

## REPORT

# 18th IALA Conference

## Aids to Navigation Knowledge and Innovations

### From the Torre de Hercules to e-Navigation and Beyond

Version 2

25 -31 May 2014



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## **REPORT**

### **18<sup>th</sup> IALA Conference**

### **Aids to Navigation Knowledge and Innovations**

### **From the Torre de Hercules to e-Navigation and Beyond**

#### **EXECUTIVE SUMMARY**

The 18<sup>th</sup> IALA Conference – Aids to Navigation Knowledge and Innovations: From the Torre de Hercules to e-Navigation and Beyond – was held from May 25 – 31 2014 at the PALEXCO (Palacio de Exposiciones y Congresos de A Coruña), A Coruña, Spain, co-hosted by Puertos del Estado. The conference was attended by 413 delegates, plus many staff from the host country with a total of 558 registrations. The delegates represented 62 countries. The exhibition attracted 46 Industrial Members with 77 stands, displaying the latest developments in aids to navigation technology and services. The conference was a "Paperless conference" and delegates were provided with electronic tablets and some apps to follow the conference, instead of using paper documents.

A series of 79 presentations were given under five broad headings:

- Aids to Navigation Provision
- E-Navigation and beyond
- Global navigation
- Management
- Heritage

In order to increase the participation of technicians in the Conference, a best practice initiative was included as a way of sharing organisations' experiences that solve a specific technical problem and / or save significant resources.

A Pre-conference capacity building Seminar on Aids to Navigation Knowledge and Innovation dealing with training and certification of AtoN and VTS personnel was held on May 24.

A General Assembly meeting was held in two sessions during the week, at which IALA's Strategy, financial status, the potential change of IALA status to IGO, and changes to the IALA Constitution were discussed. Elections took place for 21 of the 24 seats on the IALA Council. The seats for the President (Spain) and Vice President (Republic of Korea) country were filled in accordance with the IALA Constitution.

Her Royal Highness, The Princess Royal attended sessions on 30<sup>th</sup> May to celebrate the 500<sup>th</sup> anniversary of the granting of the charter to the Corporation of Trinity House.

A number of additional meetings were held during the Conference including the IALA Council, the Iberio group of Spanish speaking countries, the group of French speaking countries, VTS2016 Steering Committee and the IMC.

The Conference identified nine conclusions.

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# 18<sup>th</sup> IALA Conference

## Aids to Navigation Knowledge and Innovations

### From the Torre de Hercules to e-Navigation and Beyond

## 1 Introduction

The 18<sup>th</sup> IALA Conference was held from May 26-31, 2014 at the PALEXCO (Palacio de Exposiciones y Congresos de A Coruña), A Coruña, Spain. The theme for the conference was Aids to Navigation Knowledge and Innovations: from the Torre de Hercules to e-Navigation and Beyond, and the technical presentations focused on these aspects. Over 413 delegates, representing 62 countries attended the conference with total attendance of 558. An industrial exhibition by 46 Industrial Members provided 77 stands to show the latest developments in AtoN equipment. The conference was a "paperless conference" and delegates were provided with electronic tablets and some apps to follow the conference, instead of using paper documents.



A list of participants is included at ANNEX F.

## 2 Overall Programme

The overall programme is shown in the following table. The Conference programme was preceded by a pre-Conference Seminar on Training and Certification of Aids to Navigation (AtoN) and Vessel Traffic Service (VTS) personnel on Saturday 24<sup>th</sup> May 2014.

Aids to Navigation – Aids to Navigation Knowledge and Innovation  
18<sup>th</sup> IALA Conference – Report

18 <sup>th</sup> IALA Conference – Overall Programme									
Saturday 24th May	Sunday 25th May	Monday 26th May	Tuesday 27th May	Wednesday 28th May	Thursday 29th May	Friday 30th May	Saturday 31st May		
Pre Conference Seminar Training and Certification of Aids to Navigation (AtoN) and Vessel Traffic Service (VTS) Personnel	REGISTRATION	Council meeting	Registration	Technical session 1.1 Aids to Navigation provision	Technical session 2.1 e-Navigation & beyond	Technical session 3.1 Global Navigation	Technical session 4.1 Management	Heritage session	
			Opening Show	Break	Break	Break	Break	Break	
			Break	Technical session 1.2 Aids to Navigation provision	Technical session 2.2 e-Navigation & beyond	Technical session 3.2 Global Navigation	Technical session 4.2 Management	Conclusions	
			Keynote speech IALA Activities	Lunch	Lunch	Lunch	Lunch	Lunch	
		Registration	Lunch	Technical session 1.3 Aids to Navigation provision	Technical session 2.3 e-Navigation & beyond	Technical session 3.3 Global Navigation	Technical session 4.3 Management	General Assembly 2 (election)  Invitation to IALA 2018 & VTS 2016	
			Reports of IALA activities Session	Break	Break	Break	Break	IALA Council	
			Exhibition opening and visit to the Exhibition	General Assembly 1	Technical session 2.4 e-Navigation and beyond	Technical session 3.4 Global Navigation	Best practices Session		
				End of sessions	End of sessions	End of sessions Exhibition closes	End of sessions		
		Free	Welcome reception	Conference dinner	Free	IMC Evening	Free	Free	Gala Dinner

### 3 Conclusions

This session was chaired by the IALA Secretary-General. He thanked the group of experts who had gathered the Conference conclusions together and noted that all aspects of the Conference would be recorded in the Conference report. Following a presentation of the conclusions, the conference agreed to the following nine conclusions:

1. IALA should consider providing guidance on anomalous behaviour recognition to improve VTS operations and ship monitoring.
2. An evolving mix of communication systems is needed to convey maritime safety information and e-Navigation services. The need for protection of radio frequencies will continue.
3. There is an emerging consensus to adopt the Maritime Cloud concept as a logical infrastructure for e-navigation, with communications standardisation and resilient PNT.
4. Apparent Intensity compared to Effective Intensity may be more suitable for characterizing the range of Marine Signal lights and requires further study .
5. Shore based authorities should recognise that there is a significant population of smaller and non SOLAS vessels that is not equipped to take advantage of all aspects of e-Navigation services.
6. Recognising the IMO/IALA zero accident campaign, there is a need for standardised reporting, investigating and analysing vessel near misses.
7. The need for training and capacity building was recognised to ensure correct assessment, specification, delivery and quality assurance of AtoN. This should include safe maintenance practices and the use of personal protective equipment.
8. Marine Spatial Planning could have a significant economic benefit if successfully implemented. Maritime authorities should take account of route topology modelling and the analysis of risk using the IALA risk management toolbox.
9. Comprehensive planning for the protection of aids to navigation from significant weather or environmental events (e.g. hurricanes, tsunamis or earthquakes) is an effective risk mitigation strategy.

