriage requirement for ECDIS, M. Rambaut indicated that it would probably be 10 years before such a requirement. He remarked that IHO is continuing development of ECDIS due to IMO requirements, instancing the recent need for archipelagic sea lanes. A new, radio updatable ECDIS is being developed for 2008/10. He then added that the vision of e-Navigation should be relatively quickly developed but the associated regulatory framework may take longer.

### 4.7.5 Rational Distribution of AtoNs in the Archipelagic Areas with Complex Current, Yun Caixing et al, PRC

Yun Caixing (Shanghai Jiaotong University)
Han Zhen (Shanghai Fudan University)
Hu Wei (China Maritime Safety Administration)
Peoples' Republic of China

Presented by Hu Wei

H. Wei outlined the size and complexity (depths, tidal regime and traffic volumes) of the port of Shanghai and the waters around the estuary.

To enhance safety, China MSA involved experts, acquired data, measured and monitored traffic and studied the distribution of aids. The tidal regime in the Tangtze estuary was the focus of a separate study. High accident rates there were attributed to strong and complex currents and strong winds.

Analysis led to measures like defining prohibited areas, establishing traffic separation schemes and broadcasting current information using AIS. Particular care was taken for aligning the axis of the channel under the 32 km long Donghai bridge, to allow for strong tidal streams.

The main tools used to establish the changes due to silting over the years were multi-temporal satellite images and digital overlays of several years of data.

In concluding, H. Wei said that careful consideration of the complicated current system in archipelagic area was required to ensure safety of navigation.

### 4.7.6 Marine Aids Modernization & the Impact of Technologies on the Aids to Navigation Services, André Chateauvert, CCG, Canada

A. Chateauvert provided a quick overview of the aids to navigation in Canada, a country with a large coastline and some 3000 kms of inland waterways. It had a diverse mix of users and some 17300 aids.

The Canadian vision of its Marine Aids Modernisation (MAM) program was to meet the needs of mariners while ensuring that the right mix of aids was provided.

MAM had been underway since 1996. The objectives have remained same since then – that is, to provide cost effective services and take advantage of new technologies.

A. Chateauvert listed some key achievements: a 9% reduction in the number of aids since 1996, contracting out of 28% of the aids to date and the doubling of LED lanterns. Some more achievements were cost reductions of some 14%, and a reduction in the total number of collisions and groundings.

There are plans to review the mix of electronic and traditional aids, downsize or eliminate landfall lights, remove sound signals on buoys and the design availability for the aids to navigation. In Canada, the 75% design availability is the percentage of time during the worst month of the navigation season that specific category of vessels should be able to use the short range aids-to-navigation system. Where adverse weather conditions occur sufficiently often that the 75% design availability can't be achieved by visual means alone, Canada could design systems lower than the 75% if it is agreed to by mariners.

Canada would continue to take advantage of new technologies like LED, move from steel to plastic buoys, convert seasonal buoys to year round buoys and change from concrete to steel anchors. They aimed to contract out the maintenance of about 50% of their aids in the next four years.

A. Chateauvert said that the key to success was consultation with mariners. Education of all stakeholders, including employees and unions was important.

He concluded by saying that a balance between traditional and electronic aids was vital and that Canada would implement new technologies and ensure efficient service delivery.

### 4.7.7 The Metrology of Pulsed LED Clusters, Ian Tutt, GLA Research & Radionavigation Department, UK

I. Tutt started by saying that a human interface was required for any aid to navigation. Physical aids interface directly (seeing is believing), but the impact is difficult to quantify.

For lights, he noted that authorities measure luminous intensity and colour. These are measured using a photometer with eye response correction. For colour, colorimetry is measured and he discussed two methods of doing so.

The models for measurement used are based on the CIE standard of the 1900s, and the salient features and limitations of each were presented.

I. Tutt indicated that some of the characteristics of LED were narrow spectral distribution and variations in colour with angle and temperature. He then provided amplifying information on each of them. In presenting the measurement solutions for pulsed LEDs, I. Tutt explained that improvements were required, including the need for a spectral mismatch correction and a large effective measurement distance. He then provided some of the measures that could assist.

In summarising, I. Tutt said that LEDs behave differently from traditional lights, and that the traditional measurement measures can cause large errors. These existing models need reviewing and amending to ensure accuracy and effective provision of lights for AtoN.

### 4.7.8 Bilan de 12 années d'expérience sur plus de 500 bouées modulaires et sur l'utilisation De BALISEs A flotteurs comme support de capteurs de mesures océan météorologiques, Guy Cunty and Nicolas Auger, Centre d'Etudes Techniques Maritimes et Fluviales, France

Presented by Guy Cunty

G. Cunty started by describing CETMEF and its role within the Ministry of Transport in France. He then described the old buoy tender used by them. He noted that the reasons to move to modular buoys were the quality of the product, quality of service to the mariner, ease of access and maintenance, adding that there were currently three sizes of vessels that made up the buoy tender fleet.

CETMEF started using buoys in 1993 and their experience was based on the use of over 600 buoys so far. The details for off-the-shelf modular buoys were provided, including information on the fact that masts were re-configured to CETMEF specifications, the buoys equipped with sacrificial anodes and a few minor design changes were implemented to improve stability ergonomics.

He concluded the first part of his presentation by stating that CETMEF was convinced that they had been right in electing to deploy modular buoys as they are safer to handle and maintain both on shore and at sea. The modular buoys can be handled by cranes with smaller capacities, so smaller tender vessels are required, and the buoys are also easily fitted with solar panels and AIS transponders.

In the second part of his presentation, G. Cunty listed the advantages of buoyant beacons. These included reduced swing, good stability and ease of maintenance. There were some conditions to their use – limited to depths more than 15 m with a sinker of more than 10 tonnes.

He then discussed ocean measurement systems on buoyant buoys. The parameters measured include:

- tilt of beacon with wind speed,
- current profile over weeks, and
- current profile at various depths.

## *4.8 Technical Session 8 - Discussion forum on AIS*

Chair Wim van der Heijden, Netherlands; Vice Chair Jorge Arroyo, USCG

### 4.8.1 AIS Performance in the Irish Waters(or Irish Performance in AIS waters), Steven Burrows, CIL, Ireland

Presented by Seamus Doyle

S. Doyle began by setting the scene for an AIS trial in Dublin Bay in 2004, which also involved the GLA Research and Development Navigation Directorate. He then listed the objectives of the trial, which included :

- AIS performance in VTS area;
- Effect on bridge team workload;
- Risks of ship to ship and ship to shore operation;
- AIS AtoN evaluation;

- VTS;
- Interoperability;
- Networks;
- Integration with other bridge systems.

He then used a gathering of protesting fishermen to illustrate the difference between the clear display from the trial and that of the MKD.

S. Doyle then described a GLA trial involving the use of safety related messages, the records taken and the following conclusions:

- Useful range for safety message is about 19NM for 80% success and in agreement with theoretical range for 5 slot messages;
- Range is determined by ship Receiver;
- Range is limited by poor AIS installations of antenna or radio noise.

An Irish trial in providing AtoN information to SOLAS vessels from a lightship was then presetned. This was followed by a description of an EU INTERREG trial involving the use of 6 buoys and 6 base stations to assess the performance of AIS and synthetic AIS AtoN transmissions.

S. Doyle concluded by itemising some AIS issues arising from their recent experience:

- AIS relies on GPS for timing and position, making it vulnerable;
- Received data depends on other vessel – is transmitted data correct?;
- Not all ships have AIS or may be switched off;
- Only MKD required, which does not provide good situational awareness;
- Radar & AIS target matching;
- May provide local DGPS via AIS;
- Retransmission of radar targets as AIS;
- Class B may cause data channel overload;
- Training will be required for users and installers.

In addition, he listed potential installation, training and positional issues.

### 4.8.2 A Real Test of an Ais Network As Aids to Navigation: The SW-AIS Network, Juan F. Rebollo, Puertos del Estado, Spain

J.F. Rebollo began by setting out the areas of responsibility of Puertos del Estado and its relations with other maritime stakeholders. He showed AIS as a tool in the overlap between AtoN, Pollution, SAR and nautical charts. He described an EU sponsored project featuring AIS as an AtoN and providing added value in the provision of a traffic image. The specific objectives of the project included:

- Lighthouse use;
- Improves use of AIS as an AtoN device to transmit meteorological data and DGPS corrections;
- Vessel information in a strip of 25 nautical miles (port operations);

- Vessel information (raw data) for other user and stakeholders;
- Evaluation of the AIS-AtoN as a RNAV AtoN;
- Use the AIS-AtoN as a monitoring tool for the traditional AtoN;
- Development of the e-ANSI concept using the AIS-AtoN.

He then set out the geographic context and the composition of the national Spanish AIS network, specifically mentioning the part that the internet plays in its operation. The services provided by the network to vessels were listed:

- Identification of AtoN, type, position (on / off in buoys), operational state (on / off) – Physical AIS or Synthetic (virtual, if necessary)-
- DGPS corrections
- Weather and tide information
- port authorities :
- Vessel information and application for ISPS Code
- Traditional AtoN monitoring (position of buoys)
- Port management: statistic, replays, incidents/accidents, speed control
- (other) stakeholders :
- Access to raw data information or database
- Exchange data to/from other AIS Networks.
- Real-time web access

He then listed the lessons learned, including the fact that existing lighthouses provide a good platform for the provision of AIS AtoN, and that there are areas of concern with regards to AIS AtoN information, including the decoding capability of shipborne AIS devices, issues surrounding DATUM/real position/charted position and the fact that there are many users for the information, not only VTS. :

J.F. Rebollo concluded by itemising requests to IMO that were developed following the trials:

- AIS needs to be properly configured and included in a display with ECDIS/ENC;
- Compliance with technical specification for all message (Update) is required;
- There is a need to promote AIS in non-SOLAS vessels.
- Not all units have a capability for all messages;
- AIS Installation and information update is important, and not always carried out correctly;
- Training requirements for AIS and the use of AIS are an issue;

He concluded by noting that IALA can play a continuing role in the development of AIS, with a focus to improve the interchange of experiences and knowledge.

### 4.8.3 Program for Provision of Information using AIS - Development of Electronic Navigation Support System (ENSS), Tadayoshi Imai, JCG, Japan

Presented by Eiichi Masuda

E. Masuda presented the distribution of the 7 VTS centres in Japan and briefly outlined their function. He then turned to the AIS deployment schedule, which is due for completion in 2008. He then displayed the AIS coverage, categorised as either congested sea areas or other service areas.

The environmental conditions and difficulties faced by the various types of coastal traffic were then identified, with emphasis on the issues presented with the MKD, including examples of its inadequacy of display for watch keepers on board.

E. Masuda used three graphical scenarios to highlight the implications of introducing ENSS on board, noting cost and a requirement to satisfy the user's requirements.

He then described a communications trial held in Tokyo in November 2005, involving the transmission of met-hydro and other data by pseudo binary messages and concluded by posing the question 'How do we reduce the (risk of) collision?'

### 4.8.4 AIS Operational Concept, Harmut Hilmer, Germany

Presented by Dirk Eckhoff

D. Eckhoff noted that the introduction of AIS had prompted the setting up of an operational concept for its use. He began by stating the objectives of the concept, which was to cover Germany's EEZ as well as its coastal waters and inland waterways. These included:

- Geographical Cover;
- Division of the German Sea Areas, generally;
- Division of the German Sea Areas, specially;
- Land-Stations and Equipment of VTS-centres.

He indicated that traffic density was assessed and the results used to categorise waters as high, middle or low density and the equipment implications for their coverage.

D. Eckhoff then described the engineering consequences of establishing an AIS network and its integration into VTS.

This was followed by a description of the interim solution, which was in place until AIS became mandatory, noting that there was no data integration, standard symbology, reduced information and no automatic observation and no alarm signals. The advantages, however, were listed:

- extended insight into the VTS area;
- expanded activities of maritime Safety, particularly on traffic intensive routes;
- ability to fulfil obligations concerning the agreement with Denmark;
- early recognition of accidents and incidents, initiating alerts;
- verbal contact with shipping by the newly implemented VHF-traffic-channels.

He then turned to the advanced solution, again noting advantages and disadvantages.

### Discussion Forum

The Chairman opened the discussion by saying that the MKD is inadequate for the data being sent to ships and this had been mentioned by three of the speakers, adding that whilst moving towards e-Navigation there will need to be a solution to this problem. He then asked 'What role can IALA play in easing this situation with respect to e-Navigation?'

T. Hughes, referring to installation problems, as mentioned by CIL, asked 'Where should the MKD be displayed?' He then added that displays on board need to be type approved, which is one issue, but there is also a training issue, especially with regard to equipment limitations.

J.F. Rebollo asked how many countries have experience of using AIS as an AtoN? He also asked 'what is the role of the maritime administration in checking the installation of AIS? He then added that there are currently many displays available.

C. Polderman said that if you want to have an idea about what IALA can do with regard to relations with IMO, don't look to the appropriate IMO committee chairman, but forward proposals. He then suggested that the conference provided a wonderful opportunity for stimulating the IMO debate, and suggested that the conference conclusions be forwarded to IMO.

The Chairman, responded by saying that there needs to be co-operation between IALA and IMO to ensure successful development in this area.

S. Hickey then added that the Dublin trial had provoked surprising resistance from the mariner, due to poor briefing and a lack of relevance of the data displayed to him.

The Chairman responded that the IMO is the only authorising body and so IALA must work through it.

A delegate from Hong Kong shared an experience with a case study, where it was found that a collision resulted despite the fact that both ships could clearly see each other via AIS. In fact the master of one vessel said that he had sent a message, via AIS, to the other ship asking him to keep out of the way but, he didn't. The message (*yet again*) probably is to look out of the window and not at a variety of displays.

The Chairman said that he completely agreed. It should be realised that messages may not be read and voice radio should be used, in conjunction with looking out of the window.

The NLB, repeated the benefits of their recent experience with AIS and then asked E.Masuda if the update rate of pseudo messages changed with the manoeuvring characteristics and performance of the target. E. Masuda replied that they did.

The Chairman drew the discussion to a close and suggested that perhaps more time was needed for this activity and this might be achieved by having only three presentations or even less.

## *4.9 Technical Session 9 – Discussion forum on Differential GPS*

Chair Rolf Backstrom, Finland; Vice Chair Stuart Ruttle, Ireland

### 4.9.1 The Monitoring System of DGPS Stations in France, Pierre Yves Martin, CETMEF, France

P.Y. Martin outlined the French DGPS program, which started in 1997. In 2004, duplication of equipment took place. There are currently seven stations on mainland France and one in French Guyana.

The integrity monitor, back up and antenna arrangements were described, and the standard architecture was outlined. It was noted that L1 and L2 frequencies are used.

P.Y. Martin then presented the remote control system with a central control station (located at Belle Ile, manned 24 hours a day, including GPS monitoring software) which uses ISDN links.

The French system has advanced control stations located near the DGPS stations. These are individual stations and their aim was to verify the corrections of any system as a user would see them.

P.Y. Martin concluded by stating that using digital networks, France was able to optimise the use of the network, particularly the advanced control stations for users.

### 4.9.2 Maximising the Potential of Maritime DGNSS, Peter Douglas, NLB, Scotland

P. Douglas stated that DGPS has been operational since 1990. He noted that, after the removal of SA, there is no requirement for rapid corrections however, there is an increasing requirement for integrity monitoring.

He defined integrity, noting that users have a poor understanding of integrity. So far, lack of integrity monitoring has not led to navigation accidents. He then showed an example of a tanker where, due to an unnoticed error in the GPS clock, the auto-pilot steered the vessel dangerously close to the shore.

The bottom line is that integrity monitoring is necessary, and DGNSS provides it. DGNSS will be a component of e-navigation and IALA is recommending a recapitalisation of DGNSS, with proposed mandatory carriage requirements.

A few limitations of the system were outlined and discussed, along with several possible options for development.

In conclusion, P. Douglas stated that, in the year 2014 for example, he foresaw mariners using dual system, multi- frequency GNSS receivers as input to ECDIS, AIS etc. The combined differential services would support 'legacy' GPS and new GNSS services. Wide Area RTK at 1000 bps. in a different frequency band could be also available for high-end users.

### 4.9.3 Integrity of Present and Future (D)GNSS for Maritime and Inland Waterways Applications, Michael Hoppe, et al, Germany

Michael Hoppe, Mario Walterfang, Stefan Bober, Federal Waterways and Shipping Administration
Germany

Presented by Michael Hoppe

M. Hoppe noted that, when discussing integrity, it was important to look at failures. He noted the frequency, duration and magnitude of GPS failures, and cited three significant failures. He pointed out that GPS was at the heart of systems like ECDIS and AIS and that many nations were using the IALA DGNSS system to fulfil the IMO navigational requirements for port approaches.

M. Hoppe touched on the system components and benefits of DGNSS. He gave examples of the use of DGNSS during some outages of GPS satellites. He then described RAIM in some detail and discussed its importance when used in AIS units.

In conclusion, M. Hoppe stressed that the use of GNSS for navigation called for high accuracy and integrity. These could not be fulfilled using current standalone GNSS. RAIM was a promising technique, which had been improved during the past years, but has limited availability. GALILEO would enhance the integrity capability for specific applications (i.e. Safety of Life or SOL-Service).

### 4.9.4 Indian DGPS Chain, G. Somarajan and P.P. Sinha, Ministry of Shipping and Road Transport, India

Presented by DK Sinha

DK Sinha presented details of Indian DGPS chain, including numbers and location. He also elaborated on the configuration of a typical broadcasting station and its system hardware.

He then listed the functions of a DGPS station, which included computing and broadcast of DGPS corrections, broadcast of beacon almanac and reference station status information, failure detection and monitoring and logging of performance data.

The measures adopted to enhance the system reliability were listed, including UPS and system redundancy. System verification data for both the East and West Coasts was then presented.

DK Sinha concluded by stating that the Indian DGPS network achieved position fixing accuracy within 5m in its coastal waters. Availability was high, even in adverse weather, due to continuous deployment, periodical training and regular maintenance. On-shore monitoring takes place at the regional headquarters for evaluation of system performance.

#### Discussion Forum

At the start of the session, the Chairman gave an overview of the current situation with DGPS and options for the future, including technical options. He also posed some questions (e.g. is sub-metre accuracy required?). He highlighted some important issues for e-navigation with respect to DGPS.

In relation to integrity monitoring, there was a suggestion that user should get 'active' notification. The view of the panel was that a faulty satellite would be 'dropped' from the solution. There is also a requirement that new receivers must provide quality of position information (i.e. integrity).

In response to a question on the use of maritime DGPS beacons inland, some nations said they were trying to join up with the inland network as the portfolio of the ministries (transport) was the same. The multi-modal use of GPS was noted, and the need for cooperation stressed.

Answering a question regarding the percentage of ocean going vessels equipped with DGPS, delegates agreed that as long as carriage was not mandated by SOLAS, there was little that could be done. Educating users was one strategy to adopt.

In response to the use of DGPS in inland waterways, it was noted that there is an EU requirement and states were implementing DGPS service to cover the river regions in continental Europe.

The group felt that there could be no pressure put on Coastal States to carry DGPS, as there was only an IALA Recommendation to do so.

In response to a query whether some ports were closing their VHF DGPS sites and using the IALA MF DGPS beacon, the panel responded that SA could be brought back on at any time.

The IALA DGPS service was the minimum and must be retained, at least for the medium term.

Doubts were raised about the future of DGPS, noting that GALILEO would soon be available. In reply it was noted that GALILEO authorities now state that they see the Open Service having a 15 m accuracy complimented by an augmentation service, offering 1m accuracy.

Manufacturers are selling SBAS as a feature, but there is evidence that this does not work well. The view of the panel was that it is difficult to prevent manufacturers from using SBAS as a selling feature, but that the USCG website, for example, cautioned against this very fact.

The Chairman closed the discussion session by thanking all delegates for their active participation.

## *4.10 Technical Session 10 – Discussion forum on Historic Lighthouses*

Chair Bob McIntosh, Scotland; Vice Chair Carmen Martinez, Spain

In opening the session, B McIntosh took the opportunity to thank Larry Wilso of the Canadian Coast Guard, who was scheduled to chair the session. Although L. Wilson was unable to attend due to ill health, it was noted that his efforts as Chairman of the WG5 of the EEP Committee led to the achievements with regards to the conservation of and discussions on historic lighthouses and aids to navigation.

### 4.10.1 IALA AND THE NEW LAW ON PORTS, Carmen Martinez, Puertos del Estado, Spain

C Martinez began by outlining the legal framework applicable to lighthouses: the law on coasts that protects a strip of land 100m wide along the coast and a the law on ports that gives responsibilities for lighthouses to Port Authorities. However, only the Government can list a lighthouse as a cultural asset. She then outlined the formation of the PHL.

She noted that efforts on alternative uses of lighthouses had been focussed on three groups:

1. Puertos del Estado
2. Port Authorities
3. Regional Governments

C Martinez then itemised the major initiatives taken, giving some detail on each one. In the first group she began with a CD that has been created, *the Spanish Lighthouses Multimedia Guide*, to promote the history and backgrounds to lighthouses. She also made reference to the Aids to Navigation Day instituted in 2003 that is now an annual event. Further promotion is achieved by a Science Week; through several books that have been written and various other promotional material. The books and the CD can be obtained from the bookshop on the Puertos del Estado website.

In reporting that port authorities have also taken initiatives in promoting lighthouses, C. Martinez noted collaborative agreements with third parties, both current and future. She then went on to outline initiatives being taken with regional authorities, where there is international collaboration. She then presented one of this projects with the planned alternative uses for some lighthouses in northern Spain.

C Martinez then summarised her presentation by giving key dates and events to highlight past, present and future activities.

### 4.10.2 Alternative Uses of Lighthouse Properties – the Irish Experience, Eoghan Lehane, CIL

Presented by Seamus Doyle

S Doyle sketched the drivers for finding alternative uses for lighthouses:

- automation has resulted in the withdrawal of lightkeepers;
- parts of lighthouse estate are now surplus to requirements;
- many lighthouses are protected by statutory planning legislation;
- unused buildings are expensive to maintain;
- external partnerships to develop alternative uses are possible.

He noted that this had led to the introduction of the Irish Landmark Trust (ILT) and its work. Giving examples, he detailed the work on Wicklow and Galley Head lighthouses and the collaborative nature of the ILT's relationship with the CIL. He then described the modifications and alternative uses of part of the Loop Head and Blackhead lighthouses.

He then turned to the use of surplus premises at two lighthouse sites as heritage / visitor centres and showed how one seemingly minor difficulty can adversely affect visitor numbers.

Another example of alternative use was the Rathlin West lighthouse that is being increasingly used by bird enthusiasts. S. Doyle then described how the Baily light has been turned into a museum and how redundant property has been turned into employee holiday homes. Other alternative uses were noted, such as:

- VTS installations for Port Authorities;
- Base Stations for Mobile Phone Companies
- RNLI (Lifeboats) Marine Communications

S. Doyle concluded by stating that the CIL would continue to seek alternative uses for surplus property, that all proposals must be viable and sustainable and that the CIL encourages external partnerships to develop alternative uses.

### 4.10.3 De l'inventaire au classement : Une politique patrimoniale pour les phares français (2000-2005), G. Cunty, et al.

Guy Cunty, centre d'études techniques maritimes et fluviales (CETMEF)
Vincent Guigueno, Ecole Nationale des Ponts et Chaussées (ENPC)
Jacques Manchard, Bureau des Phares et Balises (MTETM/DGMT/DAM/SM4)

Presented by Jacques Manchard and Vincent Guigueno

V. Guigueno began the presentation by outlining the historical and regulatory context for the listing of lighthouses and the pressure that the media exert on this topic. The French listing process was described, including the fact that lighthouses hadn't been considered of particular significance until about 2000. He discussed the apparent discrepancy between the French attitude to listed buildings and the lack of interest in lighthouses and suggested that, up to that point, the need to care for in-service, publicly owned buildings had not been apparent to the Ministry of Culture. He then described, in some detail, the current preservation work on the Cordouan lighthouse.

J Manchard then continued the presentation with a description of the current actions:

- A survey of architecture and equipment;
- The opening of lighthouses to the public;
- A survey policy in the context of a global review of all AtoN priorities (SCAN);
- To collect money from alternative use for LH at sea.

The inventory of 160 lighthouses, both in France and the outlying territories, was presented and it was noted that the report is now a definitive source document. It was interesting to note that only 30 of the 160 lights were subsequently selected as being of specific importance.

Once identified as being of specific importance, the next step is the classification of the lighthouses which, surprisingly, had the effect of stimulating national and administrative action, but resulted in no revenue for the lighthouse service. This resulted in a 'knee-jerk' reaction which had also taken an unwanted turn. From this J. Manchard concluded that the top-down approach was not the best one to take. He then outlined the current policy.

In conclusion, it was noted that :

- The "Torreton effect" eventually puts national and regional administrations in motion, from survey to action
- Without a national list , top down process unacceptable in the French political context)
- But with a national evaluation system of heritage value of LH based on:
  - History (4 items)
  - Architecture (4 items)
  - Environment (3 items)
  - Nautical Conditions (4 items)

He concluded the presentation with an invitation to Paris and Ushant, in June 2007, to help celebrate the 50th anniversary of IALA

## Discussion Forum

The chairman thanked the speakers and drew delegates' attention to the IALA Conservation Manual, indicating how it might have helped the French in their work in classification of lighthouses and would be of use to nations still to tackle this work. He then mentioned specific areas of assistance included in the manual and said that a CD comes with the manual. He then sought questions from the floor.

Korea reported that it is now constructing lighthouses in the knowledge that they will be part of the cultural heritage and are preserving existing ones. It was noted that, for the newer lighthouses, it may be necessary to have a discussion with the Cultural Ministry. With this in mind, the question was asked 'has IALA been in contact with UNESCO, especially in respect to public awareness? Also, has IALA considered designating existing lighthouses in member countries as deserving preservation?

The Chairman responded that the future work programme encouraged IALA to work with UNESCO. He then sought comments on the second point.

C Martinez (PdeL) commented that the selection of lighthouses for preservation is a subject for each country, and that IALA should only support initiatives taken. This was supported by the Chairman. He then added that there is a plan to add a web portal for historic lighthouses which might be of assistance.

J Manchard, in response to the question from Korea, referred to the recent Göteborg workshop and urged the continuing exchange of information. He also thanked IALA for arranging the workshops and continuing the discussion on preservation/conservation of historic lighthouses.

J-C Leclair (IALA) said that, with respect to Korea and UNESCO, IALA cannot force preservation action but may be able to encourage preservation/conservation, especially in the case of countries with no knowledge of how to start such work and those who are not currently members of the existing discussion forums. He then gave the example of the potentially perilous state of lights in the Red Sea.

The Chairman noted that, although much guidance has been produced, there was still more work to be done and this was planned for. He then went on to encourage those present to review the manual and join the working group at EEP.

S. Doyle (CIL) agreed that the IALA documentation is of great benefit and can prevent disastrous good intentions. He then asked delegates to provide their input, even if unable to attend EEP. With regard to Korea's second question, he stated that IALA produces Recommendations and Guidelines that are not binding, but which can be used by IALA members to reinforce the development of a case for preservation. He then asked if there is there anything missing from the existing guidance that might assist in this process?

Puertos del Estado indicated that they support complimentary uses of lighthouses but did not support this concept with regard to the maintenance of operational lighthouses. It was noted that, if responsibility for maintenance of operational lighthouses is passed to a port authority, the utility of it for the mariner must not be lost. This could be a concern where technical issues clash with preservation/conservation – for example, in siting a new antenna.

G Cunty (French lighthouse service) noted that pressure from suppliers had resulted in the removal and destruction of historic equipment in the past, and asked delegates to think about the consequences of taking irreversible actions.

S Doyle (CIL) sought to reinforce this point and pointed out the future heritage value of apparently modern equipment such as radios and Racons.

The Chairman drew matters to a close by thanking the delegates for their input. He then requested that members present should consider sending a delegate to EEP but acknowledges the problems of cost of travel and said that he was expecting to set up an e-mail correspondence group and would therefore appreciate if each member identified an appropriate person in there organisation and e.mailed him with this information to the address on the Preservation of Historic Lighthouse flyer. (as provided in Annex 5 i.e. bobm@nlb.org.uk).

# 5. Conclusions and Recommendations

The conference agreed to the following 14 conclusions and 12 recommendations.

## *5.1 Conclusion:*

It was concluded that:

1. The IALA conference provided an excellent opportunity for stimulating discussion and debate on topics such as risk management and e-navigation.
2. The IALA risk management tool can assist authorities to assess the level of risk in their areas. International conventions should not constrain the maritime world, if risk and its consequences are to be discussed and acted upon. As the model is provided free of charge, the results of any assessment should be made available to IALA, to ensure the maintenance and overall integrity of the risk management tool.
3. e-navigation is a concept that involves a number of existing tools and encompasses new developments in technology. A co-ordinated international approach is required in order to develop all aspects of e-navigation.
4. Although Electronic Navigational Charts (ENC) coverage has increased in recent years, many areas remain without ENC coverage.
5. Although the maritime buoyage system has served the maritime community well since its inception in the 1970s, it is time to review the system in light of changes in the shipping environment and the development of digital aids to navigation.
6. There is a continuing role for short range aids to navigation and the IALA DGNSS in the digital age.
7. Simulation is an excellent tool, not only for training, but for risk assessment, planning and evaluation of aids to navigation. The use of Geographical Information Systems (GIS) can assist with these tasks.
8. Bayesian networks can provide a valuable tool for modeling complex multi variable problems in aids to navigation, including VTS.
9. The data available from AIS is beneficial for many aspects of aids to navigation, including aids to navigation planning. Non-shipborne AIS is an important component of the system and requires further development.
10. The use of shipborne display systems, other than the MKD, capable of displaying all AIS data should be encouraged in order to enable mariners to derive full benefit from AIS.
11. Training in aids to navigation is an ongoing challenge. IALA documentation provides a basis for VTS and aids to navigation training, however existing documentation needs updating and expanding to cover all aspects of aids to navigation training. The Conference noted that this is the focus for the workshop in Dalian on May 29-30, 2006.
12. IALA should continue to play a role in the conservation of historic lighthouses, associated aids to navigation and equipment.
13. IALA should continue to develop specific guidance on the harmonization of quality management systems in aids to navigation and service delivery.
14. IALA is the world's leading international association with expertise in the design, operation, maintenance and developments in aids to navigation.

### *5.2 Recommendations*

It was recommended that:

1. IALA make its risk management tool available, as soon as practicable, for use by members, with a priority for high risk international waterways and straits. Members using the tool should provide results and feedback on the tool to IALA, so as to ensure the maintenance and overall integrity of the risk management tool.
2. IALA works closely with IMO, ITU, IHO, IEC, sister organizations representing mariners and other related organizations, to assist in the development of the e-navigation concept.
3. IALA work closely with IHO on the development of Electronic Navigational Charts (ENCs)
4. IALA review the maritime buoyage system in consultation with all related organizations and user groups.
5. IALA investigate the use of simulation and Geographical Information Systems (GIS) in relation to risk assessment planning and evaluation of aids to navigation.
6. IALA endeavour to support the development and use of Bayesian networks for all relevant aspects of Aids to Navigation.
7. IALA continue to participate in the development of AIS, including the exchange of expertise and knowledge on AIS.
8. The inadequacy of the Minimum Keyboard and Display associated with AIS be brought to the attention of IMO.
9. IALA continue to develop concepts of training in AtoN.
10. Regarding the conservation of historic lighthouses, IALA should continue to:
    - Develop documentation;
    - Promote international cooperation programmes; and
    - Provide advice on lighthouse conservation
11. IALA remain committed to quality management systems for aids to navigation and ensure that its members have up-to-date information on Quality Management Systems.
12. IALA forward the results of the XVIth IALA conference to IMO and IHO for information.

# 6. IALA General Assembly

During the Conference, IALA held two General Assemblies. The first General Assembly was to provide an update on the work of the IALA Council, including a Financial Report and a report from the IALA Strategy Group. The IALA Strategy for 2006-2010 was presented, and a copy of the strategy was provided to all delegates. Draft changes to the IALA Constitution were reviewed and agreed. A report from the General Assembly is attached at Annex 6.

The goal of the second General Assembly was the election of the new IALA Council for the period 2006-2010. A copy of the report from the second General Assembly, including a list of the elected council members, is attached at Annex 7.

Following the election of council members, presentations were provided for both VTS2008 and the XVIIth IALA Conference.

## *6.1 Invitation to VTS2008*

J.E. Hagen, Director, Norwegian Coastal Administration provided a presentation on VTS2008 – A Global Approach, to be held in Bergen, Norway. He noted that Bergen is a dynamic location for the Symposium, with a growing network of VTS centres. The focus for the Symposium will be the role of VTS in global traffic monitoring, legal aspects of providing VTS, recruitment, training and maintaining professional competencies for VTS personnel, the role of VTS in the emerging concept of e-navigation, innovations and improvements in VTS operations and the unique aspects of providing VTS in arctic regions.

## *6.2 Invitation to XVIIth IALA Conference, 2010*

Mr. Mvikeli Matutu, General Manager: Maritime Services, National Ports Authority of South Africa (NPA) invited delegates to the XVIIth IALA Conference, to be held in Cape Town, South Africa. His very dynamic presentation noted that it is an honour for the NPA and South Africa to host the 17th IALA conference in the City of Cape Town in 2010, being an exceptionally important event, not only for South Africa, but for Africa as a whole as this will be the first time that the continent plays host to the world leaders representing IALA.

He indicated that the Conference will be held at one of Africa's finest conference centres, surrounded by arguably one of the best sceneries in the world – the ocean on one side and the famous Table Mountain on the other; a place with a sense of place at the tip of the African continent; a place where the Indian Ocean meets the Atlantic Ocean; a place where water lend land the hand.

All IALA members were invited to Cape Town, South Africa to participate in the Conference, the IALA General Assembly and the Industrial Members' Exhibition in March 2010.

# 7. Industrial Members Exhibition


The Industrial Members Exhibition was opened at 1530 on Tuesday 23rd May by Mr Wang Qiang, President of the Industrial Members Committee (IMC). Mr Wang thanked participants to the Conference for their interest in the exhibition and for their attendance at its opening.

Mr Torsten Kruuse, on behalf of IALA expressed his appreciation for the work of the IMC during the past four years in planning the event and to exhibitors for their response to the invitations to participate in it.

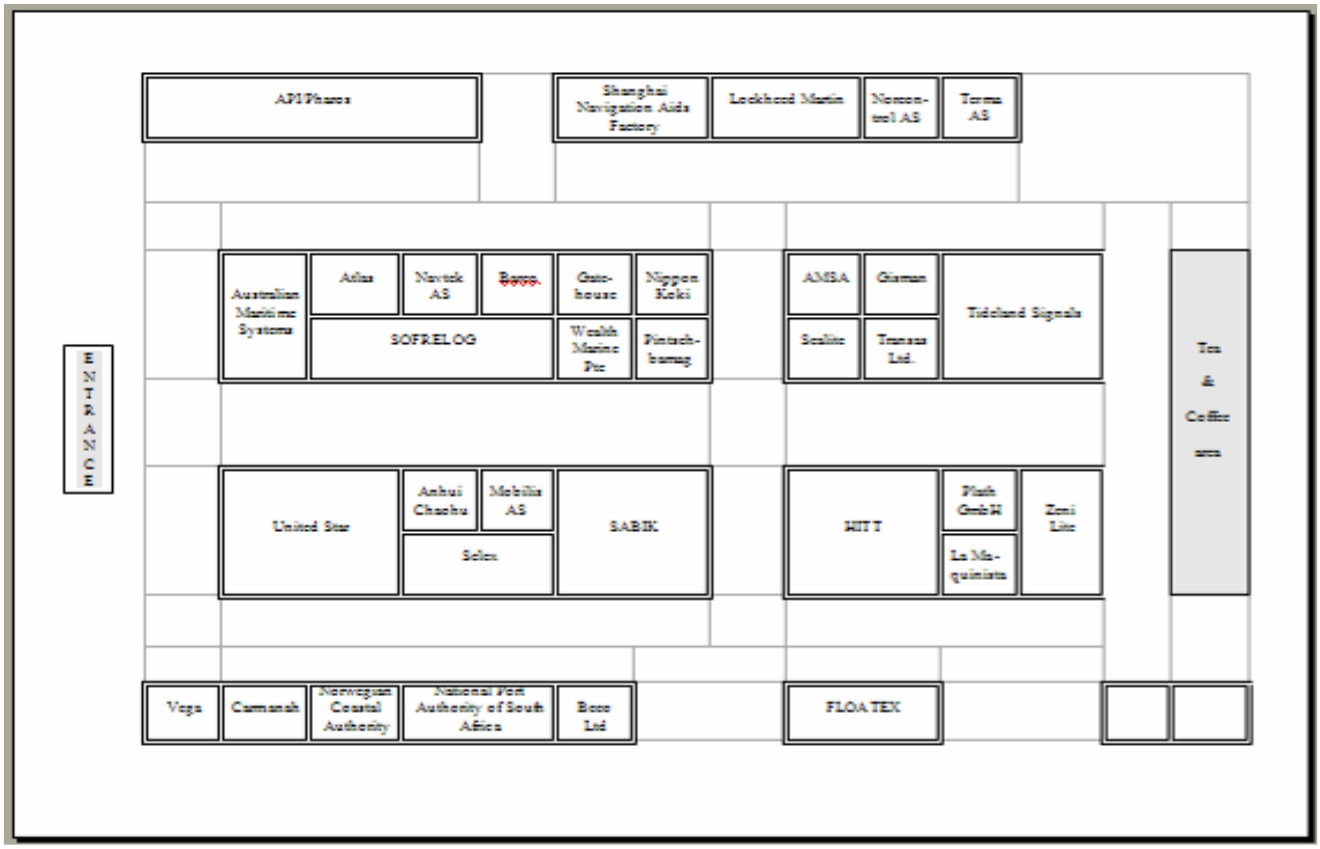
Thirty two Industrial Members exhibited their products and three National Members advertised forthcoming IALA events. The details of the exhibitors and the themes of their displays were:

| Name of exhibitor | Theme of display |
|---|---|
| Australian Maritime Systems | Construction, installation and maintenance of electronic Aids to Navigation |
| Australian Maritime Safety Authority (AMSA) | Means by which AMSA meets its responsibilities for safety, security and emergency response in the maritime sector. |
| Anhui Chaohu Yinhuan Anchor | Anchor chains, LED lights and lanterns, including solar power, and radar beacons |
| Automatic Power Inc.,/AB Pharos Marine Ltd., | AIS transponders for Aids to Navigation; New developments for LED lights |
| AB Pharos Marine Ltd., | Solar panels and LED lanterns, including rotating lights |
| Atlas Elektronik GmhB | Vessel Traffic control and surveillance system |
| Barco | System integration for VTS and coastal surveillance |
| Beco Batteries Ltd. | Solar panels, batteries and battery supply advice |
| Carmanah Technologies Inc. | Self contained solar powered marine Aids to Navigating lights |
| Floatex s.r.l. | AIS transponders for Aids to Navigation; LED and traditional lights and buoys |


| Name of exhibitor | Theme of display |
|---|---|
| GateHouse A/S | Shore based AIS solutions for ports, national authorities and international authorities. |
| GISMAN | Lanterns, port entrance lights and racons |
| HITT Holland | Software design for the management and control of Aids to navigation including VTS and portable pilot units |
| La Maquinista Valenciana, SA | Solar panels and LED lights including rotating beacons and self contained 5 nautical mile range lights |
| Lockheed Martin | Maritime Safety, security and surveillance |
| Mobilis SAS | Buoys and LED lanterns |
| NAVTEK AS | VTS, VTMIS and coastal surveillance |
| Nippon Koki Kogyo Co. Ltd., | LED: beacons; sector lights and self contained beacons |
| Norcontrol IT A/S | Seascope integrated display system |
| Norwegian Coastal Administration Harbour, Lighthouse & Pilotage Services | 2008 VTS Symposium in Bergen |
| National Ports Authority of South Africa | 2010 IALA Conference in Cape Town |
| Pintsch-Bamag Antriebs-und Verkehrstechnik GmbH | LED Lanterns, sector lights, rotating beacons and remote monitoring systems |
| Plath GmbH | Shore VHF D/F equipment, including live demonstration |


| Name of exhibitor | Theme of display |
|---|---|
| SABIK OY | Full range of LED lanterns, remote monitoring system and components for buoys operating in ice. |
| Sealite Pty. Ltd. | Latest advances in LED technology |
| Selex Integrated Systems S.p.A. | Integrated Vessel Traffic Services |
| Shanghai Aids to Navigation Factory (SNAF) | LED lanterns and range lights, radar reflectors, buoys and solar panels |
| SOFRELOG | Design, installation and maintenance of VTS and coastal surveillance systems |
| Terma A/S | Sensor technology for VTS and coastal surveillance radars |
| Tideland Signal Corporation | Latest LED technology, small port VTS display and lightweight buoys |
| TRANSAS Eurasia Ltd. | Software and hardware for VTS, VTMIS and coastal and port surveillance systems. Shipborne ECDIS equipment |
| United Star Navigation Technology Co. Ltd., | oftware management programmes for VTS and AIS, VTMIS. lights and lanterns |
| Vega Industries Ltd., | Self contained solar lights, low input power lights |
| Wealth Marine Pte Ltd | Radar beacons, self contained LED signal lanterns and lights and solar powered range lights |
| Zeni Lite Buoy Co. Ltd., | AIS technology for Aids to navigation; LED technology for lights and lanterns |


**Layout of Exhibition Hall**




In addition, two buoys were exhibited outside of the Exhibition Hall, one by Floatex and an inflatable one by Chaohu Yinhuan.

# 8. Buoy Tender Visits

Two buoy tenders participated in the Conference. The USCG Cutter Sequoia and the JCG Vessel Tsushima. Both vessels provided tours and receptions for delegates during the conference.

# 9. Social Events

## *9.1 Welcome Reception*

On May 21st, China MSA, the host for the Conference, welcomed delegates to a reception in International Convention Centre.

## *9.2 Official Conference Dinner*

On May 22nd an Official Conference Dinner was held in the International Convention Centre. Amid entertainment and music, delegates were treated to traditional Chinese cuisine. During the dinner, Admiral E. Mitropolous was recognized as an honorary member of IALA.

## *9.3 Industrial Members Chinese Night*

'A night in Shanghai' was the theme of the Industrial Members Dinner on May 24th. The location on the boardwalk at the edge of the river provided delegates with an excellent opportunity to view the busy shipping, and the bright colours of Shanghai. After entertainment representing various aspects of Chinese culture delegates were treated to a spectacular fireworks display.

## *9.4 Formal Closing Dinner*

The final banquet, a formal event, was held at the Telecom Tower, Shanghai on May 27th. The venue provided delegates with an unsurpassed view of the city of Shanghai. Prior to the event, Mr. C. Davidson, the retiring President of IALA handed over the badge of office to his success, Capt. G. Lui.

# 10. Acknowledgments

The Conference expressed its appreciation to China MSA and their sponsors for their invaluable support of the XVIth IALA Conference.