## Reports of IALA Activities

Chaired by Michael Card, Deputy Secretary General, IALA

### 4 Reports of IALA Events

#### 4.1 Technical Activities Reports

##### 4.1.1 Aids to Navigation Management (ANM) Committee Report – Capt Phil Day, Northern Lighthouse Board (Chair ANM Committee)

The Aids to Navigation Management Committee (ANM) has been in existence for 12 years and for the last 4 Phil Day has been chair. It's been a team effort though, the unwavering support of Michael Skov as Vice Chair. Roger Barker and Gerry Brine as working group chairs and with their vices Jorge Teles and Bjorn Eric Krosness have ensured that the Committee stayed on track and completed all but one task in its 2010 to 2014 work program.



Thanks have to go to Lorraine, Virginia, Christophe, Mike Hadley and latterly Wim Van Der Heijden for their support during the meetings.

This achievement has been set against the narrative of a slow global recovery after one of the deepest recessions we have known. Many administrations have faced rationalisation, merger, travel bans and sequestration as well as the day to day pressures of work. This has meant that attendance at ANM has constantly fluctuated.

One hundred and twenty six different individuals have attended ANM. Twenty nine individuals attending five or more committees, and only six individuals attending all seven committee meetings. Fifty nine individuals attended only once, giving attendance levels of 35 to 50 per meeting.

Turning this into a country by country analysis members from 37 countries attended ANM, 11 were in attendance for all sessions, whilst members from nine countries attended just once. No matter how many times people attended they contributed and benefited, ideas have been shared and networks have been expanded. Without the efforts of every single attendee ANM would not have delivered its planned output.

The committee met outside of IALA HQ on one occasion. In November 2012 at the kind request and with the support of AMSA, the Committee met in Brisbane Australia.

Following on from an IALA risk workshop the previous week in Sydney at which a number of ANM members took part, the meeting enabled a number of authorities to attend who would not normally travel to IALA.

The work slowed a little with some regular members unable to attend but this was far outweighed by the opportunity for regional attendance which brought new views and input to the committee.

The meeting in Brisbane proved to be a very successful event with technical visits to Cape Byron Lighthouse, Smartship Australia's full mission vessel simulator and to Australian Maritime Systems (AMS) being additional highlights.

During this four year period the Committee reviewed 338 input papers, produced 60 liaison notes, produced or amended 8 IALA Guidelines and produced or amended 6 IALA Recommendations.

All the documents reviewed whether only containing minor amendments or complete rewrites were thoroughly considered by those tasked prior to amendments being made.

Notable work went into guidance for Aids to Navigation Authorities on the user requirements and practical applications of e-Navigation, from berth to berth, guidance on the application of maritime surface picture for analysis in risk assessment and the provision of Aids to Navigation, developing a supplementary Guideline to 1058 providing technical detail for simulator providers and procurers

of simulation to ensure appropriate components and quality for AtoN features and review of IALA Recommendation O-139 on the Marking of Man-made Off-shore structures. The latter document was awaited with much interest by the burgeoning off shore renewable energy sector.

Keeping in mind the difficulties experienced by various authorities ANM has deliberately tried to keep inter sessional working to an absolute minimum.

One workshop was held by the Committee in May 2013. This was on Marine Spatial Planning with its output feeding into the drafting of guidance which will continue in 2014-18. This workshop generated interest outside of the normal IALA community and has created new relationships with various government planning and licensing authorities which can only benefit IALA and its members. The workshop heard case studies from the Netherlands, Scotland, Australia and the US as well as from renewable energy developer bodies. Much useful information was gathered to incorporate into a new guideline. During the workshop the draft of the revised recommendation O139 was reviewed and commented on. Members of ANM have also assisted with, and attended other committee's workshops and seminars.

The ANM Committee is responsible for the compilation, issue and analysis of the IALA questionnaire. It's fair to say the questionnaire had evolved over the years to meet various committee requests from across IALA and had got a bit complicated and lost its way.

The annual issue of an every changing questionnaire made analysis difficult. During the 2010 to 2014 program the format and frequency of the questionnaire was considered. With Council approval ANM has completely reviewed the questionnaire, with input from the other Committees. The questions are now fixed for four years and the questionnaire will only be issued every two years via an adobe interactive form, which enables improved data collection.

The first issue of this new format was in January 2014, in order to ensure that data was available for the Conference. The data collected in January 2014 showing 2013 year-end statistics was returned from 25 countries, showing that the majority of AtoN organisations are civilian, that a significant proportion use performance indicators, risk management tools, ISO certification and have training facilities. Most are solely or partially public funded, only 25% of respondents contract out AtoN management. Looking at the AtoN hardware, plastic buoys now dominate and just under half of lit AtoN are using LED lights, whilst Japan and Germany have the most lighthouse visitors. Much more than this can be gleaned from the data. Direcção de Faróis Portugal, which co-ordinates the analysis and issue are kind enough to host a Geographic Information System portrayal on their website. The data is only as good as that received and the ANM Committee requests that more countries return the information, so that a global picture can be developed.

The ANM Committee is also responsible for the co-ordination, editing and preparation for printing of the IALA NAVGUIDE. The 2014 NAVGUIDE has been provided to Conference delegates on the tablet computers. This has taken a considerable amount of time and has occupied many of the Committee members every meeting through the previous four years. It is the one area where considerable 'out of session' work has been done, particularly in the run up to being print ready. This difficult task was ably lead by John Festarrini, who was ably assisted by many of Working Group 2. I commend their work and the final document to you. Thanks also go to the Canadian Coastguard for formatting and making the NAVGUIDE print ready.

Co-ordinating ANM and the other Committees input, dealing with five different versions of Microsoft word and several versions of spell check is not straightforward when dealing with any IALA document, but the NAVGUIDE seems to magnify this considerably. Consequently we are looking at better ways of doing this task are being investigated to permit concentration on content rather than presentation.

The ANM Committee will be considering making the IALA Wiki the home of the content of the NAVGUIDE. This is a tool internal to IALA from which a document can be exported to be published on the IALA website or printed. This is very much work in progress and credit has to go to Ómar Fritz Erikson and David Jeffkins for taking it this far. I am hoping that the ANM Committee will embrace it for our future work. And of course the Committee enjoyed themselves; ANM continued the traditions of football matches, enjoyed dinners together and technical visits.

ANM will be changing in the coming session, a new name, a new work program and the challenges of getting our publications to a new level are ahead of us but as we end the 2010 to 2014 work programme I am pleased to report that ANM is as cohesive and inclusive as ever and ready for the coming challenges.

**4.1.2 Engineering, Environment and Preservation of Historic Lighthouses (EEP) Committee Report – Mr Ómar Frits Eriksson, Danish Maritime Authority (Chair EEP Committee)**

Aids to Navigation (AtoN) engineering has been one of the primary focus areas of IALA since its beginning, indeed it was an important engineering discipline for at least 100 years before that. The environmental aspects of providing Aids to Navigation services have become more and more important over the last 25 years in line with the increasing general concern about the environmental load of activities associated with our civilisation.