* * * * *

## Annex 1 – List of Delegates

### ARGENTINA

**Benmuyal, Capt Raűl Eduardo**
Head, Servicio de Hidrografía Naval
Av. Montes de Oca 2124
BUENOS AIRES (C1270ABV)
Tel: 54 11 4303 2298
Fax: 54 11 4303 0939
Email: rbenmuyal@hidro.gov.ar

**Escalante, Mr. Raul**
Aids to Navigation Manager
Hidrovia SA
Corrientes 316 – Piso 2
BUENOS AIRES C 1043 AAQ
Tel: 54 11 4320 6900
Fax: 54 11 4320 6931
Email: hidrovia@iplanmail.com.ar

### AUSTRALIA

**Bell, Mr. Andrew**
Manager (Aids to Navigation)
Maritime Safety Queensland
Floor 26, Mineral House, 41 George Street
BRISBANE 4000
Tel: 61 7 3120 7001
Fax: 61 7 3120 7449
Email: andy.c.bell@msp.qld.gov.au

**Brine, Mr. Gerard**
Manager – Maritime Safety
Australian Maritime Safety Authority
Level 1, 25 Constitution Ave
CANBERRA 2601
Tel: 02 6279 5664
Fax: 02 6279 5966
Email: can@amsa.gov.au

**Davidson, Mr. Clive**
Chief Executive Officer
Australian Maritime Safety Authority
Level 2, Allan Woods Building, 25 Constitution Ave
CANBERRA 2601
Tel: 61 2 6279 5039
Fax: 61 2 6279 5813
Email: kxo@amsa.gov.au

**Davis, Mr. John Paul**
Operations Manager
Australian Maritime Systems
30 Eagleview Place Eagle Farm
BRISBANE 4009
Tel: 61 7 3633 4103
Fax: 61 7 3268 1781
Email: jpo@marsys.com.au

**Foster, Mr. John**
Chief Executive Officer
AMC Search Ltd.
P.O. BOX 986
LAUNCESTON 7250
Tel: 61 3 63354855
Fax: 61 3 63354312
Email: l.jennings@amc.edu.au

**Jeffkins, Mr. David**
Maritime Manager
Australian Maritime Safety Authority
Level 1, 25 Constitution Ave
CANBERRA 2601
Tel: 02 6279 5664
Fax: 02 6279 5966
Email: can@amsa.gov.au

**Lemon, Mr. Nicholas**
Network Planning Manager
Australian Maritime Safety Authority
Level 1, 25 Constitution Ave
CANBERRA 2601
Tel: 02 6279 5664
Fax: 02 6279 5966
Email: can@amsa.gov.au

**Orlando, Mr. Kristina**

Office Manager (Executive & Board Coordinator)
Australian Maritime Safety Authority
Level 2, Allan Woods Building, 25 Constitution Ave
CANBERRA 2601
Tel: 61 2 6279 5066
Fax: 61 2 6279 5813
Email: kxo@amsa.gov.au

**Prosser, Mr. Gary Andrew**

General Manager - MSES
Australian Maritime Safety Authority
Level 1, 25 Constitution Ave
CANBERRA 2601
Tel: 02 6279 5664
Fax: 02 6279 5966
Email: can@amsa.gov.au

**Ries, Mr. Brian**

Project & Heritage Officer
Australian Maritime Safety Authority
Level 1, 25 Constitution Ave
CANBERRA 2601
Tel: 02 6279 5664
Fax: 02 6279 5966
Email: can@amsa.gov.au

**Satchell, Mr. Peter**

Manager Engineering Services
Australian Maritime Systems
30 Eagle View Place, Eagle Farm
BRISBANE 4009
Tel: 61 7 3633 4105
Fax: 61 7 3268 1781
Email: pjs@marsys.com.au

## AUSTRIA

**Moser, Mr. Thomas**

System Designer
Frequentis GMBH
Wolfganggasse 58-60
VIENNA 1120
Tel: 43 1 81150 1134
Fax: 43 1 81150 2499
Email: Thomas.moser@frequentis.com

## BELGIUM

**De Maere, Miss Katrijn**
Head of VTS
Shipping Assistance Division (Ministry of The Flemish Community)
Kantinestraat 3
OSTEUD 8400
Tel: 32 59 25 54 55Maere
Fax: 32 59 25 54 41
Email: katrijn.demaere@lin.vlaanderen.be

**Maekelberg, Mr. Yves**
Project Engineer
Shipping Assistance Division (Ministry of The Flemish Community)
Kantinestraat 3
OSTEUD 8400
Tel: 32 59 25 54 40
Fax: 32 59 25 54 41
Email: yves.mackelberg@lin.vlaanderen.be

## BRAZIL

**Listo, Capt Paulo**
Director
Centor Almirante Moraes Rego
Tel: 55 21 2613-8132
Fax: 55 21 2613-8133
Email: listo@camr.mar.mil.br

## CANADA

**Drabit, Ms Mimi**
Sales Manager – Marine Division
Carmanah Technologies Inc.
4-203 Harbour Road
VICTORIA V9A 3S2
Tel: 1 250 380 0052
Fax: 1 250 380 0062
Email: mdrabit@carmanah.com

**Châteauvert, Mr. André**

**Manager, Aids to Navigation**
Canadian Coast Guard
200 Kent Street, Maildrop 5N186
OTTAWA K1A OE6
Tel: 613 998 1405
Fax: 613 998 8428
Email: ChateauvertA@dfo-mpo.gc.ca

**Lorquet, Mr. Jacques**

Director, Navigation Systems
Canadian Coast Guard
200 Kent Street, Maildrop 5N186
OTTAWA K1A OE6
Tel: 613 998 1384
Fax: 613 998 8428
Email: LopquetJ@dfo-mpo.gc.ca

**Gillis, Mr. Ian**

Risk Assessment Office
Canadian Coast Guard
200 Kent Street, Maildrop 5N186
OTTAWA K1A OE6
Tel: 613 990 3115
Fax: 613 998 0454
Email: GillisI@dfo-mpo.gc.ca

**Pouliot, Capt Michel**

President
Canadian Marine Pilots Association
1311 Rue Du General Allard
QUEBEC G1W 3G3
Tel: 418 651 0273
Fax: 418 651 4734
Email: michelpouliot@oympatico.ca

**Potter, Mr. Kevin**

Director
Auditor General of Canada
414-1660 Hollis Street
HALIFAX B0N 2A0
Tel: 1 902 426 9371
Fax: 1 902 426 8591
Email: Kevin.Potter@oag-bvg.gc.ca

**Wee, Mr. Sun**
Manager Engineering and Maintenance Services
Canadian Coast Guard
200 Kent Street, Maildrop 5N186
OTTAWA K1A OE6
Tel: 613 998 1514
Fax: 613 998 9258
Email: WeeS@dfo-mpo.gc.ca

## CHILE

**Amgio, Mr. Antonio**
Head of The Maritime Signalling Service
Directorate General of The Maritime Terri'
Errazuriz 537
VALPARAISO
Tel: 56 32 208201
Fax: 56 32 208085
Email: dai@directemar.cl

**Martinez, Mr. Francisco**
Director General
Directorate General of The Maritime Terri'
Errazuriz 537
VALPARAISO
Tel: 56 32 208201
Fax: 56 32 208085
Email: dai@directemar.cl

## China (People's Republic)

**LIU, Captain Gongchen**
Executive Director-General
Maritime Safety Administration of P. R. China
11 Jianguomennei Ave
Beijing 100736
Tel: 86 10 65292218
Fax: 86 10 65292456
Email: liugongchen@msa.gov.cn

**ZHENG, Mr. Heping**
Deputy Director-General
Maritime Safety Administration of P. R. China
11 Jiangguomennei Ave
Beijing 100736
Tel: 86 10 65292218
Fax: 86 10 65292456
Email: zhengheping@msa.gov.cn

**CHEN, Mr. Aiping**
Director General
Shanghai Maritime Safety Administration of P. R. China
190 Siping Road Shanghai 200086
Tel: 86 21 53931508
Fax: 86 21 53931549
Email: cap@shmsa.gov.cn

**YANG, Mr.Pansheng**
Director General
Hainan Maritime Safety Administration of P. R. China
145, Binjiang Ave. Haikou, Hainan
570311
Tel: 86-898-688662743
Fax: 86-898-68662753

**LIN, Mr.Yunai**
Chief Commissioner of Aids to Navigation Committee of Navigation Association of China
B-801, Huacun Mensions, Jia 29, Sanhuanzhong Road, Xicheng District, Beijing
Tel: 86-10-62369699
Fax: 86-10-62369689

**ZHAO, Mr. Yaxing**
Deputy Director-General
Tianjin Maritime Safety Administration of P. R. China
No.3, 1 Wenanli, Guizhou Road, Guangzhou Ave. Tanggu, Tianjin
Tel: 86-22-66311368
Fax: 86-22-66707273
Email: zhaoyaxing@msa.gov.cn

**MO, Mr. Qi**
Deputy Director-General
Guangdong Maritime Safety Administration of P. R. China
520, Binjiang E. Road, Guangzhou
Guangdong 510230
Tel: 86-20-34298892
Fax: 86-20-34290275

**HONG, Mr. Chong**
Deputy Director-General
Shanghai Maritime Safety Administration of P. R. China
190 Siping Road
Shanghai 200086
Tel: 86 21 53931508
Fax: 86 21 53931549

**HAN, Mr. Wei**
Director
Maritime Safety Administration of P.R.China
11 Jiangguomennei Ave
Beijing 100736
Tel: 86 10 65292890
Fax: 86 10 65292893
Email: hanwei@msa.gov.cn

**JIANG, Ms. Xuemei**
Director
Maritime Safety Administration of P.R.China
11 Jiangguomennei Ave
Beijing 100736
Tel: 86 10 65292595
Fax: 86 10 65292456
Email: jiangxuemei@msa.gov.cn

**JIN, Mr. Shengli**
Vice Director
Maritime Safety Administration of P.R.China
11 Jiangguomennei Ave
Beijing 100736
Tel: 86 10 65292587
Fax: 86 10 65292893
Email: jinshengli@msa.gov.cn

**MA, Mr. Jianshe**
Vice Director
Tianjin Maritime Safety Administration of P. R. China
34, Heiniucheng Ave. Hexi District, Tianjin 300211
Tel: 86 22 28246588
Fax: 86 22 28246588
Email: majianshe@msa.gov.cn

**LU, Mr. Yongqiang**
Engineer
Shanghai Maritime Safety Administration of P. R. China
190 Siping Road
Shanghai 200086
Tel: 86 21 53931500
Fax: 86 21 53931549
Email: luyongqiang@shmsa.gov.cn

**BAO, Mr. Jianbo**
Engineer
Shanghai Maritime Safety Administration of P. R. China
190 Siping Road
Shanghai 200086
Tel: 86 21 53931500
Fax: 86 21 53931549
Email: baojianbo@shmsa.gov.cn

**ZHOU, Mr. Yizong**
Director
Shanghai Maritime Safety Administration of P. R. China
190 Siping Road
Shanghai 200086
Tel: 86 21 53931500
Fax: 86 21 53931549
Email: zhouyizong@shmsa.gov.cn

**HU, Mr. Wei**
Engineer
Maritime Safety Administration of P. R. China
11 Jiangguomennei Ave
Beijing 100736
Tel: 86 10 65292587
Fax: 86 10 65292893
Email: huwei@msa.gov.cn

**YANG, Mr. Liang**
Guangdong Maritime Safety Administration of P. R. China
520, Binjiang E. Road, Guangzhou
510230
Tel: 86-20-34298892
Fax: 86-20-34290275

**HE, Mr. Genlin**
Engineer
Shanghai Maritime Safety Administration of P.R.China
190 Siping Road
Shanghai 200086
Tel: 86 21 58073447
Fax: 86 21 68287190
Email: hegenlin@shmsa.gov.cn

## DENMARK

**Andersen, Mr. Kristian Bech**
Marketing Coordinator
Gatehouse A/S
Lindholm Brygge 31
Nr. SUNDNY 9400
Tel: 45 7020 1909
Fax: 45 7020 1910
Email: kba@gatehouse.dk

**Ankerstjerne, Ms Pia**
Gatehouse A/S
Lindbolm Brygge 31
NOERRESUNDBY
Tel: 45 7020 1909
Fax: 45 7020 1910
Email: pan@gatehouse.dk

**Brandt, Capt Jorgen**
Manager
VTS Great Belt, Admiral Danish Fleet
Sylowsvej 8
KORSOR DK-4220
Tel: 45 5837 6868
Fax: 45 5837 2819
Email: chvts@vts.svn.dk

**Engberg, Mr. Per Christian**
Marketing Coordinator
Gatehouse A/S
Lindholm Brygge 31
Nr. SUNDNY 9400
Tel: 45 7020 1909
Fax: 45 7020 1910
Email: pch@gatehouse.dk

**Eriksson, Mr. Omar Frits**
Head of Technical Division
Royal Danish Administration of Navigation and Hydrography
Overgaden O. Vandet 62B
COPENHAGEN DK-1023
Tel: 45 3268 9598
Fax: 45 3268 9634
Email: ofe@frv.dk

**Eskildsen, Mr. Svend**
Director General
Royal Danish Administration of Navigation and Hydrography
Overgaden O. Vandet 62B
COPENHAGEN DK-1023
Tel: 45 3268 9565
Fax: 45 3268 9665
Email: ses@frv.dk

## ESTONIA

**Käärmann, Mr. Leo**
Deputy Head of Aids to Navigation and Hydrography Division
Estonian Maritime Administration
Valge 4
TALLINN 11413
Tel: 372 6205 600
Fax: 372 6205 606
Email: leo.kaarmann@vta.ee

**Kivimae, Mr. Taivo**
Deputy Head of Aids to Navigation and Hydrography Division
Estonian Maritime Administration
Valge 4
TALLINN 11413
Tel: 372 6205 600
Fax: 372 6205 606
Email: taivo.kivimae@vta.ee

**Ots, Mr. Tarmo**
Head of Foreign Relation and Information Dept
Estonian Maritime Administration
Valge 4
TALLINN 11413
Tel: 372 6205 529
Fax: 372 6205 506
Email: tarmo.ots@vta.ee

**Prela, Mr. Toivo**
Head of Aids to Navigation and Hydrography Division
Estonian Maritime Administration
Valge 4
TALLINN 11413
Tel: 372 6205 600
Fax: 372 6205 606
Email: toivo.prela@vta.ee

## FINLAND

**Bäcström, Mr. Rolf**
Deputy Director
Finnish Maritime Administration
Porkkalankatu 5; P.O. BOX 171
HELSINKI FI-00181
Tel: 358 40 588 7817
Fax: 358 204 48 4470
Email: rolf.bacustrom@fma.fi

**Kostiainen, Mr. Keijo**
Director
Finnish Maritime Administration
Porkkalankatu 5; P.O. BOX 171
HELSINKI FI-00181
Tel: 358 204 48 4578
Fax: 358 204 48 4555
Email: keijo.kostiainen@fma.fi

**Mansner, Mr. Lars Bertel**
Marketing Director
Sabik
P.O. BOX 19
PORVOO FIN06151
Tel: 358 19 560 1100
Fax: 358 19 560 1120
Email: lars.mansner@sabik.com

## FRANCE

**Bertrand, Mr. Xavier**
AIS and VTS Specialist
CETMEF
Technopole Brest-Iroise B.P.5
PLOUZANE 29 280
Tel: 33 298 056 803
Fax: 33 298 056 767
Email: Xavier.bertrand@equipement.gouv.fr

**Cunty, Mr. Guy**
Ing. Head of Technical Group
CETMEF
Av. President Kennedy
AIX PROVENCE 13 090
Tel: 33 442 52 74 25
Fax: 33 442 52 74 01
Email: guy.cunty@equipement.gouv.fr

**Degre, Mr. Thomas**
Research Director
Inrets
2 Av, Du G1 Mallerel-Joinville
ARCUEIL 94114
Tel: 331 4740 7296
Fax: 331 4547 5606
Email: degre@inrets.fr

**Guigueno, Mr. Vincent**
Bureau Des Phares Et Balises
Technopole Brest-Iroise B.P.5
COURBEVOIE 92400
Tel: 33 686 770799
Email: Vincent.guigueno@m4x.org

**Kergadallan, Mr. Xavier**
Lights Specialist
CETMEF
Technopole Brest-Iroise B.P.5
PLOUZANE 29 280
Tel: 33 298 056 788
Fax: 33 298 056 767
Email: Xavier.kergadallan@equipement.gouv.fr

**Manchard, Mr. Jacques**
Head of The Maritime Aids to Navigation Division (Phares et Balises)
Ministry for Transport, Infrastructure, Tourism and The Sea – Directorate for Maritime Affairs
3, Place De Fontenoy
75 007 Pairs
Tel: 33 1 44 49 86 81
Fax: 33 1 44 49 86 80
Email: Jacques.manchard@equipement.gouv.fr

**Ville, Mrs. Christiane**
3O Rue De Groussay
RAMBOUILLET 78120
Tel: 33 1 34 83 88 30
Email: cville@wanadoo.fr

## GERMANY

**Bober, Mr. Stefan Karl**
System Engineer AIS
German Federal Waterways and Shipping Administration
Weinbergstrasse 11-13
KOBLENZ
Tel: 49 261 9819 2231
Fax: 49 261 9819 2155
Email: sbober@fvt.wsv.de

**Christiansen, Mr. Arno**
Deputy Head ANT
Federal Ministry of Transport
Robert-Schuman-Platz 1
Bonn 53175
Tel: 49 228 300 4222
Fax: 49 228 300 1478
Email: arno.christiansen@bmvbs.bund.de

**Eckhoff, Mr. Dirk**
System Engineer VTS
Federal Waterways and Shipping Administration
Hindenburgufer 247
KIEL D-24106
Tel: 49 431 3394 5702
Fax: 49 431 3394 6399
Email: deckhoff@wsd-nord.de

**Eusterbarkey, Mr. Hendrik**
System Engineer
Federal Waterways and Shipping Administration
Hindenburgufer 247
KIEL D-24106
Tel: 49 431 3394 5703
Fax: 49 431 3394 6399
Email: HEusterbarkey@wsd-nord.de

**Forst, Mr. Christian**
Head of Devision
Federal Waterways and Shipping Administration
Hindenburgufer 247
KIEL D-24106
Tel: 49 431 3394 5700
Fax: 49 431 3394 6399
Email: CForst@wsd-nord.de

**Giertz, Mr. Philip**
Captain
Federal Waterways and Shipping Directorate, FRG
Westerende 42
LEER D-26780
Tel: 49 4941 802 354
Fax: 49 4941 602 378
Email: giertz@aur.wsdnw.de

**Hoppe, Mr. Michael**
Radio Navigation System
German Federal Waterways Administration
Weinbergstrasse 11-13
KOBLENZ
Tel: 49 261 9819 2221
Fax: 49 261 9819 2155
Email: mhoppe@fvt.wsv.de

**Jaber, Capt Khaled**
Head Of AtoN Depart
Pintsch Bamag GmbH
Huenxer S tr. 149
DINSLAKEN 46537
Tel: 49 2064 602 252
Fax: 49 2064 602 283
Email: khaled.jaber@pintschbamag.de

**Piper, Mr. Steven**
Head of Sales Support
PLATH GMBH
Gotenstrasse 18
HAMBURG 20097
Tel: 49 40 237 34 253
Fax: 49 40 237 34 222
Email: steven.piper@plath.de

**Schumacher, Capt Norbert**
IMPA/Bundeslotsenkammer
Nikisch Str. 8
HUMBURG 22761
Tel: 49 40 82 40 75
Fax: 49 40 82 27 81 75
Email: LBE-Hamburg@elbe-pilot.de

**Strenge, Mr. Rainer**
Head of Traffic Technologies
Federal Waterways and Shipping Administration
Weinberg Str. 11-13
KOBLENZ 56070
Tel: 49 261 9819 2000
Fax: 49 261 9819 2155
Email: rstrenge@fvt.wsv.de

## HONG KONG CHINA

**Chan, Mr. Cueuk Sang**
Senior Marine Officer and Training
Marine Department, Hong Kong SAR
MDTC, 1st Floor, Government Dockyard, Nging Shuang R.D.
HONG KONG
Tel: 852 2307 3669
Fax: 852 2307 3893
Email: cschan@mardep.gov.hk

**Lee, Mr. Ka Mo**
Assistant Department of Marine and Port Control
Marine Department, Hong Kong SAR
2208, Harbour Building, 38 Pier Road, Central
HONG KONG
Tel: 852 2855 4403
Fax: 852 2544 9241
Email: KM-Lee@mardep.gov.hk

## IALA – AIM

**Alimchandani, Mr. Mahesh**
IALA Headquarters
20 ter, Rue Schnapper
Saint Germain-en-Laye 78100
Tel: 33 1 3451 7001
Fax: 33 1 3451 8205
Email: mahesha@wanadoo.fr

**Carson-Jackson, Ms. Jillian**
Technical Coordination Manager,
IALA Headquarters
20 ter, Rue Schnapper
Saint Germain-en-Laye 78100
France
Tel: 33 1 3451 7001
Fax: 33 1 3451 8205
Email: jillian.carson@wanadoo.fr

**deBievre, Ms Aline**
C/O IALA Headquarters
20 ter, Rue Schnapper
Saint Germain-en-Laye 78100
France
Tel: 33 1 3451 7001
Fax: 33 1 3451 8205
Email: iala-aism@wanadoo.fr

**Grillet, Mrs. Marie-Helene**
Administration Manager
IALA Headquarters
20 ter, Rue Schnapper
Saint Germain-en-Laye 78100
France
Tel: 33 1 3451 7001
Fax: 33 1 3451 8205
Email: mariehelene.grillet@wanadoo.fr

**Kent, Mr. Peter**
IALA Technical Consultant
38 Stanbury Road,
Huxton, Andover,
Hampshire, UK
SB11 8NS
Tel: +44 (1264) 77 21 91
Fax: +44 (1264) 77 30 31
Email: pekent@globalnet.co.uk

**Kruuse, Mr. Torsten**
Secretary General
IALA Headquarters
20 Ter, Rue Schnapper
Saint Germain-en-Laye 78100
France
Tel: +33 1 3451 7001
Fax: +33 1 3451 8205
Email: iala-aism@wanadoo.fr

**Leclair, Mr. Jean-Charles**
IALA Representative to IMO
AISM-IALA
20 Rue De La Colle
LA CADIÈRE D'AZUR 83740
France
Tel: +33 494983162
Email: jean.Leclair@wanadoo.fr

**Mbong, Ms. Lorraine**
IALA Headquarters
20 ter, Rue Schnapper
Saint Germain-en-Laye 78100
France
Tel: +33 1 3451 7001
Fax: +33 1 3451 8205
Email: iala-aism@wanadoo.fr

**Ridgway, Mr. Paul**
Editor, IALA Bulletin
No. 3, The Green Kelton,
Stamford, Lincolnshire
PE9 3RA
England
Tel: +44 (1) 780 721 628
Fax: +44 (1780) 721 980
Email: pridgway@globalnet.co.uk

**INDIA**

**Grewal, Mr. H.S.**
Managing Director
Ana Navaids Ltd.
193, Western Avenue, Sainik Farms
NEW DELHI 110062
Tel: 91 11 2955 6883
Fax: 91 11 2955 6939
Email: ananavaids@hotmail.com

**Sinha, Mr. D.K.**
Director
Director General of Lighthouse and General
A-13, Sector-214
NOIDA 201 301
Tel: 91 118 452 4007
Fax: 91 118 452 7683
Email: dgll@ndb.vsnl.net.in

**Suman, Mr. M.M. Singh**
Director General
Director General of Lighthouse and General
A-13, Sector-214
NOIDA 201 301
Tel: 91 118 452 4007
Fax: 91 118 452 7683
Email: dgll@ndb.vsnl.net.in

## INDONESIA

**Masman, Mr. Adiwidjaja**
Executive Director
Kemenangan, PT
J1. Gunung Sahari 75
JAKARTA 10610
Tel: 62 21 4200052
Fax: 62 21 4207083
Email: Kemenangan@cbn.net.id

## IRELAND

**Boland, Mr. Frank**
Chairman
Commissioners of Irish Lights
16 Lower Pembroke Street
DUBLIN 2
Tel: 358 1 632 1902
Fax: 358 1 676 8619
Email: s.bedlow@cil.ie

**Doyle, Mr. James**
Head of Engineering
Commissioners of Irish Lights
16 Lower Pembroke Street
DUBLIN 2
Tel: 358 1 632 1970
Fax: 358 1 676 8619
Email: s.doyle@cil.ie

**Ericsson, Mr. Holger**
Sales Director, Shore-Based Systerms
Transas Limited
10 Easgate Avenue, Eastgete Business Park, Little Island
CORK
Tel: 353 2147 10 400
Fax: 353 2147 10 410
Email: Holger.Ericsson@transas.com

**Hickey, Capt John J.**
Head of Marine
Commissioners of Irish Lights
5 Lamberton Grove
ARKLOW
Tel: 353 1 632 1930
Fax: 353 1 632 1946
Email: s.hickey@cil.ie

**Ruttle, Dr Stuart**
Chief Executive
Commissioners of Irish Lights
16 Lower Pembroke Street
DUBLIN 2
Tel: 358 1 632 1901
Fax: 358 1 676 8619
Email: s.ruttle@cil.ie

## ITALY

**Frau, Mr. Francesco**
Strategic Planning
SELEX-SI
Via Tiburtina Km. 12. 400
ROME IT 00131
Tel: 39 06 4150 2012
Fax: 39 06 4150 3643
Email: ffrau@selex.com

**Lolli, Admiral Ferdinando**
Head of Vii Department-Research and Development
Italian Coast Guard
Via Dell' Arte, 16
ROME 00144
Tel: 39 06 5908 4393
Fax: 39 06 5908 4942
Email: ferdiando.lolli@infrastrutturetrasporti.it

**Pellizzari, Capt Piero**
Structural Resources and Operative Systems Office Supervisor
Italian Coast Guard
Via Dell' Arte, 16
ROME 00144
Tel: 39 06 5908 4478
Fax: 39 06 5908 4440
Email: piero.pellizzari@infrastrutturetrasporti.it

**Sorge, Dr Stefano**
Unit Manager
D'Aprolonia S.p.a
Via Paclo di Rono, 223
ROME 00142
Tel: 39 06 5199 0631
Fax: 39 06 5199 0670
Email: Stefano.sorge@daprolonia.it

**Zuurbier, Dr Rodolfo**
Manager Director
Flatex SRL
Via Cave N. 12
PROVAGLIO DI ISEO 25050
Tel: 39 030 9823255
Fax: 39 030 9823599
Email: sale@floatex.it

## IVORY COAST

**Dagou, Mr. Ossey Albert**
Directeur Adjoint De La Logistique
Port Autonome D'Abidjan
01 BP 3254 ABIDJAN 01
Tel: 225 0707 6606
Fax: 225 2125 1947
Email: oadag@hotmail.com

## JAPAN

**Card, Mr. Michael**
Technical Director
Zeni Lite Buoy Co., Ltd.
PO BOX 54, East Horsley Surrey
KT24 5EW
Tel: 44 1483 28 1344
Email: overseas@zenilite.co.jp

**Funamoto, Mr. Iichiro**
Sales and Marketing
Japan Radio Co., Ltd.
6-1-10 Nishishinjuku, Shinjuku-Ku
Tokyo 160-8328
Tel: 3 3348 4099
Fax: 3 3348 4139
Email: funamoto.iichiro@jrc.co.jp

**Ikeda, Mr. Tamotsu**
Corporate Advisor
Tokimec Inc.
2-16-46, Minami-Kamata, Ohta-Ku
TOKYO 114-8551
Tel: 81 3 3737 8630
Fax: 81 3 3737 8668
Email: t_ikcda@tokimec.co.jp

**Imai, Mr. Tadayoshi**
Director, Aids to Navigation Engineer Division, Maritime Traffic Department
Japan Coast Guard
2-1-3 Kasumigaseki, Chiyoda-Ku
TOKYO 100-8918
Tel: 81 3 3591 6361
Fax: 81 3 3591 5468
Email: seibi@kaiho.mlit.go.jp

**Kamimoto, Mr. Ken**

Sales and Marketing
Japan Radio Co., Ltd.
6-1-10 Nishishinjuku, Shinjuku-Ku
Tokyo 160-8328
Tel: 3 3348 4099
Fax: 3 3348 4139
Email: kamimoto.ken@jrc.co.jp

**Kan, Mr. Masami**

Sales and Marketing
Japan Radio Co., Ltd.
6-1-10 Nishishinjuku, Shinjuku-Ku
Tokyo 160-8328
Tel: 3 3348 3790
Fax: 3 3348 3804
Email: kan.masami@jrc.co.jp

**Kato, Mr. Makoto**

Adviser
Nippon Koki Kogyo Co., Ltd.
290 Shimohirama Saiwai - Ku
KAWASAKI 212 - 0053
Tel: 44 522 6341
Fax: 44 555 7166
Email: makoto_kato@nipponkoki.co.jp

**Kato, Mr. Sakio**

General Manager
Zeni Lite Buoy Co., Ltd.
Hankyu Express Tokyo Building 4F, 3-9, Shinbashi 3-Chome
MINATO-KU 105-0004
Tel: 81 3 3595 3021
Email: overseas@zenilite.co.jp

**Maruoka, Mr. Noboru**

General Manger
Zeni Lite Buoy Co., Ltd.
Hankyu Express Tokyo Building 4F, 3-9, Shinbashi 3-Chome
MINATO-KU 105-0004
Tel: 81 3 3595 3013
Email: overseas@zenilite.co.jp

**Masuda, Mr. Eiichi**

Officer, Vessel Traffic Service System Office, Aids to Navigation Engineer Division, Maritime Traffic Department
Japan Coast Guard
2-1-3 Kasumigaseki, Chiyoda-Ku
Tokyo 100-8918
Tel: 81 3 3591 6361
Fax: 81 3 3591 5468
Email: seibi@kaiho.mlit.go.jp

**Masuda, Mr. Kazuhiko**

Director-General, Maritime Traffic Department
Japan Coast Guard
2-1-3 Kasumigaseki
CHIYODAKU 100-8918
Tel: 81 3 3591 5650
Fax: 81 3 3591 3590
Email: kotsukikaku@kaiho.mlit.go.jp

**Matsui, Mr. Teruhisa**

Director, Floating Aids to Navigation Office, Aids to Navigation Engineer Division, Maritime Traffic Department
Japan Coast Guard
2-1-3 Kasumigaseki, Chiyoda-Ku
TOKYO 100-8918
Tel: 81 3 3591 6361
Fax: 81 3 3591 5468
Email: seibi@kaiho.mlit.go.jp

**Mori, Mr. Katsimi**

President
Sena and Vans Co., Ltd.
1-6-6 Haneda-Koukou Ohta-Ku
TOKYO 144-0041
Tel: 81 35708 7300
Fax: 81 35708 0151
Email: morik@s-vans.com

**Murata, Mr. Hiroaki**

Manager, Marketing Engineer
Tokimec INC
2-16-46, Minami-Kamata, Ohta-Ku
TOKYO 114-8551
Tel: 81 3 3737 8630
Fax: 81 3 3737 8668
Email: h-murata@tokimec.co.jp

**Nitta, Mr. Takumi**

Executive Director
Japan Aids to Navigation Association
4-5 Kojimachi Chiyoda-Ku
TOKYO 102-0083
Tel: 81 3 3230 1470
Fax: 81 3 3230 1050
Email: nitta@jana.or.jp

**Shigematsu, Mr. Ryozo**

Senior Officer, Aids to Navigation Engineer Division, Maritime Traffic Department
Japan Coast Guard
2-1-3 Kasumigaseki, Chiyoda-Ku
Tokyo 100-8918
Tel: 81 3 3591 6361
Fax: 81 3 3591 5468
Email: seibi@kaiho.mlit.go.jp

**Shioyama, Mr. Toshio**

Chief Executive Director
Japan Lighthouse Accociation (Tokokai)
1-1-3, Nishi-shinbashi, Minato
TOKYO 105-0003
Tel: 81 3 3501 1054
Fax: 81 3 3501 0727
Email: tokokai-senmu@asashi.email.ne.jp

**Tanaka, Mr. Senji**

Chife Executive Director
Japan Aids to Navigation Association
4-5 Kojimachi Chiyoda-Ku
TOKYO 102-0083
Tel: 81 3 3230 1470
Fax: 81 3 3230 1050
Email: tanaka-sn@jana.or.jp

**Takeyasu, Mr. Mitsuru**

Executive Director
Zeni Lite Buoy Co., Ltd.
2-176-1 Toyoshima-Minami
IKADA 563-0035
Tel: 81 72 762 7001
Email: overseas@zenilite.co.jp

**Takeyasu, Mr. Tadashi**
President
Zeni Lite Buoy Co., Ltd.
2-176-1 Toyoshima-Minami
IKADA 563-0035
Tel: 81 72 762 7001
Email: overseas@zenilite.co.jp

**Toyama, Mr. Osamu**
Manager
Zeni Lite Buoy Co., Ltd.
2-176-1 Toyoshima-Minami
IKADA 563-0035
Email:

**Tsukinuki, Mr. Yoshito**
General Maneger
Nippon Koki Kogyo Co., Ltd.
290 Shimohirama Saiwai - Ku
KAWASAKI 212 - 0053
Tel: 44 522 6341
Fax: 44 555 7166
Email: tsukinuki@nipponkoki.co.jp

**Ueda, Mr. Mitsuru**
Manager
Nippon Koki Kogyo Co., Ltd.
290 Shimohirama Saiwai - Ku
KAWASAKI 212 - 0053
Tel: 44 522 6341
Fax: 44 555 7166
Email: m_ueda@nipponkoki.co.jp

**Uehara, Mr. Nobuyuki**
Sales and Marketing
Japan Radio Co., Ltd.
6-1-10 Nishishinjuku, Shinjuku-Ku
Tokyo 160-8328
Tel: 3 3348 3790
Fax: 3 3348 3804
Email: Uehara.nobuyuki@jrc.co.jp

**Ueno, Mr. Hiroshi**
President
Nippon Koki Kogyo Co., Ltd.
290 Shimohirama Saiwai - Ku
KAWASAKI 212 – 0053
Tel: 44 522 6341
Fax: 44 555 7166
Email: horoshi_ueno@nipponkoki.co.jp

**Yamakoshi, Mr. Yoshio**
Corporate Advisor
Tokimec Inc.
2-16-46, Minami-Kamata, Ohota-ku
TOKYO 144- 0035
Tel: 81 3 3737 8630
Fax: 81 3 3737 8668
Email: yoshio.yamakoshi@parkcity.ne.jp

## KOREA (REPABLIC OF)

**Bang, Mr. Young Kee**
President
Daekee Marine Corporation
58-5,Sungui-Dong, Cheil Bldg, 3F1.Nam- Gu
INCHEON 402-812
Tel: 82 32 886 7777
Fax: 82 32 886 7550
Email: ykbang@deakee.co.kr

**Jeon, Mr. Minsu**
Technique Research Department
Korea Association of Aids to Navigation
Hoseo B/D 501, 455-1 Dangsan 1Ga
Seoul 150-801
Tel: 82 2 2672 6995
Fax: 82 2 2672 7847
Email: minsuids@hanmail.net

**Kim, Mr. Kang On**
Senior Engineer
Ministry of Maritime Affair and Fisheries
#140-2, Gye-Dong, Jongro-Gu
Seoul 110-793
Tel: 82 2 3674 6340
Fax: 82 2 3674 6346
Email: ohmiri@momaf.go.kr

**Lee, Mr. Jang Woo**
Director
Ministry of Maritime Affair and Fisheries
#140-2, Gye-Dong, Jongro-Gu
Seoul 110-793
Tel: 82 2 3674 6340
Fax: 82 2 3674 6346
Email: leejw@momaf.go.kr

**Lee, Mr. Seung Jae**
Deputy Director
Ministry of Maritime Affair and Fisheries
#140-2, Gye-Dong, Jongro-Gu
Seoul 110-793
Tel: 82 2 3674 6343
Fax: 82 2 3674 6346
Email: atonlsj@momaf.go.kr

**Lee, Mr. Yong Jae**
Representative
Woormarine Corporation
Chung Chun Dong Woorim Lions Vally C-dong
BU-PYUNG
Tel: 82 032 623 6690
Fax: 82 032 623 6698
Email: woorimarine@kornet .net

**Lim, Mr. Ki Tack**
Director General
Maritime Safety Management Bureau, Ministry of Maritime Affairs and Fisheries
#140-2, Gye-Dong, Jongro-Gu
SEOUL 110-793
Tel: 82 2 3674 6130
Fax: 82 2 3674 6317
Email: limkt112@momaf.go.kr

**Lim, Mr. Nam Dong**
Director
New Marine Engineering Co., Ltd.
#116-3, Nanihang-Dong, Youngdo-Gu
BUSAN 606-031
Tel: 82 51 416 9845
Fax: 82 51 416 9895
Email: newmarine98@naver.com

**Lim, Mr. Gun**
President
Saracom Co., Ltd.
141-37, 3ka Namhang-Dong, Youngdo-Gu
BUSAN 606-033
Tel: 82 51 600 9000
Fax: 82 51 600 9095
Email: limgun@saracom.net

**Park, Mr. Kwang Youl**
Director
Maritime Safety Management Bureau, Ministry of Maritime Affairs and Fisheries
#140-2, Gye-Dong, Jongro-Gu
SEOUL 110-793
Tel: 82 2 3674 6343
Fax: 82 2 3674 6346
Email: pky0701@yahoo.co.kr

**Park, Mr. Jae Hyeon**
Senior Advisor
Saracom Co., Ltd.
A-1207, Woolim Lion's Valley 371-28, Gasan-Dong, Geumcheon-Gu
SEOUL 153-806
Tel: 82 2 2026 5382
Fax: 82 2 2026 5380
Email: ynlim@saracom.net

**Park, Prof Jin Soo**
Director, Center for International Exchange & Co
Korea Maritime University
1, Dongsam-Dong, Yeongdo-Ku
BUSAN 606-791
Tel: 82 51 410 4240
Fax: 82 51 405 2818
Email: jspark@hhu.ac.kr

**Yoon, Mr. Ji-cui**
Chief of Headquarters
Korea Association of Aids to Navigation
Hoseo B/D 501, 455-1 Dangsan 1Ga
Seoul 150-801
Tel: 82 2 2672 6995
Fax: 82 2 2672 7847

## LAOS

**Geerinck, Mr. Lieven**
Navigation Senior Advisor
Mekong River Commission Secretariat
184 Fa Ngoum, Un
VIENTIANE 01000
Tel: 856 21 263263
Fax: 856 21 263264
Email: geerinck@mrcmekong.org

## LATVIA

**Gailis, Mr. Aigars**
Chief Of Aids to Navigation Division
Hydrographic Service, Maritime Asministration of Latvia
Trijadibas Iela 5
RIGA LV-1048
Tel: 371 7 148 740
Fax: 371 7 148 741
Email: aigars@lhd.lv

**Krastins, Mr. Janis**
Head of Hydrographic Service
Maritime Asministration of Latvia
Trijadibas Iela 5
RIGA LV-1048
Tel: 371 7 148 738
Fax: 371 7 148 741
Email: jkrastins@lhd.lv

## MALAYSIA

**Abdul Hamid, Mr. Baharin**
Director
Light Due Board Peninsular Malaysia
Jalan Limbungan, P.O. BOX 12
PORT KLANG 42007
Tel: 603 3136 7604
Fax: 603 3168 5289
Email: baharin@marine.gov.my

**Abdul Kadir, Mr. Md Hassan**
Managing Director
Jinora Corporation S/BHD
71 Jalan Indah 1/1, Bukit Indah
JOHOR BAHRU 81200
Tel: 607 238 0000
Fax: 607 238 1000
Email: jinoraco@streamyx.com

**Anuar, Capt Hasnan**
Director
Light Due Board Peninsular Malaysia
Jalan Limbungan, P.O. BOX 12
PORT KLANG 42007
Tel: 603 3169 5222
Fax: 603 3168 5020
Email: nasar@marine.gov.my

**Omar, Capt Sahak**
Director
Light Due Board Peninsular Malaysia
Jalan Limbungan, P.O. BOX 12
PORT KLANG 42007
Tel: 603 3136 5222
Fax: 603 3168 5020
Email: nasar@marine.gov.my

**Othman, Capt Ahmad**
Deputy Director General
Light Due Board Peninsular Malaysia
Jalan Limbungan, P.O. BOX 12
PORT KLANG 42007
Tel: 603 3136 7602
Fax: 603 3168 5289
Email: ahmad@marine.gov.my

**Wan Salleh, Mr. Wan Endok**
Director
Light Due Board Peninsular Malaysia
Jalan Limbungan, P.O. BOX 12
PORT KLANG 42007
Tel: 603 3169 5222
Fax: 603 3168 5020
Email: nasar@marine.gov.my

**Yap, Ms Lay-Hua**
Principal Assistant Secretary
Ministry of Finance
Economics & International Ministry of Finance
PUTRAJAYA 60592
Tel: 603 8882 3446
Fax: 603 8888 3450
Email: lhyap@treasury.gov.my

## NETHERLANDS

**Bosch, Mr. Martien**
Chief Instructor
Port of Amsterdam
Box 19406
AMSTERDAM 1000GK
Tel: 31 20 5234 731
Fax: 31 20 5234 231
Email: bosch@portofamsterdam.nl

**Glansdorp, Mr. Cornelis**
Chairman
CETLE
Vollenhove Straat 3
ROTTEEDAM 3O16 BE
Email: cees.glansdorp@cetle.org

**Goud, Mr. Ko**
Chairman
Netherlands Racon Association of VTS personnel
Noordelijke Achterweg 70
WEMELDINGE 4424 EG
Tel: 31 11 3622 324
Email: chairman@vts-racon.nl

**Hoekstra, Mr. Sipke**
Senior Adviser Aids to Mavigation
Ministery of Transport, Public Works and Watermanagement, North Sea Directorate
Lange Kleiweg 34
RIJSWIJK (ZH) 2288 GK
Tel: 31 70 3366600
Fax: 31 70 4152246
Email: s.hoekstra@dnz.rws.minvenw.nl

**Kleijweg, Mr. Jan**
Scientist
TNO
Oude Waelsclorpaweg 63
THE HUAGE 2597 AK
Tel: 31 182 532 586
Fax: 31 153 243 752
Email: jan.kleijweg@ton.nl

**Koopmans, Mr. Marten**
Senior Policy Advisor
Ministry of Transport
Plesman Weg 1-6
THE HUAGE 2514 BK
Tel: 31 70 351 1562
Fax: 31 70 351 1548
Email: marten.koopmans@minvenw.nl

**Langen, Mr. Rob**
Senior Adviser Aids to Mavigation
Ministery of Transport, Public Works and Watermanagement, North Sea Directorate
Lange Kleiweg 34
RIJSWIJK (ZH) 2288 GK
Tel: 31 70 3366600
Fax: 31 70 4152246
Email: r.langen@dnz.rws.minvenw.nl

**Lens, Mr. Robbert**
Marketing & Sales Manager
CHL Netherlands B.V.
P.O. BOX 3072 2220 CB
KATWÍÍK
Tel: 31 71 402 5514
Fax: 31 71 402 5078
Email: marketing@chl.nl

**Leuveling Tjeenk, Capt G.H.H.B. (Guus)**
Pilot
Dutch Pilots' Corporation
P.O. BOX 830 (Seattleweg 7)
POTTERDAM 3000 AV
Tel: 31 10 4000 500
Fax: 31 10 4523 457
Email: s.tuinman@loodswezen.nl

**Mol, Mr. Frans**
Hydrographer
Ri Jkswaterstaat Zeeland
Ganzestraat 14
HEINKENSZAND 4451D
Tel: 0118 622258
Fax: 0118 622999
Email: f.m.mol@dzl.rws.minver.nl

**Polderman, Mr. Kees**
Assistant Director, International Maritime Affairs
Directorate General for Civil Aviation and Freight Transport
P.O. BOX 20904
THE HUAGE 2500 EX
Tel: 31 70 351 1568
Fax: 31 70 351 1548
Email: kees.polderman@minvenw.nl

**Van De Weem, Mr. Claus**
Marketing & Sales Representative
CHL Netherlands B.V.
Lageweg 16
KATWÍÍK
Tel: 31 71 402 5514
Fax: 31 71 402 5078
Email: marketing@chl.nl

**Van Der Heijden, Mr. Wim**
Consultant
TNO
Oude Waelsclorpaweg 63
THE HUAGE 2597 AK
Tel: 31 182 532 586
Fax: 31 153 243 752
Email: wvanderheijden@zonnet.nl