As time has passed, some of our aids to navigation have become obsolete, having served their purpose and now AtoN authorities are faced with having to make decisions about how to preserve or conserve these assets in a sustainable manner.



The Engineering, Environment and Preservation of historical lighthouses committee (EEP) has provided guidance on all these important matters to the IALA membership for over 12 years now.

The past four years have been hectic and the Committee has done a tremendous work on all aspects of Aids to Navigation provision.

In order to manage this very ambitious work plan we organized ourselves in four working groups:

1. Aids to Navigation infrastructure, design and maintenance lead by Adrian Wilkins;
2. Heritage, conservation & civil engineering lead by Bob Macintosh;
3. Environment, quality assurance, training & publications lead by David Jeffkins;
4. Light and vision lead first by Seamus Doyle who has now retired and thereafter by Malcolm Nicholson.

The EEP Committee has been fortunate enough to enjoy between 40 and 50 participants from more than 25 different countries, which underlines the international character of the work undertaken by IALA through its committees.

EEP Committee achievements 2010-2014

During this work period the committee revised 3 Recommendations and 8 Guidelines, created 12 new guidelines and conducted 2 workshops and 1 seminar.

Revised recommendations:

- Recommendation E-110 on rhythmic characters of lights on Aids to Navigation;
- Recommendation E-108 on Surface Colours used as Visual Signals on AtoN;
- Recommendation E-141 on Standards for Training and Certification of AtoN Personnel.

Revised Guidelines:

- Guideline 1006 on Plastic Buoys;
- Guideline 1012 on Lightning Protection;
- Guideline 1015 Painting Aids to Navigation Buoys;
- Guideline 1036 on Environmental Management in Aids to Navigation;
- Guideline 1043 on Light Sources Used in Visual Aids to Navigation;
- Guideline 1065 on Aids to Navigation Signal Light Beam Vertical Divergence;

- Guideline 1066 on Design of Floating Aids to Navigation Moorings;
- Guideline 1067-0 on Selection of Power Systems for Aids to Navigation and Associated Equipment.

New Guidelines:

- Guideline 1073 on Conspicuity of Aids to Navigation Lights at Night;
- Guideline 1080 on the Selection and Display of Heritage Artefacts;
- Guideline 1085 on Standard Format for Electronic Exchange of AtoN Product Information;
- Guideline 1094 on Daymarks for Aids to Navigation;
- Guideline 1091 on Bird Deterrents;
- Guideline 1092 on Safety Management for AtoN Activities;
- Guideline 1093 on Management of Surplus Property;
- Guideline 1098 on Application of AIS AtoN on Buoys;
- Guideline 1099 on Hydrostatic Buoy Design;
- Guideline 1100 on AtoN Training and Accreditation;
- Guideline 1108 on Providing AtoN services in Polar Regions;
- Guideline 1109 on Theft and Vandalism Deterrents.

Workshops and Seminar:

- Workshop on Short Range AtoN in the e-Navigation era (Brest, France) 2012;
- Workshop on the Challenges of Arctic AtoN Provision (Ilulissat, Greenland) 2013;
- Seminar on the Preservation of Lighthouse Heritage (Piraeus, Greece) 2013.

The Committee also assisted the IALA World Wide Academy with the development and revision of a number of Recommendations, Guidelines and Model Courses in relation to Aids to Navigation manager and technician training. More than 30 new and revised model courses were developed and these are now being utilized in the World Wide Academy capacity building activities.

New and revised model Courses:

- E-141.1 Model Course Level 1 Training
- E-141.2 Model Course Level 1+ Senior Management Training
- L1.3 Use of IALA Risk Management Tools
- L2.0 IALA WWA Courses Technician Level 2 Overview
- L2.1.1-1.2 Introduction to Aids to Navigation
- L2.1.12 Power sources on Buoys
- L2.1.12 Maintenance of Plastic Buoys
- L2.1.13 Maintenance of Steel Buoys
- L2.1.14 Introduction to Shore Marks
- L2.1.3-1.4 Introduction to Aids to Navigation – buoyage
- L2.1.7 Buoy Moorings
- L2.1.8 Buoy Cleaning
- L2.1.9 Introduction to buoy positions
- L2.2.1 DC Power Systems

- L2.2.3 Photovoltaic (Solar Panel) systems and maintenance
- L2.3.10 Range, Sector and Precision Direction Lights
- L2.3.1-3 Introduction to Marine Signal Lanterns
- L2.3.4-6 Light Flashers, Lamp Changers and Self Contained Marine Lanterns
- L2.3.7-8 Rotating Beacons and Classic Lenses
- L2.3.9 Maintenance of Mercury Rotating Optics – Technician
- L2.4.1-2 Sound Signals
- L2.5.1-2 Surface Preparation before Coating
- L2.6.1-6.2 Service Craft and Buoy Tenders
- L2.7.1-7.2 Racons
- L2.8.1 AIS AtoN Operations
- L2.9.1-9 Introduction to Radionavigation and DGNS
- L2.1.5 Buoy handling
- L2.2.4 Wind generators
- L2.2.7 Lightning Protection
- L2.2.5-6 Mains AC power systems petrol and diesel generators
- L2.11.1-5 AtoN structures, materials, corrosion and protection
- L2.11.6 Preservation of structures
- L2.11.7 Maintenance Planning and Records
- L2.10.1-2 Remote monitoring of AtoN
- L2.0 IALA WWA Courses Technician Level 2 Overview

During the course of conducting this tremendous amount of work, the Committee has experimented with new ways of working using modern technology. This has resulted in what we call the IALA-WIKI; a closed Wikipedia-like environment where Committee members can store and share important information and co-operate on developing new Guidelines and Recommendations. It is envisaged that IALA-WIKI will be used across all committees over the next four year work period.

Once again, the EEP Committee work programme was a very ambitious one, which could only be accomplished through the continued dedication and hard work of Committee members. It is the work of individuals that makes up the work of the group and I want to express a deep appreciation for the work of each and every individual contributing to the work of the Committee. Only through your hard work and late nights, has the Committee succeeded in achieving its objectives.

Many thanks to Committee members, in particular to the chairmen of the working groups, to the IALA Secretariat for their invaluable support and not the least many thanks to my vice chairs Seamus Doyle and David Jeffkins for their patience with me.

I urge IALA members to continue to support IALA by sending their best experts to IALA technical committees where they can inspire others and be inspired by each other for the benefit of the whole maritime community.

#### **4.1.3 e-NAVigation (e-NAV) Committee Report – Mr Bill Cairns, United States Coast Guard (Chair e-NAV Committee)**

With the bell sounding the end of e-NAV14, the 2010-2014 committee work programme came to a close. At this last meeting, the Committee produced 28 output papers including 2 Recommendations and 6 Guidelines. The Committee also prepared two input documents on PNT and Communications for the Polar AtoN Services Workshop that followed e-NAV14. The essence of the Committee's 4-year work follows.