**Van Gooswilligen, Capt Reinder**
President
Dutch Pilots' Corporation
P.O. BOX 830 (Seattleweg 7)
POTTERDAM 3000 AV
Tel: 31 10 4000 500
Fax: 31 10 4523 457
Email: s.tuinman@loodswezen.nl

**Van't Padje, Mr. Wim H.M.**
Training Manager
MSR-STC
Wilhelminakade 701
ROTTERDAM 3072AP
Tel: 31 10 4866 654
Fax: 31 10 4846 071
Email: wvtpadjc@msr-r.nl

**Wiegert, Capt K.T. (Karel)**
Pilot
Dutch Pilots' Corporation
P.O. BOX 830 (Seattleweg 7)
POTTERDAM 3000 AV
Tel: 31 10 4000 500
Fax: 31 10 4523 457
Email: s.tuinman@loodswezen.nl

## NORWAY

**Andreassen, Capt Harald**
Head of Department
Kystverket
Servicebox 625
ARENDAL NO-4809
Tel: 47 37 01 97 00
Fax: 47 37 01 97 01
Email: harald.andreassen@kystverket.no

**Dimmen, Mr. Arve**
Director
The Norwegian Coastal Administration
Servicebox 2
AALESUND N-6025
Tel: 47 70 23 10 00
Fax: 47 70 23 10 08
Email: Arve.dimmen@kystverket.no

**Elgar, Mr. Paul Stephen**
Product Manager
C-MAP Norway A/S
Hovlandsveien 52
EGERSUND 4379
Tel: 47 5146 4700
Fax: 47 5146 4701
Email: pselgar@c-map.no

**Fredriksen, Mr. Fred E.**
Key Account Manager
Kongsberg Norcontrol IT
Bromsveien 17
HORTEN N-3183 HORTEN
Tel: 47 33 08 48 00
Fax: 47 33 04 57 35
Email: fred.fresriksen@norcontrolit.com

**Hagen, Mr. John Erik**
Director
Norwegian Coastal Administration
BOX 466
HAUGESUND 5501
Tel: 47 52 73 3200
Fax: 47 52 73 3201
Email: john.erik.hagen@kystverket.no

**Løberg, Mr. Alf-Einar**
Managing Director
Navtek Director
Gannestadveien 2
BORRE 3184
Tel: 47 33 07 1070
Fax: 47 33 07 1071
Email: vts@navtek.no

**Stene, Mr. Øyvind**
Director General
The Norwegian Coastal Administration
Servicebox 2
AALESUND N-6025
Tel: 47 70 23 10 00
Fax: 47 70 23 10 08
Email: oyvind@kystverket.no

## PAPUA NEW GUINEA

**Petrus, Mr. Eric**
Manager – Navaids & Investigation
National Maritime Safety Authority
P.O. BOX 668
PORT MORESBY
Tel: 675 3211244
Fax: 675 3210873
Email: epetrus@nmsa.gov.pg

**Rupen, Mr. Chris**
General Manager
National Maritime Safety Authority
P.O. BOX 668, Level 2, Pacific MM1 BLDG
PORT MORESBY
Tel: 675 321 1244
Fax: 675 321 0873
Email: crupen@nmsa.gov.pg

## PORTUGAL

**Abrantes Horta, Mr. Fernando José**
Portuguese Lighthouse Authority
Estrada Marginal
LISBOA 2780-657 PAÇO DE ARCOS
Tel: 351 214461660
Fax: 351 214410193
Email: dirfarois@sapo.pt

**Mendes, Mr. Luís**
Head Of Navigation Division
Instituto Hidrográfico - Portugal
Rua das Trinas, 49
LISBOA 1249-093
Tel: 351 210943080
Fax: 351 210943299
Email: proenca.mendes@hidrografico.pt

**Oliveira Santos, Mr. Manuel**
Portuguese Lighthouse Authority
Estrada Marginal
LISBOA 2780-657 PAÇO DE ARCOS
Tel: 351 214461660
Fax: 351 214410193
Email: dirfarois@sapo.pt

## RUSSIA

**Fridman, Dr Boris**
Chief of Lighthouse Service
Deputy Chief
11 Line. 8
SAIT – PETERSTUIG 199034
Tel: 7 812 323 75 48
Fax: 7 812 323 75 48
Email: gunio@homepage.ru

**Gordienko, Capt Alexander**
Chief of Lighthouse Service
Head Department of Navigation and Oceanography
11 Line. 8
SAIT – PETERSTUIG 199034
Tel: 7 812 323 75 48
Fax: 7 812 323 75 48
Email: gunio@homepage.ru

**Kirilin, Mr. Michail**
Deputy Director, Shore-based Business Unit
JSC Transas
54-4, Maly pr. V.O.
St. PETERSBURG 199178
Tel: 7 812 325 31 31
Fax: 7 812 325 31 32
Email: Michail.Kirilin@transas.com

**Reshetnyak, Mr. Sergey**
Hydrographic Director
State Hydrographic Office of Russian Federal Agency of Merchant and River Transport
Prospect Sizova
SAINT - PETERSBURG 197349
Tel: 7 812 310 52 12
Fax: 7 812 310 37 68
Email: svr@hydrograph.spb.su

## SENEGAL

**Thioub, Mr. Mamadou**
Chef Subdivision Dharei Et Balises
Port Autonome de Dakar
Bd Uberation
DAUAN
Tel: 211 822 05 56
Fax: 211 823 52 63
Email: mbaidythioub@yahoo.fr

## SOLOMON ISLAND

**Houmola, Capt Jonathan**
Department of Foreign Affairs
Mendana Avenue
HONIARA
Tel: 28230
Fax: 23798

## SOUTH AFRICA

**Collocott, Mr. James**
Act. Manager Lighthouse Services
National Ports Authority of South Africa
P.O. BOX 50491, Waterfront 8002
CAPE TOWN 8002
Tel: +27 21 449 5171
Fax:+27 21 449 3663
Email: jamesc@npa.co.za

**Coopoo, Mr. Kribashin**
Technical Manager (Electrical)
National Ports Authority of South Africa
P.O. BOX 50491, Waterfront
CAPE TOWN 8002
Tel: +27 21 449 5171
Fax: +27 21 449 3663
Email:kribashinc@npa.co.za

**Matutu, Mr. Mvikeli**
General Manager: Maritime Services
National Ports Authority of South Africa
30 Wellington Road
PARKTOWN 2193
Tel: +27 11 351 9198
Fax: +27 11 351 9200
Email: mvikelim@npa.co.za

**Nell, Mr. Steve**
Managing Director
Marine Data Solutions
Cnr Borcherds Quarry and Michigan Street, Unit 7, Airport Business Park
CAPE TOWN 8000
Tel: +27 21 3868517
Fax: +27 21 3868519
Email: steven@marinedata.co.za

## SPAIN

**Calvo, Mr. Carlos**
Aids to Navigation Maritime
Santander Port (Puertos del Estado)
Acacio Gutirez 140
SUANCES 39340
Tel: 649 405 378
Email: carloscgmja@teleline.com

**Haro Martinez, Ms Pilar**
Commercial Manager – Aids to Navigation Division
Mediterraneo Servicios Marinos S.L.
Poligono Industrial Mas de Tous – C/Belgrado, Nave 6
LA POBLA DE VALLBONA (Valencia)
Tel: 34 96 276 10 22
Fax: 34 96 276 15 98
Email: pharo@mesemar.com

**Martínez, Ms Carmen**
Head Aton Planning Division
Puertos Del Estado
Avda, Partenón, 10
MADRID 28042
Tel: 34 91 524 55 26
Fax: 34 91 524 55 06
Email: cmartinez@puertos.es

**Rebollo, Mr. Juan F.**
Head Spanish Aton Service
Puertos Del Estado
Avda, Partenón, 10
MADRID 28042
Tel: 34 91 524 55 26
Fax: 34 91 524 55 06
Email: jfrebollo@puertos.es

## SULTANATE OF OMAN

**Al-Yahmadi, Mr. Yasser Bin Hamood**
Technician
Arabian Maritime and Navigation Aids Services
P.O. BOX 1677
CPO SEEB PC 111
Tel: 968 2451 0283
Fax: 968 2451 0432
Email: info@amnas-oman.com

**Bennett, Mr. Stephen Harry Guy**
Operations Manager
Arabian Maritime and Navigation Aids Services
P.O. BOX 1677
CPO SEEB PC 111
Tel: 968 2451 0283
Fax: 968 51 0432
Email: stephen@amnas-oman.com

## SWEDEN

**Bergholtz, Mr. Lars**
Senior Vice President and Managing Director
Saab Transponder Tech AB
Låsblecksgatan 3
LINKÖPING SE 589 41
Tel: 46 13 189458
Fax: 46 13 182377
Email: lars.bergholtz@transpondertech.se

**Bergljung, Mr. Peter**
Technical Director
Saab Transponder Tech AB
Låsblecksgatan 3
LINKÖPING SE 589 41
Tel: 46 13 189483
Fax: 46 13 182377
Email: peter.bergljung@transpondertech.se

**Bergström, Mr. Anders**

Manager
True Meading AB
Nybergs Gatan 6B
STOCKHOLM 11445
Tel: 46 8 6609060
Fax: 46 8 6618020
Email: anders.bergstrom@trueheading.se

**Blomen, Capt Sven-Ake**

Senior Administration Officer
Swedish Maritime Safety Inspectorate
Ostra Promenaden 7
NORRKOPING SE-601 78
Tel: 46 11 19 12 57
Fax: 46 11 19 12 30
Email: sven-ake.blomen@sjofartsverket.se

**Edenius, Capt Torbjorn**

Director
Swedish Maritime Administration
Ostra Promenade 7
NORRKOPING SE-601 78
Tel: 46 11 19 12 56
Fax: 46 11 19 12 30
Email: torbjorn.edenius@sjofartsverket.se

**Jacobsson, Mr. Kjell**

Manag. Maint, Oper. Organization
Swedish Maritime Administration
Ostra Promenaden 7
NORRKOPING SE-601 78
Tel: 46 11 19 10 26
Fax: 46 11 12 67 91
Email: kjell.jacobsson@sjofartsverket.se

**Lagerwall, Mr. Christian**

Head of Project Plann
Swedish Maritime Administration
Ostra Promenade 7
NORRKOPING SE-601 78
Tel: 46 11 19 11 93
Fax: 46 11 12 67 91
Email: christian.lagerwall@sjofartsverket.se

## THAILAND

**Soontonmongkol, Vice Admiral SANEH**
Director General
Hydrographic Department, Royal Thai Navy
222 Rim Tang Rod Fai Kao Road
BANGKOK 10260
Tel: 66 2 475 2007
Fax: 66 2 361 3596
Email: hydrotech@navy.mi.th

## TOGO

**Ali, Nadjombe**
Director General Adjoint
Port Autonome DE Lome
Boulevard Du Mono
LOME 1225
Tel: 228 227 4742
Fax: 228 227 2627
Email: togoport@togoport.tg

**Doungbe, Mr. Affo**
Chef De Securite
Port Autonome de Lome
Boulevard Du Mono
LOME 1225
Tel: 228 227 4742
Fax: 228 227 4169
Email: doungbeaffo@yahoo.com

## TRINIDAD

**Fisher, Mr. Mark**
Superintendent of Light
Maritime Services Division
Corner of Queen And Henry Streets
PORT OF SPAIN
Tel: 1 868 627 8630
Fax: 1 868 627 5884
Email: msdmowt@yahoo.com

## TURKEY

**Cehreli, Capt Tuncay**
Manager of Istanbul VTSC
TURKISH Straits VTSC
Gemi Trafik Hizmetieri Herkfzi Istinyf Cad NO.1
ISTANBUL 34460
Tel: 90 212 323 48 00
Fax: 90 212 323 48 09
Email: tuncaycehreli@vts.org.fo

## UKRAINE

**Sheludko, Mrs. Oksana**
Head of International
State Hydrographic Services of Ukraine
26 Elektrykiv Str.
KIEV 04176
Tel: 380 44 467 60 85
Fax: 380 44 425 40 68
Email: sheludko@dudg.kiev.ua

**Symoneko, Dr Sergii**
Head
State Hydrographic Services of Ukraine
26 Elektrykiv Str.
KIEV 04176
Tel: 380 44 467 60 77
Fax: 380 44 425 40 68
Email: office@dudg.kiev.ua

## UNITED KINGDOM

**Basker, Dr Sally**
Radio Navigation Strategy Director
Trinity House Lighthouse Service
Tower Hill
LONDON EC3N 4DH
Tel: 44 207 481 6947
Fax: 44 207 480 7662
Email: sally.basker@thls.org

**Baskerville, Mrs. Frances**
CIRM
South Bank House
LONDON SE1 7SJ
Tel: 44 20 7587 1245
Fax: 44 20 7587 1436
Email: frances@cirm.org

**De Halpert, Rear Admiral Jeremy**
Deputy Master and Executive Chairman
Trinity House Lighthouse Service
Tower Hill
LONDON EC3N 4DH
Tel: 44 207 481 6901/2
Fax: 44 207 480 7662
Email: deputy.master@thls.org

**Douglas, Mr. Peter**
Navigation Manager
Northern Lighthouse Board
84 George Street
EDINBURGH EH2 3DA
Tel: 44 131 473 3100
Fax: 44 131 220 2093
Email: peterd@nlb.org.uk

**Findlay, Mr. James**
Head of Information Communication Technology
Maritime and Coastguard Agency, United Kingdom
Spring Place, 10s Commercial Road
SOUTHAMPTON SO15 1EG
Tel: 44 23 8032 9100
Fax: 44 23 8032 9429
Email: james.findlay@mcga.gov.uk

**Glass, Capt Duncan**
Director of Navigation Requirements
Trinity House Lighthouse Service
Tower Hill
LONDON EC3N 4DH
Tel: 44 207 481 6911
Fax: 44 207 480 7662
Email: duncan.glass@thls.org

**Hughes, Mr. Terence**
VTS Consultant
Trinity House Lighthouse Service
Tower Hill
LONDON EC3N 4DH
Tel: 44 207 481 6911
Fax: 44 207 480 7662
Email: terryhughes@maritime-vts.co.u.k

**Lockwood, Mr. Roger**
Chief Executive
Northern Lighthouse Board
84 George Street
EDINBURGH EH2 3DA
Tel: 44 131 473 3100
Fax: 44 131 220 2093
Email: jillb@nlb.org.uk

**McIntosh, Mr. Robert**
Project Group – Team Leader
Northern Lighthouse Board
84 George Street
EDINBURGH EH2 3DA
Tel: 44 131 473 3100
Fax: 44 131 220 2093
Email: bobm@nlb.org.uk

**Nicholson, Mr. Malcolm**
Development Engineer – Light Specialist (coloor+vison)
Trinity House Lighthouse Service
The Quay
HARWICH CO12 3JW
Tel: 44 1255 245000
Fax: 44 1255 245009
Email: malcom.nicholson@thls.org

**Parkes, Mr. Richard**
Technical Services Director
Maritime and Coastguard Agency, United Kingdom
Spring Place, 10s Commercial Road
SOUTHAMPTON SO15 1EG
Tel: 44 23 8032 9424
Fax: 44 23 8032 9429
Email: richard.parkes@mcga.gov.uk

**Platten, Mr. Guy**
Director of Maritime Operations
Northern Lighthouse Board
84 George Street
EDINBURGH EH2 3DA
Tel: 44 131 473 3100
Fax: 44 131 220 2093
Email: guyp@nlb.org.uk

**Rambaut, Mr. Michael**
Secretary General
CIRM
South Bank House
LONDON SE1 7SJ
Tel: 44 20 7587 1245
Fax: 44 20 7587 1436
Email: frances@cirm.org

**Richardson, Rear Admiral, Bruce**
Chief Haibour Master
Port of London Authority
London River House, Royal Pier Road, G
GRAVESEND DA12 2BG
Tel: 14 74 562200
Fax: 14 74 562277
Email: bruce.richardson@pola.co.uk

**Stewart, Mr. Alan**
Electrical Engineer
Northern Lighthouse Board
84 George Street
EDINBURGH EH2 3DA
Tel: 44 131 473 3100
Fax: 44 131 220 2093
Email: alans@nlb.org.uk

**Sutherland, Capt George**
Vice Chairman
Northern Lighthouse Board
84 George Street
EDINBURGH EH2 3DA
Tel: 44 131 473 3100
Fax: 44 131 220 2093
Email: jillb@nlb.org.uk

**Taylor, Capt Geoffrey John**
President
International Maritime Pilots' Association
Pear Trees' 42 Kirby Lane, GT. Brooghton
MIDOLESBEOOGH TS9 7HG
Tel: 44 1642 712458
Fax: 44 20 7240 3518
Email: gjjt@btinternet.com

**Tutt, Mr. Ian**
R+D Expert (Lights)
Trinity House Lighthouse Service
The Quay
HARWICH CO12 3JW
Tel: 44 1255 245000
Fax: 44 1255 245009
Email: ian.tutt@thls.org

**Waddell, Mr. Moray**
Director of Engineering
Northern Lighthouse Board
84 George Street
EDINBURGH EH2 3DA
Tel: 44 131 473 3100
Fax: 44 131 220 2093
Email: morqayw@nlb.org.uk

**Ward, Dr. Nick**
Research Director
Trinity House Lighthouse Service
The Quay
HARWICH CO12 3JW
Tel: 44 1255 245000
Fax: 44 1255 245009
Email: nick.ward@thls.org

## UNITED STATES OF AMERICA

**Arenstam, CDR John**
Chief, Visual Aids to Navigation and Marine Information Division
U.S. Coast Guard
2100 Second Street SW
WASHINGTON 25093-0001
Tel: 202 267 0344
Fax: 202 267 4222

**Atkinson, Mr. Ian**

Tideland Signal Corporation
4310 Director's Row
HOUSION 77092
Tel: 713 681 6101
Fax: 713 681 6233
Email: iana@tidelandsignal.com

**Browning, Mrs. Margaret**

Director of Technology
L-3 Communication Aviation Recorders
6000 Fruituille Road
SARASOTA 34232
Tel: 941 377 5591
Fax: 941 377 4498
Email: Peggy.browning@L-3.com.cn

**Clark-Maudsley, Ms Christine**

Tideland Signal Ltd.
Tel: 44 1444 872240
Fax: 44 1444 872241
Email: cclark@tidelandsignal.ltd.co.uk

**Holland, Capt Dennis**

Acting Director Of Waterways Management
United States Coast Guard
2100 2nd Street SW
WASHINGTON 20593
Tel: 1 202 267 0470
Fax: 1 202 267 4700
Email: dholland@comdt.uscg.mil

**Hor, Mr. MK**

Vice President, TSPL
Tideland Signal Corporation
4310 Director's Row
HOUSION 77092
Tel: 713 681 6101
Fax: 713 681 6233
Email: mkh@tidelandsignal.com.sg

**LaRue, Mr. Edward**
Chief Navigation Standards Division
U.S. Coast Guard
2100 Second Street SW
WASHINGTON 25093-0001
Tel: 202 372 1564
Fax: 202 267 4826
Email: elarue@comdt.uscg.mil

**Muilenburg, Capt Wayne**
Waterways Management
United States Coast Guard
2100 2nd Street SW
WASHINGTON 20593
Tel: 1 202 267 2338
Fax: 1 202 267 4823
Email: wmuilenburg@comdt.uscg.mil

**To, Mr. PC**
Vice President Production
Tideland Signal Corporation
4310 Director's Row
HOUSION 77092
Tel: 713 681 6101
Fax: 713 681 6233
Email: pcto@tidelandsignal.com

**Mitchener, Mr. Allen**
President
Tideland Signal Corporation
4310 Director's Row
HOUSION 77092
Tel: 713 681 6101
Fax: 713 681 6233
Email: allenm@tidelandsignal.com

**Quickenden, Mr. Clive**
Vice President Marketing
Tideland Signal Corporation
4310 Director's Row
HOUSION 77092
Tel: 713 681 6101
Fax: 713 681 6233
Email: cwq@tidelandsignal.com

**Sollosi, Mr. Mike**

Navigation Systems
United States Coast Guard
2100 2nd Street SW
WASHINGTON 20593
Tel: 1 202 267 1539
Fax: 1 202 267 4826
Email: msollosi@comdt.uscg.mil

**Sprunt, Mr. Sam**

Chairman of the Board
Tideland Signal Corporation
4310 Director's Row
HOUSION 77092
Tel: 713 681 6101
Fax: 713 681 6233
Email: sprunt@physics.kent.edu

**Trenchard, Mr. Stephen**

President
Automatic Power, Inc.
213 Hutcheson Str.
HOUSION 77003
Tel: 713 228 5208
Fax: 713 228 3717
Email: strenchard@automaticpower.com

**Tung, Mr. Jonathan**

Account Manager, China
Tideland Signal Corporation
4310 Director's Row
HOUSION 77092
Tel: 713 681 6101
Fax: 713 681 6233
Email: jonathant@tidelandsignal.com

**Welsh, Mr. Mike**

Product Manager, TSL
Tideland Signal Corporation
4310 Director's Row
HOUSION 77092
Tel: 713 681 6101
Fax: 713 681 6233
Email: mwelsh@tidelandsignal.com

**Williams, Mr. Robert**
Vice President, TICAN
Tideland Signal Corporation
4310 Director's Row
HOUSION 77092
Tel: 713 681 6101
Fax: 713 681 6233
Email: Robertw@tidelandsignal.com

## URUGUAY

**Barletta, Capt Luis Dario**
Chief
Lighting and Buoyancy Service - Uruguayan
Sarandi 75
MONTEVIDEO 11000
Tel: 0598 2 9161210
Fax: 0598 2 9155852
Email: serba_jefe@armada.gub.uy

## VIETNAM

**Dong, Mr. Trung Kien**
Manager of Aids to Navigation and Hydrographic Survey Dept.
Maritime Safety Company No.1
No.31 Da Nang str.,
HAI PHONG CITY
Tel: 84 31 550658
Fax: 84 31 550797
Email: vms_office@hn.vnn.vn

**Luu, Mr. Van Quang**
Director General
Maritime Safety Company No.1
No.31 Da Nang str.,
HAI PHONG CITY
Tel: 84 31 550817
Fax: 84 31 550797
Email: vms_office@hn.vnn.vn

**Pham, Mr. Dinh Van**

Director General
Maritime Safety Company □
112 Bacu
VUNG TAU
Tel: 80 64 852637
Fax: 80 64 858312
Email: mscii_office@ vnn.vn

**Tran, Mr. Duc Thi**

Manager of Work Technique
Maritime Safety Company □
112 Bacu
VUNG TAU
Tel: 80 64 852637
Fax: 80 64 858312
Email: mscii_office@ vnn.vn

**Tran, Mr. Thanh Minh**

Vice Chairman
Vietnam Maritime Administration
No.8 Pham 1lung, Mai Dich
HANOI
Tel: 84 4 7683190
Fax: 84 4 7683058
Email: vms_office@hn.vnn.vn

# Annex 2 – Address by Vice Minister of Communications

Xu Zuyuan
Vice Minister of Communications
People's Republic of China

Respectable Mr. Davidson, President of IALA,
Respectable Mr. Kruuse, Secretary-General of IALA,
Respectable Mr. Mitropoulos, Secretary-General of IMO,
Council members, distinguished guests,
Ladies and Gentlemen,

Good Morning!

Accompanied by the pleasant Chinese traditional dancing show, IALA inaugurated its 16th Conference in Shanghai, the Pearl City of the East. On behalf of the Ministry of Communications of the People's Republic of China and myself, I would like to take this opportunity to extend my warm congratulations on the opening of the Conference, my sincere welcome to the delegates of IALA members and distinguished guests coming far to attend this Conference.

As a professional international technical association in marine aids to navigation, IALA has been committed itself to harmonize standards and practice in marine aids to navigation over the past 50 years since its inception, with an aim to ensure safe and efficient shipping as well as the protection of marine environment. At the same time, IALA also encourages cooperation of the international community, providing many countries, particularly the developing countries with specialist technical advice. IALA has therefore played an important role in ensuring a rapid and sound development of global shipping.

Ladies and Gentlemen,

It is well-known that China enjoys a long tradition of marine navigation and the glory of maritime culture. As early as 600 years ago, Zheng He, the great mariner of Ming Dynasty, had successfully launched seven voyages to the Sea, marking a magnificent achievement in the world. This is the IALA Conference first held in China which gathers together marine aids to navigation authorities, manufacturers and consultant agencies from all over the world. Under the theme of *"Aids to Navigation in the Digital World"*, intensive discussions will be conducted on how to improve, in the context of the rapid global technological advancement, the application of digital techniques in the traditional marine aids to navigation for the benefit of a safer shipping and cleaner marine environment. This Conference will exert practical and far-reaching significance to the development of shipping in the digital world. As the host country, we feel very pleased and honored.

China is the council member of IALA, the competent authority of marine aids to navigation of China actively participates in various activities organized by the association in pursuant to the IALA Constitution. At the same time, as the A category council member of IMO, the Chinese Government also faithfully honor its commitment in compliance with the regulations provided in the SOLAS convention, making arrangements for marine aids to navigation responding to the marine traffic and risk assessment. By doing this, China has made its due contributions to ensure the safety of marine navigation.

Serving as the important facilities to ensure the safety of ship and efficiency of shipping, marine aids to navigation greatly contributes to the development of shipping industry, marine explorations and fisheries. Since 1980s, the Chinese Government has accelerated the construction of ports and development of shipping industry to satisfy the increasing growth of

shipping economy and foreign trade. The financial input was increased to expedite the infrastructure construction of waterways and marine aids to navigation, and great efforts made on the innovation and application of marine aids to navigation technology as well as the improvement of administration of marine aids to navigation along the coastal ports areas. As a result of the development of past two decades, an entire navigation-guaranteeing system with rational layout, distinct level, complete function and reliable capability as well as a safe and convenient public marine trunk routes network along the coastal ports of China has taken shape. By the end of 2005, a total number of 3395 public marine aids to navigation have been well maintained by China Maritime Safety Administration, up 1347 than the number in 2000.

With the advancement of marine science and technology and the booming of shipping in recent years, particularly the steady economic growth in the Bohai bay region, Yangtze delta region and Pearl river delta region, the Chinese Government promulgated the *National Construction Plan for the Coastal Ports in the Yangtze River, Pearl River Deltas and Bohai Bay Region*, which put demanding on the development and enhancement of service of marine aids to navigation. In this connection, the Chinese Government has successfully conducted studies and researches on the effectiveness of marine aids to navigation and worked out the general plan for the development of marine aids to navigation in China's coastal areas. We have given the priority to the adjustment and improvement of major coastal ports and marine aids to navigation, and formulated a set of standards and technical specifications for marine aids to navigation. In addition, we have completed the building of a main network of AIS shore station and increased the input of human resource in the maintenance of marine aids to navigation. The technological progress and the enhancement of service of marine aids to navigation has reliably guaranteed the sound and fast development of shipping in China, in turn, marine aids to navigation development of China is also keeping a good momentum with the increasing growth of shipping.

Ladies and Gentlemen,

This Conference marks a grand event for the world's marine aids to navigation community and provides opportunities for communication and exchange of ideas. I sincerely hope that all delegates will take full advantage of this platform to promote mutual understanding, expand cooperation and exert concerted efforts to make greater contribution to the further development of world's marine aids to navigation, promotion of safer shipping and protection of marine environment.

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# Annex 3 – Aids to navigation in a digital world

Keynote address by
Efthimios E. Mitropoulos,
Secretary-General, International Maritime Organization

Chairman, Minister, IALA President and Secretary-General, Director-General of the Maritime Safety Administration of China, distinguished participants and media representatives, ladies and gentlemen,

It is a great pleasure for me to be with you here in Shanghai and I welcome the opportunity to speak to the membership of IALA at its 16th Conference. You are to be congratulated, once again, both on the topicality of the theme you have selected for the Conference and for the venue you have chosen – one of the world's most vibrant and dynamic cities, one that never ceases to amaze its visitors, and yet in a country that can point to a continuous culture stretching back nearly 4,000 years.

The fruitful and productive co-operation between IMO and IALA also stretches back many years, although we still have a long way to go to match the history of Chinese civilization! Our work together has embraced a number of disparate but related activities in the broad pursuit of navigational safety and I know that the shipping world at large, as well as the membership of IMO, has a great deal to thank IALA for in this respect – not least for the buoyage system it introduced worldwide a few decades ago, its development of the World Vessel Traffic Services and Aids to Navigation Guides, its involvement in the development of the Guidelines on Vessel Traffic Services; not to mention IALA's contribution to IMO's regulatory work, in particular that of the NAV Sub-Committee.

Indeed, before moving on to address in detail the central topic of your Conference, I should like to make mention of one particular area in which the collaborative work of IALA warrants particular mention.

I am referring, of course, to IALA's part in the response of the maritime world to the Indian Ocean Tsunami disaster of December 2004. In the immediate aftermath of that tragedy, it was clear that the rapid restoration of safe navigation in the stricken area would primarily aid the provision of humanitarian relief, as well as assist affected communities in rebuilding livelihoods and self-sufficiency. IMO co-ordinated an inter-agency response in which IALA worked closely and diligently with us and others, in particular IHO, to promote the re-establishment of aids to navigation essential for the safety of ships operating in the tsunami-hit area. IALA members deserve great credit for their efforts to work directly with affected countries to provide assistance, for example in Indonesia and the United Republic of Tanzania. IALA is continuing to monitor the situation and respond both to requests for help and offers of assistance and, in this context, as a result of consultations between our two organizations, IMO is contributing financially – through it Tsunami Maritime Relief Fund – to an IALA project addressing lighthouse rehabilitation needs in Sri Lanka.

Ladies and gentlemen, having thus outlined the general framework of co-operation between IALA and IMO, I will turn now to the main theme of this Conference – **Aids to Navigation in a Digital World,** which, for obvious reasons, I will address mainly from the IMO viewpoint as I expect the IALA side to be adequately covered at *ad hoc* sessions of the programme. The potential hazards involved in the navigation of ships are many and familiar to us all – grounding, collision, weather damage and so on. However, as its title acknowledges, this Conference comes at a time when the traditional hardware designed to aid navigational safety – lights, buoys, channel markers and the like, in association with the corresponding shipborne

navigational equipment – is being supplemented and gradually superseded by a new generation of information-based tools such as Vessel Traffic Services - VTS, the Automatic Identification System - AIS, the Global Positioning System - GPS, electronic charts, vessel reporting schemes, satellite tracking and others.

Technology today is presenting us with an opportunity to re-assess in a fundamental way the whole concept of aids to navigation, both onboard and ashore – an opportunity to make changes that will be far-reaching in extent and which can have a significant, beneficial impact long into the future. IALA has been in the vanguard of embracing these changes and in seeking ways to attain the maximum benefit from them, and deserves great credit for its visionary stance.

There is no doubt that we are now entering a crucial stage in the development of what has become known by the "catch-all" designation of "**e-navigation**". Many of the building blocks are in place, but what is still in an embryonic state is the global strategic vision needed to ensure that the new generation of navigational tools, available to us now and in the near future, can be drawn together in a holistic and systematic manner or, in other words, into **an all-embracing system**. If we get this right, we have the opportunity to secure not only a greater level of safety and accident prevention but, at the same time, deliver substantial operating efficiencies with consequent commercial benefits.

Although it is difficult, at this stage, to be precise about the full extent of the changes that might be necessary to realize fully a vision of e-navigation, it does, nevertheless, seem reasonable to assume that they will be extensive and fundamental. In the digital world, anything seems to be possible and nothing is sacred. As well as IALA's world of aids to navigation, the whole gamut of shipboard navigational tools is on the brink of revolution and the impact of this is likely to be felt in working methods and practices, personnel training, communications and the shoreside infrastructure. It is also very likely that, as the overall strategy for e-navigation becomes clearer, there will be implications for the international regulatory framework, and I can assure you that IMO stands ready to address this issue and deal with it effectively when the time comes. The recent reaction of MSC to relevant proposals bears testimony to this.

There seem to be clear advantages in the development of e-navigation that will contribute to enhanced navigational safety (with all the positive repercussions this will have on maritime safety overall and environmental protection) while simultaneously reducing the burden on the navigator and I am sure that all relevant factors will be meticulously examined before we move onto endorsing the proposed system. This may take some time but, as I observed at MSC two weeks ago, even the longest walk starts with a first step.

The array of electronic navigational and communication technologies and services already available or in development is extensive. We are all now familiar, to a greater or lesser extent, with the likes of AIS, Electronic Chart Display and Information Systems – ECDIS, Integrated Bridge Systems and Integrated Navigation Systems – IBS/INS, Automatic Radar Plotting Aids – ARPA, radio and satellite-based navigation systems, Long Range Identification and Tracking – LRIT, VTS, wireless digital data communication networks and the Global Maritime Distress and Safety System – GMDSS.

Not only do these technologies hold the promise of reducing navigational errors and accidents, they also have the potential to deliver benefits in other ways. Search and rescue, responding to pollution incidents, ship and port security and the protection of critical marine resources, such as fishing grounds, are among those that spring most readily to mind. They can also offer operational benefits: imagine the potential of a system that can make available in advance

detailed information on vessel arrival and cargo arrival; or, the ability to ease throughput and, thereby, effectively increase capacity in ports, fairways and waterways suffering from chronic congestion or, even, simply poor visibility – it would be invaluable.

My concern, however, is that technological advances of this kind must be developed in a co-ordinated and structured manner, which is why I am particularly pleased that organizations, such as IALA, are now looking at these developments from a broader perspective and beginning to identify what part they can play in them and how they can collaborate with others to produce solutions from which all will benefit.

A lack of standardization both on board ships and in shoreside infrastructure (with its attendant problems of incompatibility either between vessels, or between vessels and shore-based facilities) and increased and unnecessary levels of complexity, clearly has to be avoided. There are many potential stakeholders in this; as well as specialist organizations such as yourselves and, I have no doubt, IHO, the likes of equipment designers and suppliers, shipowners and the port industry, not to mention those who actually practice navigation, all need to be involved in the process.

In the Manual of Radio Aids to Navigation, published by IALA in 1975, a distinction is made between "Aids to Navigation" and "Navigational Aids", with the former consisting mainly of devices external to a vessel, while the latter are carried on board ships. However, both categories, the Manual explains, are designed to assist the navigator to ascertain the position of his vessel and, therefore, contribute to a safe and expeditious voyage; moreover, some of these devices contribute to warn of dangers or obstructions.

Aids to navigation, as the term is currently understood, have always been components within a multi-dimensional network embracing different yet complimentary technologies, all designed to facilitate the task of navigating ships safely and effectively. A conventional lighthouse, a paper chart and an analogue radar display, for example, each provide the navigator with useful information; and all three, taken together, can provide a considerably enhanced level of information by reinforcing and confirming the intelligence that can be derived from each one individually. Yet, even though the sum of their parts is greater than their whole, they have not actually been designed to constitute an integrated system.

In the digital world, aids to navigation will still be components in the wider, all-embracing system I just mentioned. The key difference will lie in the need for **more care, more thought and more advance planning** to be given to the integration of digital components, if we are to realise their full potential benefits.

At last week's meeting of IMO's Maritime Safety Committee, a paper was presented jointly by a number of countries – Japan, the Marshall Islands, the Netherlands, Norway, Singapore, the United Kingdom and the United States, to be precise – proposing the addition of a new item, on the 'Development of an e-navigation strategy', to the work programmes of the Organization's Sub-Committees on Safety of Navigation and on Radiocommunications and Search and Rescue. This proposal was duly approved and the related developmental work is scheduled for completion, in those two Sub-Committees, by 2008. Their mandate is to consider all related issues with the aim of developing a strategic vision to take the matter forward and thus enable the Committee to develop the necessary policy direction to progress the concept further.

In that joint submission, a suggestion was made as to what were likely to be the key structural components of a safe and comprehensive e-navigation system, and I think it is instructive to look at these in some detail.

A prime requirement is for **accurate, comprehensive** and **up-to-date electronic navigational charts**, covering the entire geographical area of a vessel's operation. These need to be combined with **accurate and reliable electronic positioning signals** and with '**fail-safe' backups**, probably provided through multiple redundancy, using, for example, a combination of the several systems that exist today or will soon be available, such as GPS, GLONASS, Galileo, Loran C or even onboard inertial navigation devices.

A further prerequisite is the provision of information on the vessel's route, course, speed, manoeuvring parameters and other vessel status items such as the ship's identity, passenger details and/or cargo type and security level, etc., again in electronic format.

Any such system should also incorporate the transmission of positional and navigational information in several directions: from ship-to-shore, shore-to-ship (by the likes of VTS centres, coastguard and SAR facilities, hydrographic offices, etc.), as well as ship-to-ship.

All of this information would have to be capable of being displayed clearly, accurately and in a user-friendly manner both aboard ship and ashore. In risk or danger situations, simple and effective prioritization of information (something like information on a "need to know" basis) would also be a key requirement.

Contemporary technology already has the capability to deliver much, if not all, of any e-navigation strategy that may be proposed at this stage. Indeed, as you will be aware, there are already several projects that have taken tentative steps in this direction.

One such example is the **Marine Electronic Highway**, IMO's 'e-navigation' project in the Straits of Malacca and Singapore, which will offer the prospect of linking a shore-based marine information and communications infrastructure with the corresponding navigational and communication facilities onboard transiting ships; while being also capable of incorporating marine environmental management aids.

Essentially, the Marine Electronic Highway is being built upon a network of electronic navigational charts using ECDIS and environmental management tools, all combining in an integrated platform covering the region that allows the maximum of information to be made available both to ships and shipmasters as well as to shore-based users, such as vessel traffic services.

The overall system – which, in addition to electronic navigational charts, would include positioning systems, AIS, real-time navigational information like tidal and current data, as well as providing meteorological and oceanographic information – is designed to assist in the overall traffic management of the Straits and provide the basis for sound marine environmental protection management. It will be, therefore, an essential tool for the planning and organization of pollution prevention and control operations, not to mention the safety of navigation in the region.

Moreover, not only does the Marine Electronic Highway project tackle the technical issues involved, it also addresses the all-important mechanisms for intergovernmental and inter-sectoral co-operation – be they financial, legal or institutional – that will be necessary to underpin any such system in the future. And like the LRIT system, it will be used not only for search and rescue, navigational safety and environmental protection purposes, but also for security aims.

This and, indeed, other projects tackling similar issues, have the potential to provide an excellent starting point for the development of a fully **functional, efficient and sustainable e-navigation system** on a wider global scale. But there are, unsurprisingly, a number of **challenges** that will have to be overcome before any such vision can be fully realized.

The production, coverage and interfaces of electronic navigational charts, for example, will have to be increased, and the distribution and promotion of commercially viable and globally accepted protocols for ENC production and updating would have to be accelerated. Standardized controls and common performance standards for shipboard e-navigation systems would need to be developed and decisions made as to what information needs to be captured, how it should be displayed, how it should be laid out and what should be shared with other vessels and with shore-based navigation support centres.

The **security of information** is another **key issue**. We must be able to ensure not only that those who might wish to use e-navigation information malevolently are prevented from getting it, but also that they are prevented from intercepting and corrupting it.

Although a great deal of work has already been undertaken by several organizations – including both IMO and IALA – that has led to the development of standards for individual electronic navigational technologies, the maritime world is only just embarking on the development of a comprehensive vision for e-navigation. I have no doubt that, just as aids to navigation will continue to play a vital role in the digital world, so IALA also has an important contribution to make to the establishment of such a vision, now and in the future.

No-one can doubt the compelling need to equip ships' masters and others responsible for the safety of shipping with the very latest tools to make navigation – and maritime communications – more reliable and thereby reduce errors, especially those with a potential for loss of life, injury, environmental damage and undue commercial costs. More substantial and widespread benefits for States, shipowners and seafarers can be expected to arise from the increased safety at sea, which should be the core objective of e-navigation.

As the necessary core and ancillary technology is already available, the challenge lies in using it effectively in order to simplify the display of the local navigational environment to the mariner. It is, therefore, important that any integrated navigation or decision-support system be designed such as to relieve the officer of the watch from some of the burdens of watchkeeping while, at the same time, be sufficiently intelligent to filter out some of the less crucial information and not draw the navigator into a false sense of security by over-reliance on the equipment or the information presented. As I suggested in a paper I recently wrote for the Journal of the Royal Institute of Navigation, the design of the system should not reduce the navigator solely to the role of monitoring the system, but enable him or her to obtain optimum navigational support and information from it to facilitate and ensure appropriate and timely navigational and anti-collision decision-making in accordance with good seamanship. This is a crucial factor if we are not to introduce more "technology-assisted" collisions or groundings.

What, therefore, is equally crucial is that **effective**, possibly even **ship-specific**, **training** be devised and delivered to make certain that optimum use is made of an integrated e-navigation system designed to benefit navigational safety and environmental protection whilst simultaneously reducing the burden on the navigator. However, irrespective of how sophisticated the technology and the training, the obligation will always remain with the officer of the watch to **comply with the Collision Regulations** and "… maintain a proper look-out by … all available means … so as to make a full appraisal of the situation and of the risk of collision".

Mr. Chairman,

The **digital revolution** in information and communication technologies (ICTs) has created the platform for a **free flow of information, ideas and knowledge across the globe**. This is already impacting the world in deeply intrinsic ways, perhaps even more profoundly than the industrial revolution itself. For example, the Internet has become an important global

resource, one that is critical to both the developed world as a business and social tool and the developing world as a passport to equitable participation, as well as economic, social and educational development.

Yet, while the digital revolution has extended the frontiers of the global village, the vast majority of the world remains unhooked from this unfolding phenomenon. This has created what is known as the 'Digital Divide', or the gap that separates those who **are** connected to the digital revolution in ICTs and those who have no access to the benefits such new technologies generate. The disparity can happen across international frontiers, as well as within communities where people are separated by economic and knowledge barriers. To bridge the divide, the United Nations has pursued the objective of agreeing principles and plans of action leading the world to an all-inclusive and equitable 'Information Society'; one in which the benefits derived from ICTs are accessible to all and promote the use of e-strategies, e-commerce, e-governance, e-health, e-trade, education, literacy, cultural diversity, gender equality, sustainable development and environmental protection. In other words, the objective is to generate information and communication benefits that will help us all towards the fulfilment of the Millenium Development Goals.

In pursuing our dream of e-navigation, we must not lose sight of the needs, the capabilities and the potential of the developing world and, to harness that potential, we should act in tandem with it. Developing countries should be involved in the process at an early stage and their nationals should be made aware of what is going on. We should endeavour to bring them on board and, at IMO, we should engage them in all phases of the development of the e-navigation concept. I am certain they will be able to contribute satisfactorily.

Mr. Chairman,

To conclude these remarks, through on-going dialogue with IMO, IALA, assisted as necessary by IHO, CIRM and others, will, I am certain, continue to promote the concept of integrated navigation by planning, designing and providing aids to navigation responding to the needs of the emerging digital maritime world. This is something that can only be achieved through widespread, active participation and I note with satisfaction that IALA is to establish an e-navigation committee for its 2006-2010 work term. IALA is to be commended for looking to the future of navigation and continuing its commitment to finding the best possible means of providing aids to navigation in this changing environment that will contribute further to our common goal of ensuring safe, secure and efficient shipping on cleaner oceans.

I wish the Conference every success.

Ladies and gentlemen,

Thank you.