Working Group (WG) 1, Operations, were led by David Patraiko (Nautical Institute) and, until he moved over to chair Testbeds, his vice chair Mahesh Alimchandani (Australia). WG1 produced numerous liaison notes to the IMO e-NAVigation correspondence group. Consequently, IALA input is prominent in the IMO e-NAVigation Strategy Implementation Plan. This group developed the e-NAVigation Frequently Asked Questions (FAQs) and finalized a Portrayal Guideline.

WG2, Sensors/PNT, was receiving signals from chair Alan Grant (United Kingdom) and vice chair Michael Hoppe (Germany). WG2 crafted the IALA World Wide Radio Navigation Plan and updated IALA Recommendations R-101 (Maritime Radar Beacons),

R-121 (Performance and monitoring of a DGNSS Service in the band 283.5 – 325 kHz 121, and R-135 (Future of DGNSS). The WG also contributed greatly to measures for disaster recovery and the Polar Guideline.

WG3, AIS/Communications, under the chairmanship of Rolf Zetterberg (Sweden) and vice chair Bill Kautz (USA), was responsible for developing the IALA Maritime Radio Communications Plan. Not only was this a significant work for IALA, but was requested by ITU to be reformatted to meet its needs. WG3/4 updated the ITU-R Recommendation M.1371 (Technical characteristics for AIS) as well as the related IALA Technical Clarifications. It updated Recommendations A-124 (AIS Shore Stations) and A-126 (Use of the AIS). With regret, we note that Rolf Zetterberg attended his last Committee meeting at e-NAV14. Rolf has been a steady hand on the tiller for AIS and Communications and we wish him fair winds and following seas as he looks forward to retirement following the 2014 Conference.

WG4, Architecture, gets its blueprints from chair Jan-Hendrik Oltmann (Germany) and vice chair Paul Mueller (Tideland Signal, USA). The architects have developed a series of e-NAVigation Architecture FAQs now included with the generic FAQs. The WG have been building the common shore-based system architecture (CSSA), an update to Recommendation e-NAV140 on the overarching e-NAVigation architecture – the shore perspective, and the structure of the Maritime Service Portfolios. The group has a workshop on CSSA now planned for August 2014 in Hamburg.

WG5, Data Modelling, is piloted by Peter Hooijmans (The Netherlands) and Jarle Hauge (Norway). The WG prepared a Guideline on Producing an IALA S-100 Product Specification and revised Guideline 1087 on Procedures for Management of the IALA Domains under the IHO GI Registry. The WG is working intersessionally to progress a Product Specification on AtoN Information as well as a proposal to IHO on the use of streaming data under S-100.

The latest Working Group is WG6, Testbeds, led by Mahesh Alimchandani (Australia) and Natacha Riendeau (Canada). In two meetings, the group developed an IALA Guideline on the reporting of results of e-NAVigation testbeds and this will be provided to the IMO e-NAVigation Correspondence Group. The WG proposed enhancements to the Danish Maritime Authority's e-NAVigation portal [www.e-navigation.net](http://www.e-navigation.net) based on members' experiences with testbeds and created an IALA e-NAVigation forum on testbeds on LinkedIn.

The Committee was successful in achieving the goals of its work programme and Chairman Bill Cairns wishes to thank all the Committee members, in particular working group chairs and vice chairs and, especially, Committee Vice Chairman, Dr. Nick Ward for his hard work and sage counsel.

#### **4.1.4 Vessel Traffic Services (VTS) Committee Report – Capt Tuncay Cehreli, Directorate General of Coastal Safety, Turkey (Chair VTS Committee)**

Vessel Traffic Services (VTS) has been in existence in various forms since 1948 and the first radar based port control systems were established in Douglas (Isle of Man) and Liverpool in 1948. IALA has been associated with the development of VTS for more than 50 years and the IALA VTS Committee was created in 1981. A primary objective of the VTS Committee is the provision of sound and timely guidance and advice to those involved in VTS matters. The Committee's work programme is decided on a 4-yearly basis, to match the strategies and policy set by the IALA Council. VTS Committee comprises national, associate and industrial members meeting every six months, usually at IALA HQ.



The VTS Committee started its 2010-2014 work period with its 31<sup>st</sup> session with four Working Groups (WG) and came to an end at VTS37 with three WGs. The average number of participants to these seven sessions was 71 from 24 different countries. On average, 12 of the 71 participants (17%) were attending for the first time. The issue of new members needs special consideration in terms of their adaptation and active contribution to the Committee's work. The Committee dealt with an average of 46 input papers at each session and produced 11 output papers.

During the 2010-14 work period, all seven sessions of the VTS Committee were chaired by Tuncay Çehreli (DGCS, Turkey) with Neil Trainor (AMSA, Australia) as Vice Chair. Currently, Chair and one Vice Chair positions of WG1 (Operation) are empty while the other Vice Chair is Monica Sundklev from STA, Sweden. Rene Hogendoorn from SAAB, The Netherlands is Chair of WG2 (Technical Aspects) and Robert Townsend from MCA, UK is Vice Chair. Chair of WG3 (Personnel and Training) is Kevin Gregory from IHMA, UK and Vice Chair is Lilian Biber-Klever from NNVO, The Netherlands. Committee Chairs also endorsed eight persons as IALA World Wide Academy (WWA) VTS Experts in 2013. The list of WWA Experts can be found on WWA page in the IALA website.

##### ***VTS events***

There were three VTS related IALA events within 2010-14 work period. The first event was 12<sup>th</sup> International IALA VTS Symposium held in Istanbul from 10 to 14 September 2012, back to back with the 35<sup>th</sup> session of the VTS Committee. It was a very successful Symposium in which 335 delegates participated from 41 countries. The theme of the Symposium was "Beyond the Limits" and a series of 53 presentations were made under eleven broad headings. In addition, the associated exhibition attracted 14 Industrial Members, displaying their latest developments in VTS. There was also a technical visit to Istanbul VTS Centre and the Symposium identified 12 conclusions.

The second event was a workshop on "Portrayal of Data and Information at a VTS" held in conjunction with the Federal Waterways and Shipping Administration and Jacobs University, Bremen, from 6 - 9 May 2013. The workshop was attended by twenty-five delegates representing ten countries and one Sister Organisation. There were also technical visits to Bremen MRCC, Bremen VTS and Hochschule Bremen's Bridge Simulator. The Portrayal Workshop concluded with fourteen portrayal and eight non-portrayal conclusions and seven principles.

The third event was the IALA Seminar on Simulation in VTS Training. It was held at MARIN and Hotel Hof van Wageningen, The Netherlands from 9 - 13 September 2013, just a week prior to VTS37. A Technical Tour was made to the VTS Centre of the Port of Rotterdam by the Hook of Holland. The seminar was kindly sponsored by MARIN, NNVO and the Port of Rotterdam. Fifty delegates, representing twenty countries attended this Seminar and ten IALA Recommendations were recorded.