* * * * *

# Annex 4 – IALA Risk Model Validation

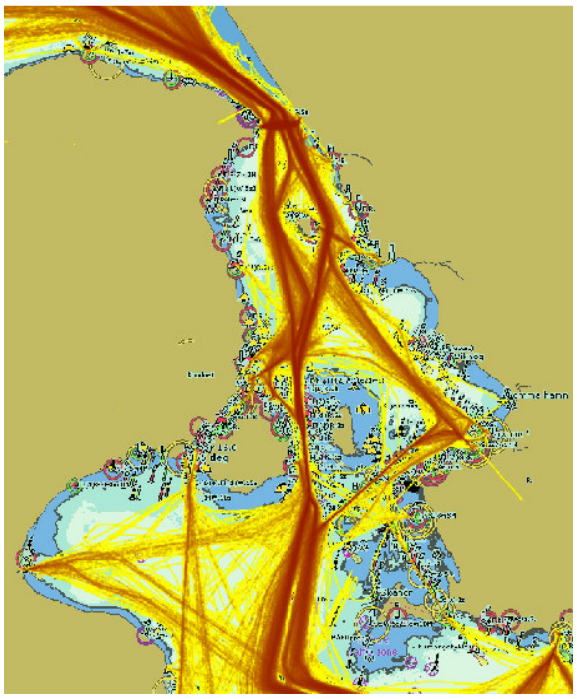
Executive Summary of a Workshop
to validate
The IALA Risk Management Tool
for Ports and Restricted Waterways
Copenhagen, Denmark
2nd -5th May 2006

**Introduction**

Mr Ómar Frits Eriksson opened the Workshop and welcomed all participants to Copenhagen. He explained that at the request of IALA, the Royal Danish Administration of Navigation and Hydrography (RDANH) were hosting the Workshop for the purpose of validating the IALA Risk Management Tool for Ports and Restricted Waterways. 35 people attended the Workshop, 10 were associated with organising and running the event, including the facilitation teams for the PAWSA and IWRAP risk assessments of Oresund waterway. The remaining 25 took part in, or observed, the PAWSA assessment.

Mr Kruuse informed the meeting that the validation process would be conducted by carrying out risk assessments by both the PAWSA and the IWRAP risk assessment models of the area of the Oresund between Denmark and Sweden from a line in the north from Kullen to Gilleleje and a line in the south from Falstervo to Stevns. The assessments would be carried out simultaneously and the results compared.

Oresund
Marine Traffic density



Oresund was selected for several reasons, including:

- It is a complex international waterway with considerable traffic passing through the area, in both directions, substantial traffic crossing between Denmark to Sweden and busy ports on both sides of the waterway.
- It is an international waterway which passes through territorial waters of two Countries and is the subject of an international agreement.
- Risks in the waterway are currently under review in both Denmark and Sweden.

**The PAWSA Risk Assessment**

The PAWSA assessment was carried out by a facilitation team led by Potomac Management Group and was a structured approach that obtained expert judgments on the level of waterway risk and the effectiveness of possible intervention actions for reducing risk in the waterway.

In the first step in the process the participants assessed their expertise with respect to the six risk categories in the model. Those self assessments were used to weigh inputs during all subsequent steps. During the second step the participants provided input for the rating scales used to assess risk in the third step. The third step was to discuss and then numerically evaluate the baseline risk levels in the waterway using pre-defined qualitative risk descriptions. In the fourth step, the participants discussed and then evaluated the risk reducing effectiveness of existing mitigation strategies. Next, the participants were asked to offer new ideas for further reducing risk, for those factors where risk was considered not to be well balanced with existing mitigations. The effectiveness of the additional intervention actions in reducing unmitigated risk was then evaluated.

Finally, the participants re-evaluated their team's expertise and also evaluated the expertise of the other teams. The process produced the group's consensus of risks in this waterway and proved to be an excellent tool for focusing risk mitigation efforts.

However, it was noted that risk factors evaluated as being adequately balanced may still be worthy of additional risk mitigation actions. Any reasonable steps for minimizing or preventing the impacts of marine accidents should be encouraged for the benefit of the waterway community.

**Result of the assessment of the waterway with existing mitigating measures**

| Vessel Conditions | | Traffic Conditions | | Navigational Conditions | | Waterway Conditions | | Immediate Consequences | | Subsequent Consequences | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Deep Draft Vessel Quality | | Volume of Commercial Traffic | | Winds | | Visibility Impediments | | Personnel Injuries | | Health and Safety | |
| 1.9 | 1.6 | 6.4 | 4.9 | 2.1 | 2.0 | 9.0 | 6.0 | 8.7 | 7.0 | 9.0 | 7.7 |
| Maybe | | Maybe | | Balanced | | Maybe | | Maybe | | Balanced | |
| Shallow Draft Vessel Quality | | Volume of Small Craft Traffic | | Water Movement | | Dimensions | | Petroleum Discharge | | Environmental | |
| 3.4 | 2.5 | 5.6 | 4.7 | 3.6 | 2.5 | 3.5 | 3.3 | 8.2 | 6.6 | 6.2 | 5.4 |
| NO | | Maybe | | NO | | Maybe | | Maybe | | Balanced | |
| Commercial Fishing Vessel Quality | | Traffic Mix | | Visibility Restrictions | | Bottom Type | | Hazardous Materials Release | | Aquatic Resources | |
| 3.6 | 2.5 | 6.0 | 4.2 | 3.9 | 3.3 | 6.7 | 5.7 | 7.0 | 5.9 | 5.1 | 4.3 |
| Maybe | | Maybe | | NO | | Balanced | | Maybe | | Balanced | |
| Small Craft Quality | | Congestion | | Obstructions | | Configuration | | Mobility | | Economic | |
| 7.8 | 4.5 | 5.5 | 4.2 | 2.7 | 2.5 | 8.2 | 5.8 | 5.7 | 4.5 | 3.0 | 2.5 |
| NO | | Maybe | | Balanced | | NO | | Balanced | | Balanced | |

| KEY | |
|---|---|
| **Risk Factor** | |
| Book 3 | Book 4 |
| Consensus | |

| | EXPLANATION |
|---|---|
| Book 3 | Baseline level of risk |
| Book 4 | Level of risk taking into account existing mitigations |
| Balanced | Consensus that risks are well balanced by existing mitigations |
| Maybe | No consensus that risks are adequately balanced by existing mitigations |
| NO | Consensus that existing mitigations do NOT adequately balance risk |

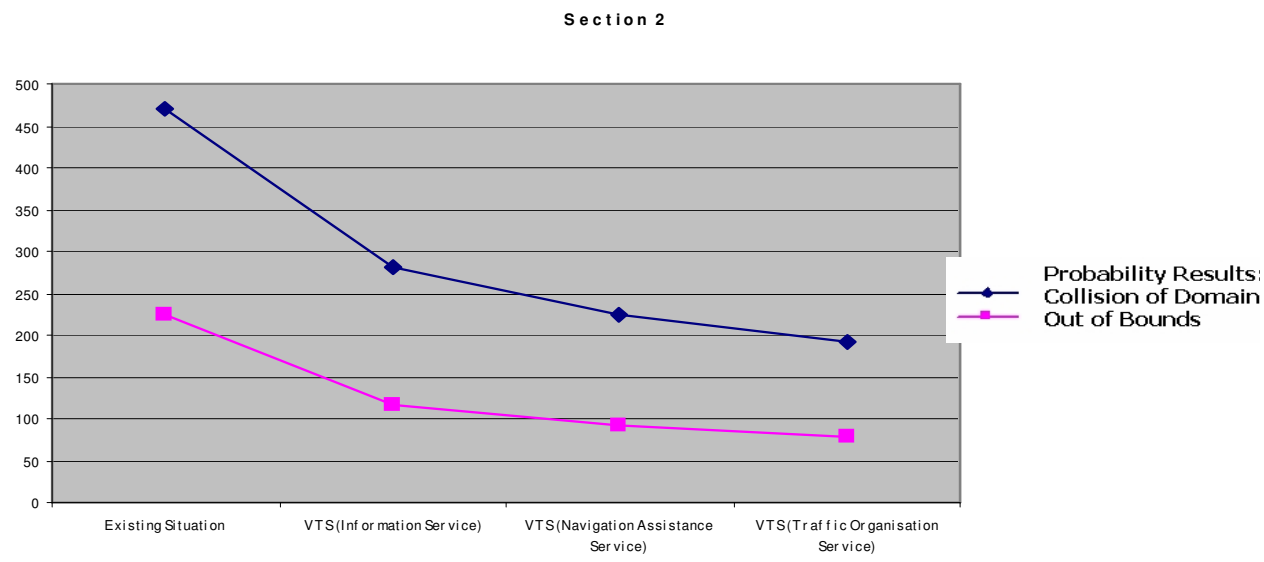
**The IWRAP Risk Assessment**

The IWRAP Risk Assessment was conducted by a facilitation team led by the Canadian Coast Guard and was carried out by:

1. Dividing a chart of the Øresund into over thirty sections which were categorized into reaches, bends, and crossings.
2. Gathering traffic data from three sources;
   - Visual observations from Drogden Light Station over a period of 18 months that included ships without AIS.
   - HELCOM AIS database over a 9 month period; and,
   - AIS Denmark database over a 1 month period
3. This data was cross referenced, filtered into a useable format for IWRAP and grouped to correspond with each of the waterway sections.
4. The chart information along with the corresponding traffic data was then entered into IWRAP. This created the base case for 19 waterway sections and resulted in 202 individual scenarios. The IWRAP team was asked by RDANH to assess the potential impact of VTS in the Øresund sound. This added three options to be evaluated for each of the base cases and resulted in a total of 1098 scenarios being run in IWRAP
5. IWRAP has a feature allowing all of the data from one section of a waterway to be viewed in a graphical format. An arbitrary level of 16 out of bounds/collisions per 10,000 transits was set as the threshold to identify potential "Hot Spots" in the waterway. It is recognized that this is high for the area however IWRAP deals with the interaction of artificial domains that are calculated with the vessels. Therefore when the report refers to probabilities, it is the domain and not the vessels that may go out of bound, or collide. It is possible for two domains to interact without the vessels residing inside actually colliding.

**Sector division**

# Results for Section 2: Straight Traffic flow

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The PAWSA assessment was better than the majority of participants had expected. It was considered that the results were an accurate reflection of the risks in the waterway and that the mitigation options identified were feasible and realistic. The concept of PAWSA and the methods by which risk is analysed were clearly and concisely explained by the facilitation team and generally understood by participants. However, some participants expressed the view that it would be helpful if Books 1 to 5, and their associated forms, were simplified.

The majority of participants considered that the IWRAP assessment was successful. However, a few expressed the view that it was not as good as expected because:

- Problems were identified with installing and using the programme in computers that do have the North American or British numerical format in their software.

- The introduction to the model and the first presentation of results were considered to be too brief, with insufficient information being given on the factors taken into consideration when dividing the area into sectors, the data used during the assessment, how this was processed and the results obtained. However, a second presentation of results included information on these matters and most participants were subsequently satisfied that they had a good understanding of the concept, the terms used and the process of assessment.

- Preparation for conducting the assessment did not begin until the Workshop started and this resulted in a significant proportion of the time available being spent on dividing the area into sectors, collating and rationalising the data of vessel traffic and identifying the particular needs of each sector. Therefore, insufficient time was available to complete a full assessment of the whole waterway.

However, it was considered that the major risks were adequately identified and that with better preparatory work or more time to complete the process, the results would have given an accurate reflection of the risks in the waterway and that feasible mitigation options would have been identified.

As the PAWSA and IWRAP models use different criteria and methods to assess the risk it was not expected that identical results would be obtained, but that both models would identify areas of the waterway where risk was greatest and propose mitigation measures for consideration and implementation by the Authority responsible for the waterway.

Good co-relation between the results of the two models was demonstrated by the identification of the following areas of major risk (or "Hot spots"):

*PAWSA Assessment*

Helsingør/Helsingborg vicinity
Landskrona vicinity
Copenhagen harbour
Drogden Channel

Malmo harbour
Flint Channel

Hot spots compared to the traffic patterns from AIS data


*IWRAP Assessment*

Helsingør/Helsingborg vicinity
Vicinity of Ven Island

Drogden Channel
Southern entrance to Drogden Channel
Flint Channel

Conclusion

The Workshop concluded that the objective of the Workshop had been met and that the results of the assessments of Oresund by PAWSA and IWRAP were sufficiently consistent with each other for the IALA Risk Management Tool to be considered validated.

* * *

# Annex 5 – Information Flyer on Preservation of Historic Lighthosues

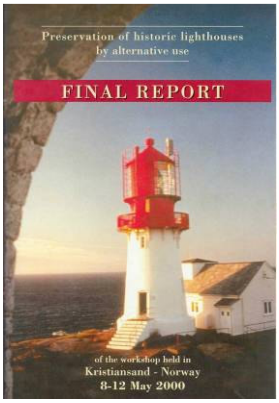
This document has been prepared to provide you with information relating to IALA's aim of helping its members and other interested bodies in the preservation (conservation) of historic lighthouses. This can be achieved by sharing experiences and make the information available to members and non-members, with particular attention to methods of funding and alternative use.

In 1996 IALA established an Advisory Panel for the Preservation of Historic Lighthouses, Aids to Navigation and Related Equipment of Historical Interest This was in response to the realisation that new technologies and user requirements change, and that traditional Aids to Navigation *(AtoN's)* are reviewed and downsized to accommodate these changes with the resultant reduction in resources available for maintenance.

The work of the panel was to encourage greater commitment by IALA members to the preservation of lighthouse heritage and to improve access for the public. This would include solutions to the maintenance of old and surplus equipment in as original condition and location as practicable.

After the Sydney conference of Spring 2002 the Panel was incorporated into the Engineering, Environment and Preservation of Historic Lighthouses Committee (EEP) as Working Group 5 where the work has continued through to this conference in Shanghai. In the next session of EEP the Preservation/Conservation of Historic Lighthouses will be allocated one of the four working groups to carry out its work, which it is hoped will allow greater participation from EEP members.

One of the early successes of the Panel was the publication of the book "Lighthouses of the World", which gave details of 125 historic lighthouses from 40 contributing countries. This showed the great variety of lighthouses which satisfied the criteria agreed by the panel on the constituents of a historic lighthouse site and indeed only shows a few of some countries many historic sites.




In the introduction, Alternative Use and the means of funding the preservation of historic lighthouses were identified as two areas of great importance and in May 2000 the Panel held a workshop in Kristiansand in Norway where a large international group of interested people from lighthouse authorities, heritage bodies and conservation groups shared their experiences. A report was published but in addition this helped to identify the way forward for the panel as to further areas of help required and ideas for additional guidelines on related subjects.

These guidelines had been one of the prime functions of the panel and after many years by which time, several had been published separately, the major achievement of Working Group 5 and all its members was to produce the IALA Lighthouse Conservation Manual which has now been published and is available at this conference for the first time as a complete document. There are chapters on many important topics, preparing a National Conservation Plan, Legal Issues, the problems and benefits associated with opening lighthouses to the public, funding options and the impact of

modernisation. The manual also includes a CD, which includes a pdf. copy of the document and a word file of each check list which can be fully adapted by the users of the manual to suit their individual requirements.

Another early success of the PHL was the preparation of a template for recording details of historic lighthouses, which would be issued to members to allow them to include their lighthouses in an International Lighthouse Database. Several countries did this but in more recent discussions it was agreed that a web site portal could allow members to input the details of their historic lighthouse on to an interactive template. However due to other pressures on Secretariat time this item has not progressed to date but will be taken further after the conference.

At each meeting the exchange of information on the ways in which each country is dealing with the problems associated with looking after their historic lighthouses proved a very useful means of discussing the options available and allowed members to learn from the mistakes and achievements of others. This in many ways acts as a means of updating guidelines as for example those incorporated in the Conservation Manual.

In addition to the regular meetings the working group was responsible for organising an extremely successful seminar with the help and co-operation of the Swedish Maritime Authority entitled Practical Aspects of Lighthouse Preservation. It was held from August 16-19, 2005, at the Novotel, Gothenburg, Sweden and was attended by 60 delegates from 19 countries.

The Seminar provided an opportunity for discussion on issues surrounding all aspects of preservation of lighthouses, including historic lighthouses. The Seminar provided examples of practical solutions to the diverse problems facing aids to navigation authorities when dealing with building maintenance in remote and harsh environments. The presentations provided the latest in research and developments in paint solutions, mortar options and conservation and preservation techniques.

The Seminar identified 16 conclusions and 9 recommendations, which it is hoped, will be incorporated into the work programme for the working group for next session.

As the nominated chairman of the working group on Lighthouse Preservation for the next sessions of the EEP Committee I would like to take the opportunity to encourage all IALA members and relevant interested bodies to send a representative to the EEP Committee meetings, starting 9 October 2006 and to participate with the working group on Preservation of Lighthouses, Aids to Navigation and Related Equipment of Historical Interest. For further information contact Bob McIntosh, Northern Lighthouse Board, Scotland, bobm@nlb.org.uk. Session 10 of this conference includes three papers, which describe different experiences in three countries relating to Historic Lighthouses, and the session will also include time for discussion and comments on this subject and I would urge all members to bring their experiences to this discussion.

*Bob McIntosh – EEP Committee - 26 May 2006*

# Annex 6 – Report of the 10th IALA General Assembly Session 1

**SHANGHAI INTERNATIONAL CONVENTION CENTER**
**Auditorium**

## REPORT OF SESSION 1

Session 1 of the IALA General Assembly was held on 23rd May, 2006, at the Shanghai International Convention Center, People's Republic of China.

It was attended by representatives of National Members of the following countries:

- Australia
- Brazil
- Canada
- Chile
- China
- Côte d'Ivoire (Ivory Coast)
- Denmark
- England & Wales
- Finland
- France
- Germany
- Hong Kong SAR
- India
- Ireland
- Italy (Italian Coast Guard)
- Japan
- Korea
- Kuwait
- Latvia
- Malaysia
- Netherlands
- Norway
- Oman
- Papua New Guinea
- Portugal
- Russia
- Scotland
- Senegal
- Spain
- South Africa
- Sweden
- Thailand
- United States of America
- Vietnam

Although they were represented at the Conference, the National Members of the following countries did not attend the 1st session of the General Assembly:

- Argentina
- Belgium
- Estonia
- Turkey
- Ukraine
- Uruguay

## 1. Opening

The General Assembly was opened at 13:30 by Clive Davidson, President of IALA.

Mr. Davidson, referring to the theme of the Conference, "Aids to Navigation in a digital world" remarked that incredible changes were taking place in the aids to navigation field, where the safety aspect is more and more important.

To reflect these changes, the IALA Committees produced an enormous amount of work. The President expressed his special thanks to the Secretary General and his team for their continuous effort to support the work of the Committees and to respond to vast issues.

The IALA Council, also, worked hard during the 4 year period that comes to its end with this Conference. The Council managed the IALA administrative and financial matters very carefully. It also had the opportunity to visit several National Member countries, which is very valuable. This was excellent opportunities to see actual aids to navigation situations and issues.

The Industrial Members had been very involved too. They contribute deeply to the IALA work and the organisation of the Conference. In addition, their working with National Members enables IALA to achieve a perfect balance, and the companies belonging to IALA can have products tailored to the needs.

The President encouraged all participants to visit every stand of the Exhibition and take full advantage of this unique opportunity to meet the producers and see the latest equipment.

## 2. Presentation of the IALA accounts – 2002-2005

The accounts were presented by Jeremy de Halpert, IALA Treasurer and Chairman of the Financial Advisory Committee.

The Treasurer began his presentation by paying tribute to his predecessor, Mel Boyd of Ireland, who held the position of IALA Treasurer from 1996 to March 2005, and thanking the IALA Secretariat for its good management of the finances in some difficult years.

He explained that the Finance Advisory Committee (FAC) is comprised of 5 members elected from among the Council. The Treasurer is elected from among the FAC. The FAC meets twice a year and advises the Council on financial matters.

During the period 2002-2005 the annual turnover amounted to Euros 1.4 M, with a reserve of 1 M Euros. The purpose of the reserve is to ensure one year of operation without any income. The current reserve is lower than it should be, due to financial problems experienced during the period.

A global view of the balance sheets of the individual years was presented, which shows two critical years (2003 and 2004) ending with a loss (Figure 1).

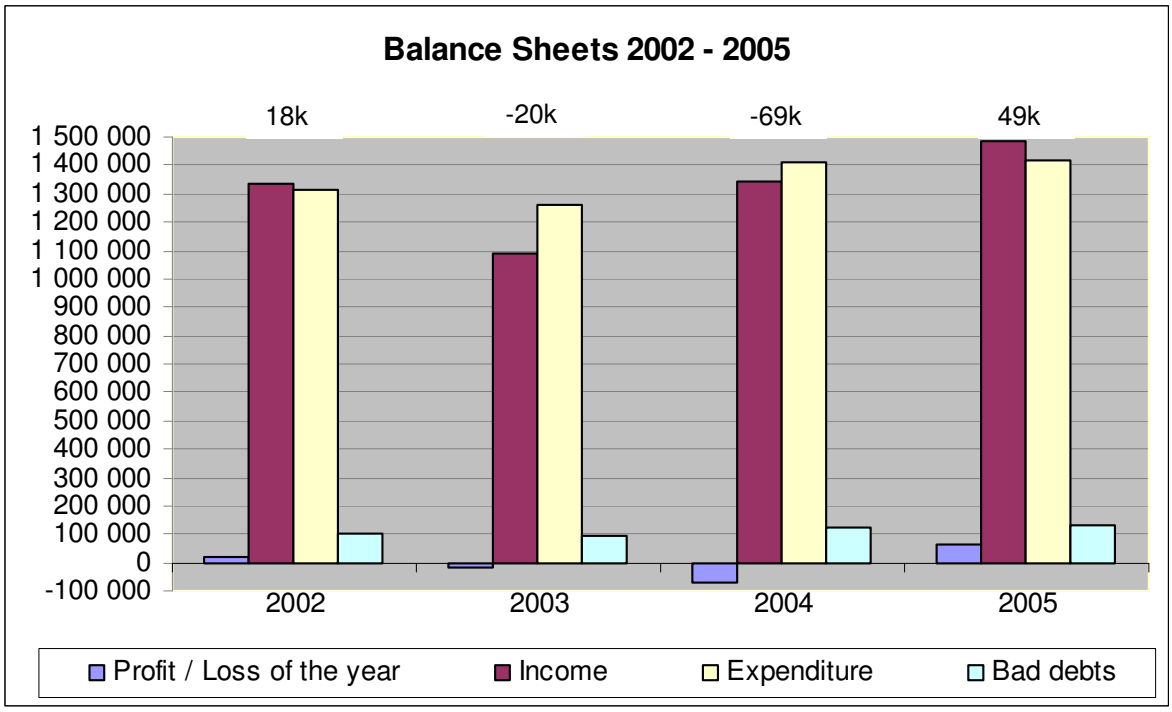



***Figure 1***

The income allows IALA to carry out its planned activities – Committees, Workshops, Seminars, etc. More income means more activity and better service to Members. However, the level of income varies from one year to another, making it difficult for the IALA Secretariat to take on unexpected additional activities.