***New / revised documents***

The VTS Committee produced five IALA Guidelines and one IALA Recommendation, and revised five Recommendations and one Guideline during the 2010-14 work period.

Recommendation produced;

- V-145 on Inter-VTS Exchange Format (IVEF) Service.

Guidelines produced;

- 1083 On Standard Nomenclature to identify and refer to VTS Centres;  
IMO Resolution A.857(20) on VTS recommends that VTS Centres in an area or sector to use a name identifier but it has been noted that there is a lack of consistency in the use of name identifiers by VTS Centres. These include such terms as: 'VTS', 'VTIS', 'traffic', 'control', 'coastguard', 'harbour control', 'harbour', 'port control'. This Guideline aims to provide guidance to promote consistent nomenclature amongst VTSs around the world.
- 1089 on Provision of Vessel Traffic Services;  
The aim of this Guideline is to give guidance on the delivery of the three types of services provided by a VTS. These services are Information, Traffic Organization and Navigational Assistance. The Guideline also aims to achieve consistency in the provision of the services worldwide in order to avoid confusion about the delivery of VTS services for the mariners.
- 1101 on Auditing and Assessing VTS;  
The aim of Auditing and Assessing Guideline is to provide guidance for competent and VTS Authorities to meet their obligations under SOLAS for the establishment and operation of VTS. In particular it aims to provide guidance for auditing and assessing a VTS and the subsequent on-going assessment and evaluation.
- 1102 on VTS Support and Interaction with Allied Services;  
The Guideline on VTS Support and Interaction with Allied Services describes the issues to be considered and the principles to be respected for successful interaction between VTS and allied or other services.
- 1103 on Train the Trainer;  
The purpose of guideline 1103 is to assist maritime training organizations and their teaching staff in the preparation and introduction of new training courses for Trainers, Teachers and/or Instructors. Guideline provides facilitators with guidance on the content, sequencing and material required to train Trainers, Teachers and/or Instructors.

**Recommendations revised;**

- V-127 on Operational Procedures for VTS
- V-102 on the application of the 'User Pays' principle to VTS
- V-125 on the use and presentation of Symbology at a VTS Centre
- V-103 on Standards for Training and Certification of VTS Personnel
- V-120 on VTS in Inland Waters

**Guideline revised;**

- 1014 on the Accreditation and Approval Process for VTS Training

**Other documents;**

- The Committee revised the IALA VTS Manual in 2012, just prior to the VTS Symposium and distributed printed copies as “IALA VTS Manual 2012 Ed.5” to the VTS 2012 Symposium participants.
- The Committee produced a Position Paper on the need for mandatory training for VTSOs.
- IALA, through the VTS Committee, proposed the STW develop guidance providing a more comprehensive knowledge of VTS functions, responsibilities and procedures for masters and officers. IALA also offered its services to assist drafting the relevant guidance. However at STW43, the Sub-Committee agreed that there was no need to develop guidance as proposed by IALA. After STW rejected the IALA proposal, the VTS Committee added a new work item to the coming work period named ‘develop guidance on VTS awareness for navigating officers’.
- During the 12th VTS Symposium in 2012 in Istanbul, Mr. Koji Sekimizu the Secretary-General of IMO took the initiative of proposing a plan of action to promote a Zero Accident Campaign. This initiative was well received and supported by the VTS Symposium and IALA. After the inaugural meeting of a group of experts from IALA, IHO, IMO, IAPH and IMPA at IMO HQ on January 2013, the IMO Secretariat prepared an outline plan, which shows the composition of the Panel of Experts, Terms of Reference including the draft criteria for evaluation and sent it to IALA to review and provide its comments. Then, IALA, through the VTS Committee provided its comments and finally an input paper numbered NAV 59/19/1 was submitted to the IMO Sub-Committee on Safety of Navigation as a ‘note by the Secretariat’ on the Zero Accident Campaign. The Campaign is expected to be launched at an appropriate time after IMO Council 112 in June 2014.

Briefly, the purpose of this award is to provide a unique, international recognition for established Vessel Traffic Services, which contribute to safety of life at sea, safety and efficiency of navigation and protection of the marine environment, adjacent shore areas, work sites and offshore installations from the possible adverse effects of maritime traffic. According to the proposed terms of reference, the Panel of Experts should meet once a year in order to review and evaluate the nominations with respect to the basic criteria and any other supporting elements.

I believe that, this campaign will have very important effects on the development and harmonization of VTS worldwide and of course improving safety and efficiency of vessel traffic and protection of marine environment. So, I would like to thank once again Mr. Koji Sekimizu, Secretary General of IMO for proposing this fantastic campaign.

**4.1.5 IALA Industrial Members’ Committee (IMC) Report – Mr Enrique Bernabeu Dolz, La Maquinista Valenciana, Spain. (IMC President)**

Enrique Bernabeu Dolz, (La Maquinista Valenciana), President of the IALA Industrial Members’ Committee welcomed delegates and spoke highly of his committee’s achievements, naming its current constituent members: Steve J. Nell of Marine Data Solutions (Vice President & PAP Representative), Clive W Quickenden of Tideland Signal Corporation (Secretary, Treasurer & American Representative), Lars Mansner of Sabik (Europe/Africa Representative), Noboru Maruoka of Zeni Lite Buoy Co Ltd (Asian/Oceania Representative), John Sugarman, Australian Maritime Systems (IALA Observer). He also noted that Laura Rodriguez Salvador had been President until May 2012 and Allen Mitchener was Secretary, Treasurer & American Representative until April 2013.



The work of the IMC in the last four years, since the last meeting of the Industrial Member General Assembly held in Cape Town during the previous IALA conference, has been conducted in accordance with the objectives of the Committee assigned in its Constitution and Byelaws.

One of these objectives is informing Industrial Members about all important decisions and events in IALA. To do this, members of the Committee attended the Sessions of the IALA Council and the Session of the Policy Advisory Panel (PAP). Reports of these sessions have been made and sent via the regional representatives to the industrial members. With this communication industrial members have been kept permanently informed about the IALA news.

This communication has been bidirectional, collecting and transmitting queries from Industrial Members which have been then addressed and answered by the Committee.

The Committee also had regular meetings to discuss matters relevant to the field of activity of IALA with special consideration for the interests of Industrial Members. The meetings held in this period of time have been March, 2011 in A Coruña, May, 2012 in Vancouver, May 2013 in A Coruña, October 2013 in Hamilton Island.

The decisions made at these meetings have been according to the interests and the opinions of the Industrial Members and the general secretariat of the IALA. Among these decisions Mr Bernabeu highlighted the following:

- Dropping IALA Product Certification while maintaining existing Product Templates and informing to all Industrial Members that IALA does not have a Product Certification program.
- Supporting IALA's World Wide Academy including a full presentation of the Academy to Industrial Members who attended the Mid Term General Assembly in Brest.
- Supporting the paperless Conference, being a major sponsor of the tablets that each delegate received when they registered.
- Sponsoring the travel expenses for delegates mainly from Central and South America and Africa who otherwise would not have been able to attend the Conference.

The committee has drafted two pamphlets to promote that companies related to marine aids to navigation should become IALA members. These documents are:

- Pamphlet 1, directed to clients, promoting the advantages of insisting their suppliers to be members of IALA. The most important advantages included in the document are:
  - IALA industrial members work closely with and play their important roles in the different kinds of committees, symposiums and workshops;
  - Based on the IMs activities in IALA technical aspect, the products of industrial members can be reliable, durable, hence maintenance free and environment friendly;
  - Products of industrial members are complied with IALA Recommendations and Guidelines.
- Pamphlet 2, directed to companies, promoting the advantages of being an industrial member. The most important advantages included are:
  - To have the opportunity to exhibit their new technologies during the conference, symposiums and workshops;
  - To contribute one's expertise and compare experiences with other IALA members;
  - To meet with suppliers, or customers, and contribute to the design of the best products;
  - To have a direct and easy access to recommendations, guidelines and manuals publishes by IALA.

These two documents are complementary to each other, and show that if suppliers are IALA Industrial Members it will benefit both customers and suppliers.

Mr Bernabeu noted the very positive growth that has taken the number of IALA Industrial Members in the past ten years, with an increase from 69 to 105 members, representing an increase of 52%, making it the most numerous IALA member category.

The Committee has been active in the organization of three industrial exhibitions in the last few years, coinciding with the 12<sup>th</sup> IALA VTS Symposium, held in Istanbul in September 2012, the Fixed and Floating Aids Workshop, held in Brest in October 2012 and the 18<sup>th</sup> IALA Conference held in A Coruña in May 2014.

The Industrial exhibition of the 18th IALA Conference had the largest number of participants in the history of this event, with a total of 77 stands and 7 outdoor exhibition areas offered by 47 companies from all over the world, where the latest cutting-edge products, equipment, systems and services offered by the AtoN industry were on display.

Concluding, Mr Bernabeu referred to the Industrial Members' evening on the evening of Wednesday 28th May during the occasion of each IALA Conference at Marina Coruña, standing in a privileged part of the city at the entrance to the bay of A Coruña. For this occasion an entertaining Spanish fiesta featuring the best of Spain's different regions was prepared.

In addition to the work done by the IMC on behalf of Industrial members, he remarked on the great job done by them in actively participating in the Technical Committees, Workshops and Industrial Exhibitions organised by IALA.

#### **4.2 IMO/ ITU and other international organisations Report – Mr Michael Card, IALA**

IALA has a wide ranging interaction with International Organisations and Partners.

IALA contributes to a number of United Nations Organisations. These include the International Maritime Organization (IMO), the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships, and the International Telecommunication Union (ITU), the United Nations specialized agency for information and communication technologies. IALA has observer status at IMO, and was one of the first organisations to be awarded this honour, it participates in the IMO Assembly, the IMO Council, the Maritime Safety Committee (MSC) and the Sub Committee on Navigation, Communications, and Search & rescue (NCSR). In the ITU ITU-R IALA contributes to Working Party 5B dealing with maritime mobile service including Global Maritime Distress and Safety System (GMDSS); aeronautical mobile service and radiodetermination service.



Among Inter-Governmental Organisations (IGOs) IALA cooperates with the International Hydrographic Organization, the Arctic Council (protection of the Arctic marine environment (PAME) WG and the Transport Group of the Western Mediterranean. Much work is being done on the New IHO standard S-100 IHO Universal Hydrographic Data Model where IALA will be a contributing partner and is allocated S-100 codes S-201 to S-299 to underpin e-Navigation and marine spatial data infrastructure. IALA participated in the PAME meeting of February 2014 following which there is PAME interest in developing a cooperation with IALA.

IALA also contributes to Non Governmental Organisations (NGOs) and works with organisations such as CIRM, IEC, and CIE. Along with the European Union Group of Institutes of Navigation (EUGIN) and the International Association of Institutes of Navigation (IAIN), IALA sponsored the First Resilient PNT Forum on 14 May 2014 in the Rotterdam World Trade Centre. IALA also participates in international studies such as Mona Lisa and EfficienSea.

IALA is an organising partner in international conferences such as the e-Navigation Underway Conference in Demark and in the USA,

#### **4.3 Legal Advisory Panel (LAP) Report – Mr Francis Zachariae, DMA (Chair LAP)**

Mr Francis Zachariae presented a short report covering the period from 2010 to the 18th IALA Conference in 2014 and the briefing was given on behalf of the author and vice chairman Jon Price (Trinity House, UK).



The Legal Advisory Panel (LAP) is an advisory body to the IALA Council. During the period the LAP met nine times and the normal schedule covers two meetings per year – spring and fall. The LAP has discussed legal questions posed by the IALA Council, by the IALA Committees and by the Secretary General. Currently the LAP comprises participants from Australia, Denmark, China, Finland, France, Germany, Norway, Sweden, the United Kingdom and the United States.

In 2010-2012 LAP meetings developed advice for the IALA Council on a range of issues related to IALA outputs and operations.

In relation to the different projects where IALA is providing a service to external partners or ships the LAP advised on the legal aspects of these services. More specifically the LAP has advised on data sharing in relation to IALA-NET and the conditions of participation in IALA-NET and has developed disclaimers for IALA-NET, the IALA Dictionary and IALA Documentation.

The LAP was also tasked to support the Secretary General on matters related to the new HQ in Rue des Gaudines and on the development of an MOU between IALA and its host Country, France. In a wider context LAP was tasked to consider the use of AIS data in court proceedings.

During each meeting the *List of IALA's Main Activities and Associated Risks (The Risk Register)* was developed and updated. The risk register lists the mitigation in place against each risk; the level of risk in terms of low, medium or high; and any action required. The LAP submits the register to the Council for information. Recently the register has been enhanced bringing it in line with internationally recognised standards including those of the Federation of European Risk Management Association.

Since 2012 the LAP has worked primarily on the "Change of Status" project developing a Roadmap, SWOT analysis, a draft HQ agreement, draft amendments to the Constitution, a Draft International Agreement and related draft General Regulations and a draft General Assembly Resolution. A workshop addressing the benefits and risks of a change of status was also conducted. Each of the above considerations resulted in the preparation of documents for consideration by Council.

The last two meetings in October 2013 and March 2014 were extraordinary meetings (EXLAP 1 and EXLAP 2) and were open to all national members with approximately 35 delegates participating in each of these meetings.

The work of the LAP is challenging and on-going, and relies, like all IALA activities, upon the support and good will of IALA's members. We look forward to continuing to support IALA in the future.

#### **4.4 e-Navigation SIP – Mrs Kirsti Slotsvik, Norwegian Coastal Administration.**

Mrs Kirsti Slotsvik made a presentation regarding the IMO e-Navigation Strategic Implementation Plan (SIP) on behalf of Mr John Erik Hagen, Norwegian Coastal Administration (Coordinator of the IMO Correspondence Group on e-Navigation).