The expenditure has to be kept within the limits of the income but, sometimes, in order continue the activity, IALA has to make use of its reserve, which explains that the reserve is not as high as it should be.

Generally however, the profit and loss are kept as a minimum, with an efficient use of resources.

The bad debts are a worry. They are provided for in the IALA budget but their amount represent a lot of activities that could happen if sufficient money were available. And, worse, they are increasing year by year.

Obviously, but importantly, Membership fees are vital for IALA: they represent 86% of its income (Figure 2). The remaining small parts are generated by the sale of publications, advertising spaces in the IALA Bulletin, and payment of written off invoices or industrial members paying additional years in order to exhibit.

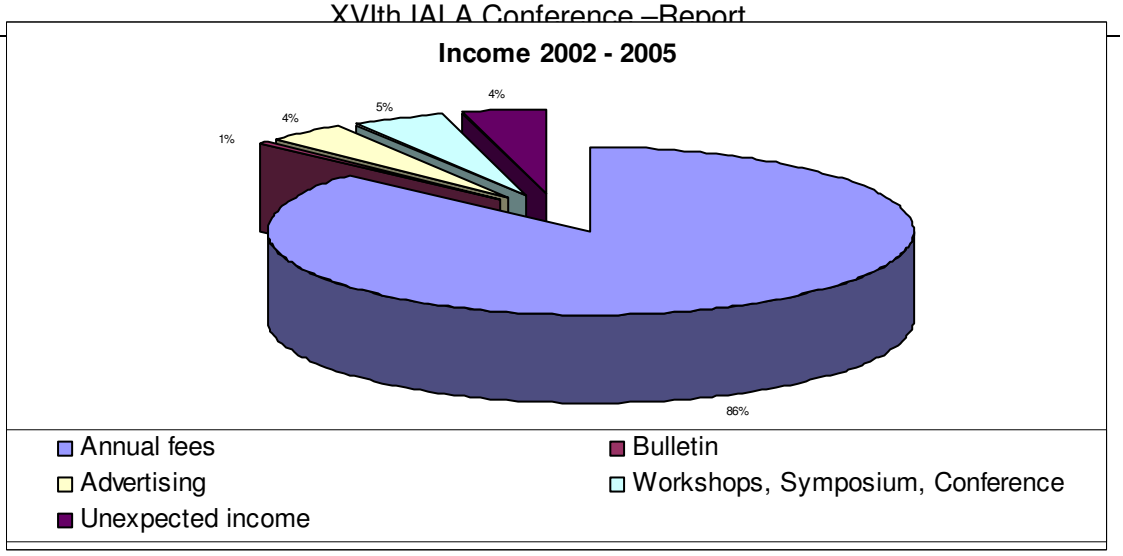



***Figure 2***

Expenses are divided into categories fitting to accounting rules (Figure 3). With 62% of the expenditure, staff is the major expense. However, the staff is the engine room of IALA activities. It plays an important role in the work of the Committees, in the Conferences and Workshops. It produces all IALA documents. So it is a major source of output.

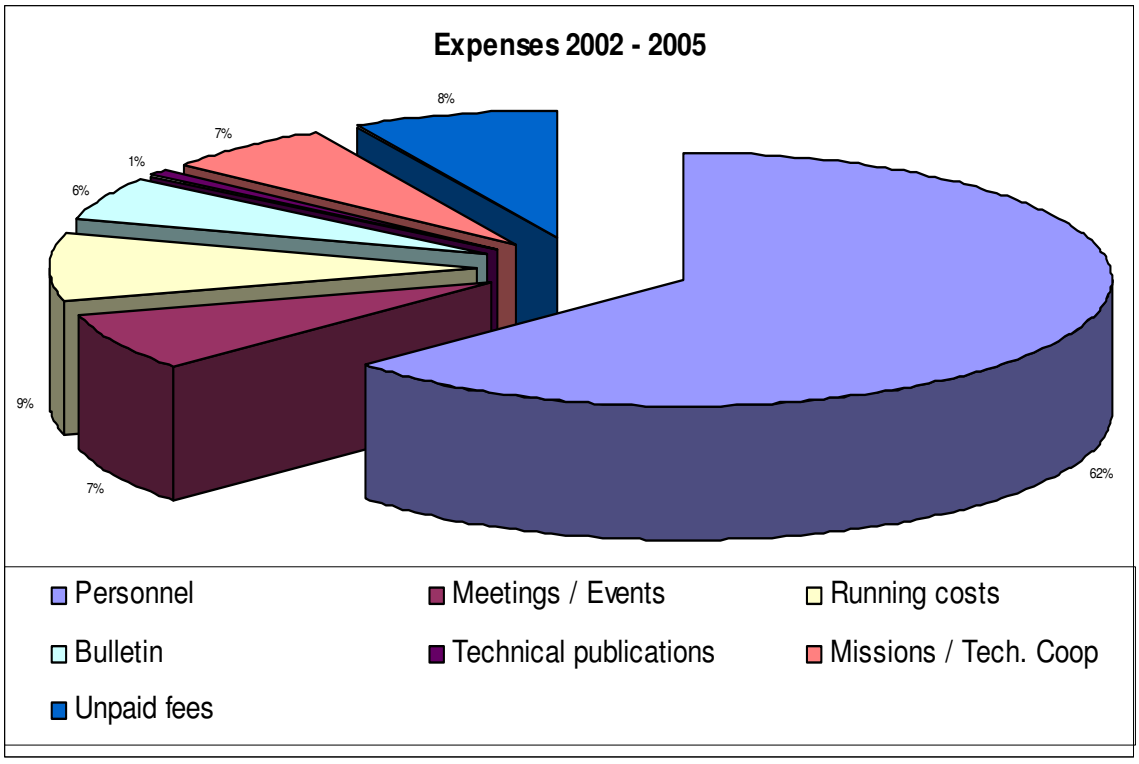



***Figure 3***

There is a need, however, to give a real picture of the actual use of the money, there is a need to allocate expenses to the actual use. administration costs are ¼ of the full output; service to members (including documents, papers and public relations) are ¾ of the full

output. Figure 4 gives a clear picture of a slim and efficient organisation, focused on output. Unpaid fees, however, are a real handicap to IALA in its service to the membership.

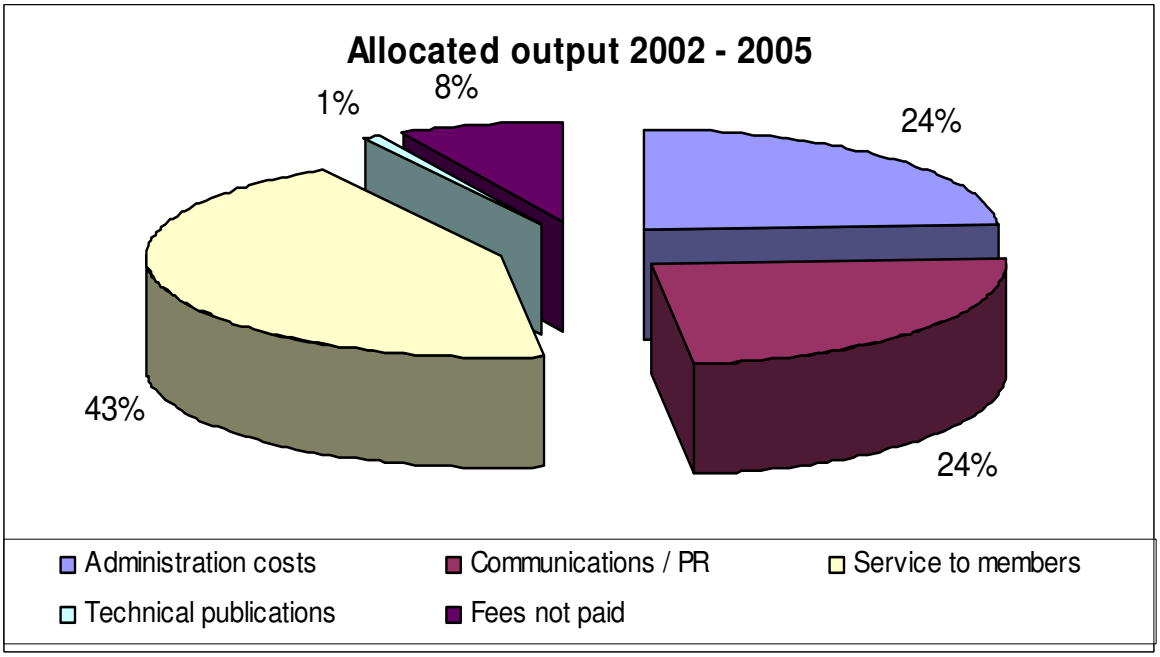



***Figure 5***

As already stated before, each year cash flow is a problem. A monthly cash flow situation is therefore produced, to foresee the result of the year, monitor the income and expenditure, ensure that the budget is not exceeded, and give the Council a real time information on the IALA accounts.

At the end of the year cash flow situations can look very different, as illustrated in Figure 6.

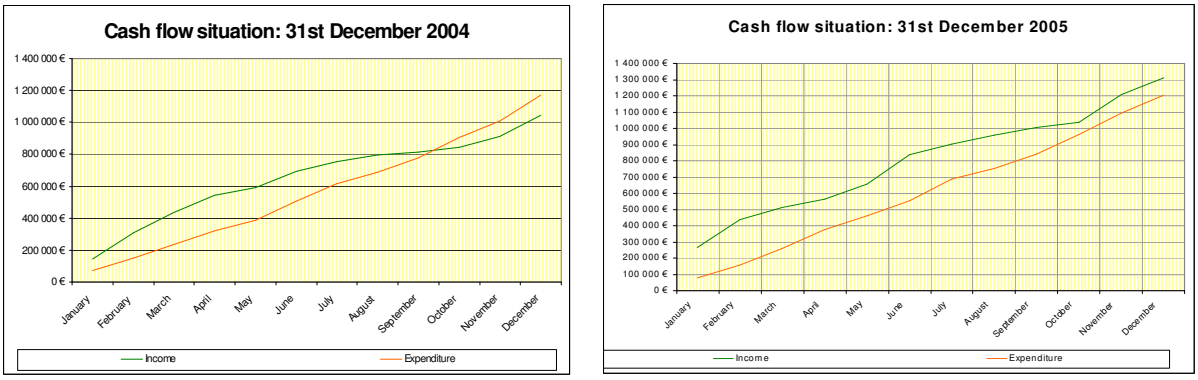



***Figure 6***

In 2004, when there was a loss, the expenditure line crossed the income one in September and continued to go up until the end of the year. It should be borne in mind that IALA activities are planned 1 to 3 years in advance and it is not always possible, nor desirable, to have the programmes trimmed in a year. Although the cash flow situation looks much better in 2005 (the two lines never cross), membership fees should be paid in January, which means that the income line should be at the top at the beginning of the year. This is, however, not the case and the late payment of subscriptions generates a lot of uncertainties.

In conclusion, it can be said that IALA is a small but very effective organisation. The Secretary General exercises good financial control but membership fees are vital to ensure the annual programmes. The lack of payment, or late payments, resulted in programmes trimmed or new programmes unable to be funded. Small increases in fees must be expected.

## 3. Presentation of the IALA Strategy

Øyvind Stene, Chairman of the Council Working Group on Strategy, outlined the main features of the work done by his group: creating a strategy, defining important points for a strong future, implementing the strategy and identifying its implications for IALA.

The IALA strategy was created in a detailed process, starting with initial work by the IALA Strategy Group. A questionnaire was then forwarded to the Council for consultation, and the results were verified and clarified. The resulting draft strategy elements were presented to the Council for review, and then went to a joint Strategy / PAP meeting.

The final results were modified and then forwarded to IALA Council Session 38 (held on Sunday 21st May 2006) for final approval in principle. The Strategy will go to the new Council, when elected, for final implementation.

**Nine major aspects were identified, as follows:**

- The role and image of IALA: strengthen the role and image of IALA as an international centre of excellence in marine Aids to Navigation and related matters. An essential aspect is to facilitate the health and efficiency of IALA membership to deliver optimum services.

- International cooperation: strengthen IALA relationship with IMO, and form strategic alliances with other international and regional bodies. IALA is the only international non-governmental association representing, world-wide, administrations and authorities responsible for the provision and operation of marine AtoN. To optimize safety of navigation for the benefit of the IALA members, strategic alliances with other international and regional bodies needs further development.

- Aids to Navigation system mix: develop a set of standardized, traditional and enhanced Aids to Navigation services to ensure a balanced mix. One of the greatest challenges facing IALA and its members in the coming decade will be how to provide an appropriate and balanced mix of enhanced and traditional aids to navigation, to maximize safety of navigation through careful selection of what services to provide and at what level. This task includes designing a system of aids that will benefit the entire spectrum of users, from recreational boaters to commercial vessels, as well as organizations that exploit the sea and the sea bed.

- E-Navigation: take a leading role in the development of e-navigation and the Marine Electronic Highway. With the introduction of Marine Electronic Highways, recent research results and developments regarding e-navigation and AtoN Information Systems are considered as important elements to support and increase safety of navigation.

- Risk Analysis and Management: strengthen the role and image of IALA as an international centre of excellence in marine Aids to Navigation and related matters. Develop methods and tools for a world wide, harmonized risk analysis and risk management system for Aids to Navigation services.

- Support to Members: publish and circulate IALA Recommendations, Guidelines and Manuals to the Membership and the international community.

- Service to users: develop methods to identify user requirements on an objective basis for providing the best possible service to the customers.

- IALA Members and third parties: support coordinated waterways management, Aids to Navigation and VTS, with other private sector organizations, and other governments.

- Quality assurance: develop a quality management system for Aids to Navigation services and equipment.

**The IALA Strategic Plan will be implemented** according to a detailed implementation matrix, which makes best possible use of the IALA Toolbox. This will include close coordination between IALA Headquarters, IALA Council, IALA Policy Advisory Panel and IALA Committees.

To ensure all aspects are responded to, IALA will prepare workshops and seminars or provide ad-hoc groups with access to specialists to respond to requirements and provide specific expertise.

The overall strategy will be evaluated on an on-going basis by the IALA Strategy Group, formed from IALA Council members.

The IALA Strategic Plan for 2006-2010 is ambitious, yet achievable. However, it must also be flexible to adapt to the rapidly changing environment in which we all work. The ongoing evaluation will be crucial to ensuring IALA is positioned to respond quickly and appropriately to changing demands.

**The Strategic plan has specific implications for IALA:**
- On the IALA Committee structure
- On the working process; and, ultimately, the
- On the IALA Constitution.

**The IALA Committees are working for the future.** With the Strategy set, it is envisioned that there will be 4 committees for 2006-2010. These committees will be:

VTS – Vessel Traffic Services – continuing the work on technical requirements and equipment; operational issues and training of VTS Personnel;
E-Nav – e-navigation – encompassing all related aspects including AIS, information exchange and display, Differential GNSS, communications technologies and more!
EEP – Engineering, Environment and Preservation – with emphasis on the light and colour issues as identified in 2002 (ongoing); the impact of technology on the provision of AtoN services and equipment; the conservation of historic lights and equipment.
ANM – Aids to Navigation Management – an ongoing focus on the management of AtoN services, including quality assurance and provision of the best possible mix of AtoN to respond to user requirements.

The IALA Policy Advisory Panel, consisting of the Chairs and Vice-Chairs of each committee, as well as other IALA experts and IALA HQ personnel, will continue to work to ensure continuity of response to issues facing IALA.

The work programs for the IALA Committees has been identified directly through review of detailed strategic elements, and responds to the key 9 points identified.
Committee work will continue to be a focus for our expert communities, with ad-hoc groups providing an opportunity to deal with specialist areas as required. The IALA toolbox will continue to draw on options for Workshops and Seminars, and make best use of communications techniques such as the IALA bulletin and the IALA website.

**The working process** will continue to provide the best possible working environment for the IALA membership, sharing expertise and identifying issues and trends. Specifically, the 4 committees have an ambitious work program, directly linked to the IALA Strategy, that they will be working to fulfil. This will be done with close liaison through the IALA Secretariat, specifically through the IALA Technical Coordination Manager.

The Policy Advisory Panel will continue its role of ensuring coordination in the work of the committees, as many elements in the strategy straddle more than one committee's area of expertise.

The IALA Strategy Group will continue its work, reviewing the existing strategy as required, but more importantly, looking forward to the future. As IALA approaches its 50th Anniversary – July 1, 2007 – it is important that we not only review what we have done, where we have been, but look to what we can be and where we can go in the future.

## 4. Proposed changes to the Constitution

The Secretary General explained the reasons for which a proposal for some changes to the Constitution was submitted.

Article 1
An addition was made to emphasize the fact that an aid to navigation can also be a "service", like a Vessel Traffic Service.

Article 2
The Council thought it was important to stress that, in the present days, IALA does not deal with political or religious issues.

Article 3
Article 3 now provides for IALA organizing events other than Conferences and Seminars.

Article 4
Accent was put to the necessity of cooperating with other organizations, not only maintain links.

Article 5
National Membership now provides for more than one National Member in a country. Also, the conditions of membership termination have been changed to give the Council more flexibility, and not to have a member expelled automatically after a stated number of unpaid years.

Article 6
The address of the registered office of IALA was reintroduced, to comply with the French law on associations but the Council would be given the possibility to decide on a relocation.

Article 8
This was the most important change. Council was of the opinion that its membership does not give a true geographical representation of the IALA Membership. After due consideration it was felt that increasing the number of elected Councillors from 18 to 22 would give regions not represented an opportunity to seat on the IALA governing body.

Article 10
Exhibition conditions were not clear in the previous Constitution. Clarification was given by stating that Industrial Members intending to exhibit at IALA Conferences must have paid an amount of money equivalent to the subscriptions of the 2 previous years plus the year of the Conference.

Other changes were editorial.

The President invited questions and the Netherlands representative had two remarks:

- The way Article 2 was written could lead people that IALA **is** a religious organization.
- Regarding Seat, he suggested to remove the sentence requiring ratification by the General Assembly.

Both modifications were accepted and the President invite the National Members present to vote on the new Constitution, by raising hand.

The new Constitution was accepted by a large majority of votes.

The President invited candidate National Members to make themselves known by Friday 26th May, 1300, by returning to the Secretariat the necessary application forms, duly completed and signed.

The General Assembly was adjourned until session 2, which will be held on Saturday 27th May, 1100. Election of new Councillors will take place during this second session.

# Annex 7 – Report of the 10th IALA General Assembly Session 2

**SHANGHAI INTERNATIONAL CONVENTION CENTER**
**Auditorium**

**REPORT OF SESSION 2**

Session 2 of the IALA General Assembly was held on 27th May, 2006, at the Shanghai International Convention Center, People's Republic of China.

## 5. Opening

The General Assembly was opened at 11:00 by Clive Davidson, President of IALA.

Mr. Davidson expressed his gratefulness to the Organisers of the Conference and warmly thanked the IALA staff, requesting them to come on the stage.

## 6. Election of the new Council for the period 2006-2010

Mr. Davidson recalled that the number of Councillors had been increased to 24 during the 1st session of the General Assembly. He then explained that the IALA Secretariat had received as many applications as seats available in addition to the nominated organisations (China MSA and National Ports Authority of South Africa), therefore no vote was needed. The following organisations would form the IALA Council for the next four years:

Australian Maritime Safety Authority
Brazilian Lighthouse Authorities
Canadian Coast Guard
Chilean Navy
China Maritime Safety Administration
Royal Danish Administration of Navigation and Hydrography
Finnish Maritime Administration
Direction des Affaires Maritimes, France
Federal Waterways and Shipping Administration, Germany
Directorate General of Lighthouses and Lightships, India
Commissioners of Irish Lights
Japan Coast Guard
Ministry of Maritime Affairs and Fisheries, Republic of Korea
Ministry of Communications Transport Sector, Kuwait
Light Dues Board Peninsular Malaysia
Norwegian Coastal Administration
Head Department of Navigation and Oceanography, Russia
Service de Sécurité Maritime, Sénégal
Puertos del Estado, Spain
National Ports Authority of South Africa
Swedish Maritime Administration
Coastal Safety and Salvage Administration, Turkey
Trinity House, England and Wales
United States Coast Guard, USA

The heads of delegation of these organisations were requested to come to the stage where they were congratulated by the Assembly.

The new Council then left the Assembly to have its first meeting and elect the new President, Vice President and Finance Advisory Committee.

## 7. Invitation to the VTS Symposium 2008

Mr. John Erik Hagen, Director, Norwegian Coastal Administration, presented the arrangements made for the next VTS Symposium to be held in 2008 in Bergen, Norway – VTS2008 – A Global Approach. He noted that Bergen is a dynamic location for the Symposium, with a growing network of VTS centres. The focus for the Symposium will be the role of VTS in global traffic monitoring, legal aspects of providing VTS, recruitment, training and maintaining professional competencies for VTS personnel, the role of VTS in the emerging concept of e-navigation, innovations and improvements in VTS operations and the unique aspects of providing VTS in arctic regions. He concluded his presentation by inviting all IALA members to take part in the Symposium.

## 8. Invitation to the 17th IALA Conference

Mr. Mvikeli Matutu, General Manager Maritime Services, National Ports Authority of South Africa invited delegates to the XVIIth IALA Conference, to be held in Cape Town, South Africa. His very dynamic presentation noted the planning underway for the conference to be held in March 2010. All IALA members were invited to South Africa to participate in the conference and the IALA General Assembly.

There was no other business and the General Assembly closed at 12:30.

IALA Council 2006-2010