The e-Navigation SIP submitted to IMO (NCSR 1/9) concentrates on five prioritized e-navigation solutions. These solutions focus on improved systems and equipment on the bridge, and efficient, standardized information exchange between ship and shore and vice versa.

A total of eighteen tasks are identified as needing to be completed in order to continue the further implementation of the e-Navigation solutions during the period 2015 - 2019. Some of these tasks may require further consideration and investigation before taking a final decision on the best way forward and subsequent tasks. A number of guidelines have also been identified as important for the future development and implementation of e-navigation. Four of these guidelines have been prioritized. Progress on their development is reported separately to IMO (NCSR 1/9/1).

Communications are a key for e-Navigation. Any communications systems used must be able to deliver appropriate electronic information ship-to-ship, ship-to-shore, shore-to-ship and shore-to-shore in a harmonized and structured way using the agreed IHO S-100 data structure and the approved overarching e-navigation architecture, wherever possible.

As part of the development of the e-Navigation strategy, it was recognized that there is a need to identify shore-based functions and services. At present, there are many different types of services in most given situations or locations, such as ports, coastal and high seas. Harmonizing and standardizing these services results in a proposal on a set of sixteen Maritime Service Portfolios (MSPs).

For enhancing public awareness of e-Navigation, a plan has been introduced in the SIP. IMO is asked to approve the need for and the establishment of a co-ordinated e-navigation website and its administration, to be used during the implementation phase. Such a website would provide a coordinated approach to distributing/sharing information on the e-Navigation implementation electronically – and would support the implementation of e-Navigation.

#### **4.5 IALA-NET and Risk Management Tools Report – RAdm Jean-Charles Leclair, IALA**

##### ***IALA-NET***

IALA-NET is an IALA project which was declared operational the 1<sup>st</sup> July 2010. It is a near real time AIS data exchange service through the Internet. It is a worldwide service and is only open to national authorities who provide AIS data from their own country. The service is intended to assist these authorities to fulfil their duties regarding safety, security, protection of the marine environment and the efficiency of navigation.



With regard to the secrecy of ship movements the author made clear that AIS is a broadcast system. There are already existing numerous traffic monitoring systems and these are shore-based and soon to be satellite-based. The reasons for the creation of IALA-NET were stated. Several private and commercial companies already monitor maritime traffic on a global mode. However, traffic monitoring includes security, safety, protection of the marine environment and traffic organization missions. These missions are part of governmental responsibilities and the information used by the Authorities in charge of the missions shall not be dependent solely upon the private sector.

Of the benefits of IALA-NET, the author gave some examples: maritime safety, search and rescue, marine accident investigation, improving efficiencies of navigation, security, surveillance, traffic analysis and environmental monitoring. Access to the IALA-NET data exchange will only be allowed to countries which provide AIS information themselves to the system. Providers of satellite AIS information may also use IALA-NET to exchange information between them.

The system is managed by an IALA Steering Committee reporting directly to the Council, and run mainly thanks to the generosity and works of the Danish Maritime Administration. However, today despite the benefits offer by the system, the number of participants is stagnant (around 20). Different reasons can explain the situation, but it is without taking into account the development of e-Navigation and the monitoring of the maritime traffic ahead of us. To avoid the closure of the system, the author urged the participants to join IALA-NET which is free of charge. Further information can be found at: [www.iala-aism.org](http://www.iala-aism.org) and [www.iala-aism.org/wiki/ialanet](http://www.iala-aism.org/wiki/ialanet).

### ***Risk Management Tools***

Following the requirement of SOLAS V/12-13, IALA has undertaken to develop tools able to assist National Authorities to assess the volume of traffic and the degree of risk in waterways and port approaches. Today the IALA toolbox contains three tools: the IALA IWRAP Mk2 programme which is a quantitative tool, the Ports and Waterways Safety Assessment (PAWSA) programme which is a qualitative tool and the simulator technical capability.

The author gave some details on those three elements and gave information on the work done by the dedicated Steering Group that the IALA Council has created to manage the tools. The Group met 14 times during the last four years and has worked to improve the IWRAP Mk 2 (ALA Waterway Risk Assessment Programme) model, which is updated every 6 months, and to encourage more countries to use PAWSA.

The Group also discussed some specific subjects as the introduction of another programme in the toolbox, SAMSON, which is own by The Netherlands. A Bayesian network was also developed. In parallel, the experts of the Steering Group organised an annual training seminar on the use of the toolbox under the auspices of the IALA WWA. The next seminar will be held in Istanbul from 8 to 12 September 2014.

#### **4.6 IALA World-Wide Academy – RAdm Jean-Charles Leclair, IALA**

The IALA World-Wide Academy was officially created at the last IALA Conference in Cape Town and became operational the 1<sup>st</sup> of January 2012. It is the vehicle by which IALA delivers training and capacity building to national authorities. During the two first years of activity the Academy's three-man part-time team, ably supported by the IALA Secretariat and subject matter experts, have built to establish the Academy as a well-recognised independently funded division of IALA.



The Academy is governed by a Board of five members which reports to the IALA Council, which has responsibility for approving its activities on an annual basis. It is an independently funded division of IALA. Generous financial support from the Academy's principle sponsor, the International Foundation for Aids to Navigation (IFAN), helped to start the activity and to make it sustainable. Additional sponsorship was also gratefully received from IMO, Australia, Denmark, France, and several others. At this stage, the financial security of the Academy remains sound.

The activity of the IALA WWA includes training and capacity building. The author gave details of each one of those activities. On training, the drafting of model courses for AtoN managers and technicians was achieved thanks to the work of the Committees. Approval of training organisations by National Authorities has grown well together with the creation of a list of IALA experts. The Academy also participated itself to the delivery of training courses, including annual training seminars on the use of the IALA risk management toolbox, and a one-month AtoN Managers course held at the IALA Headquarters. A next one in French will be held in September 2014, again in France.

With regard to capacity building activity, the Academy has adopted a model which groups together both Member and potential Member States into regions of most need. The regions have similar geographical limits to those defined by the International Hydrographic Organization (IHO). Of the 15 IHO regions, seven have been identified by the IALA World-Wide Academy for capacity building initiatives.

The Academy's capacity building strategy is based on a four-stage process: awareness, assessment, analysis and actions. For stage 1, awareness, it includes the participation to the regional hydrographic commissions and the organization of regional awareness seminars for the authorities in charge of safety of navigation in their country. Furthermore, under the umbrella of the United Nations "Delivering as One" capacity building initiative, The Academy reinforced its relationship with the International Maritime Organization (IMO), the International Hydrographic Organization (IHO) and other authorities to develop a joint capacity building strategy to improve the safety of navigation world-wide.

Stage 2 of the capacity building strategy is based on technical visits to countries requesting such need assessment mission. Up to now only four countries benefited from the visit of IALA experts. The author invited the countries volunteer to apply for such a visit, which is free of charge for them and very beneficial taking into account, in particular, the near implementation of the IMO mandatory audit scheme.

## Annexes to the Report

### ANNEX A Conference Opening

#### 5 Opening Ceremony



The Conference was opened with an entertaining performance of Galician folk music performed by the Xacarandaina folk music group.

##### 5.1 Address by Carlos Negreira Souto, Mayor of A Coruna

The Mayor welcomed the delegates to A Coruna, noting the long history of the town in nautical activities. The Torre de Hercules dates back to the first century and is the oldest working lighthouse in the world. It was built the Roman Emperor Claudius to mark the sea route from Rome to Britannia, now the UK. The conference presents an image of A Coruna internationally as a symbol of history, navigation and marine security. In the 17<sup>th</sup> century King Carlos renovated the building, coating it with granite as it remains today. 2014 is the fifth anniversary of the designation of the Torre de Hercules as a UNESCO World Heritage Site, the first lighthouse to be so designated. Noting that 70% of international trade is by sea and the 4.3% increase in maritime traffic in 2012, he recognised the importance of A Coruna in international trade and the contribution of IALA to navigation safety. He concluded wishing the delegates an enjoyable stay in A Coruna. The full text of the speech is at ANNEX H.



##### 5.2 Address by Mr David Gordon, President IALA

The President thanked the Mayor for his welcome and noted that, in reading the reports to the Conference, he had noted no references to lighthouses while the references to e-Navigation were too many to count, indicating the current trend in marine Aids to Navigation. The demands an continuing evolution in the life of IALA and the development of documents and managing the global world in which we live. Puertos del Estado have taken the baton and prepared a technically advanced conference. He concluded with thanks to Puertos del Estado, the sponsors and the organising committee for a memorable conference.



### 5.3 Address by Mr Jose Llorca, President of Puertos del Estado

The President expressed appreciation to IALA for its confidence in Puertos del Estado to host the Conference. He thanked all participants for their attendance and thanked the organisers and the port authority of A Coruna who were of great assistance in preparing for the Conference. He spoke of the history the Torre de Hercules and the similarity of the technological advances of its building with the advances in Aids to Navigation today. The topic of the Conference sets the stage for exchange of ideas through 90 presentations from 152 authors and 42 exhibitors. He remembered the need for training and Spanish plans for developing a training model like the IALA World Wide Academy. He also expressed a hope for promotion of Spanish in IALA and provision of IALA documents in Spanish. This paperless conference shows a commitment to sustainability and environmental conservation while the good practices session will contribute to world wide improvement. An exhibition has been arranged in the Torre de Hercules titled “the Light should never go out” make residents of A Coruna aware of the IALA Conference. He concluded hoping that delegates take home good memories of their visit. The full text of the speech is at ANNEX I.



### 5.4 Address by Dna Rosa Quintana, Regional Minister for Agriculture, Rural Development and Maritime Affairs

The Minister thanked the local port and IALA for selecting Spain to host the 18<sup>th</sup> IALA Conference. She noted that Galicia is a seafaring region and has suffered loss and pain as a result of sea tragedies. The Galician coastline has a significant number of lighthouses and floating AtoN. She referred to the history and UNESCO status of the Torre de Hercules and noted its benchmark contribution to maritime safety over millennia. She noted the high volume of shipping in the region and the leadership of Spain in converting 222 lights to solar powered LED. She observed the link with the Panama Canal in which Galicia could be a European hub for global maritime traffic as well as already established local fishing and trade. She wished the delegates a successful conference. The full text of the speech is at ANNEX K.



### 5.5 Address by Dna Ana Pastor, Minister of Public Works and Transport

The Minister welcomed delegates to the very special place of A Coruna, noting 548 participants from 50 countries. She noted the ten-year time span to plan and deliver the Conference and congratulated Puertos del Estado and IALA on their achievement. She noted the many achievements of IALA since its inception in 1957, recalling that Spain had become a national member of IALA in 1977 while Puertos del Estado is an Associate Member. IALA is about harmonisation of AtoN systems. She anticipated the next IALA Conference in the Republic of Korea in 2018 and the involvement of Spain in the preparation assisting the Korean organisers. She noted the benefit of the IALA Conference to A Coruna in terms of tourist trade as well as maritime safety.



Safety and security is the main issue in AtoN but heritage is also important. The Torre de Hercules demonstrates the long tradition of AtoN in Galicia and modern technology such as AIS is reinforcing this early development. She noted the technical advances occurring in Spain, mentioning the possibilities of on-demand as well as broadcast services. As a result, maritime transport is safer and more secure. She thanked the long line of lighthouse workers who have maintained the AtoN over the years and continue to develop modern techniques from lighthouses. She thanked HRH the Princess Royal for sharing the 500<sup>th</sup> anniversary of the founding of Trinity House with the Conference. She concluded that the 18<sup>th</sup> IALA will make a major impact. The full text of the speech is at ANNEX L.

## 5.6 Keynote Speaker – Mr. Koji Sekimizu, IMO Secretary General

Koji Sekimizu noted the appropriateness of the venue of A Coruna for the Conference. He noted the cooperation between IMO, IALA and IHO in achieving a reduction in maritime accidents and fatalities. He mentioned the IMO Zero Accident campaign and noted a need for work to improve safety of passengers and domestic passenger vessels which are not subject to SOLAS. In considering the evolution of e-Navigation, he recalled his initiative of the Maritime Electronic Highway 10 years and his view that there is still a role for this concept within the wider e-Navigation concept. He spoke about the challenges being faced by the maritime industry and the need for technical standards to enable the further development of e-Navigation.



A copy of the address by Mr. Sekimizu is attached at ANNEX G

## 5.7 Presentation to Best Participant – IALA World-Wide Academy Level 1 AtoN Manager Course

Mr Koji Sekimizu, Secretary General of the International Maritime Organization graciously agreed to present the IALA “Best Participant” Certificate in the IALA World-Wide Academy Level 1 AtoN Manager Course to Mr Ralph Boland – a Technician from the Ministry of Transport Maritime Services Division; Trinidad and Tobago. Ten participants from seven nations attended the course. They were judged on three aspects: their total score in the three examinations; their contribution and interventions to lectures and their individual development over the one month course. Mr Ralph Boland from Trinidad and Tobago was considered by the Academy to have been the “best” participant and was honoured to receive his certificate from the IMO Secretary General.



## 5.8 Address by Mr Gary Prosser, Secretary General of IALA.

Gary Prosser echoed the comments of the IMO Secretary General regarding cooperation, thanking those who have contributed to the work and development of IALA. IALA works closely with IMO and IHO as well as sister organisations such as CIRM. Noting that 2013 was the busiest year yet for IALA, he recalled necessary successful move of the IALA HQ, the establishment of the World Wide Academy in 2012, the launch of the new IALA web site, improvements in corporate governance and fiscal control. He noted that the 2013 IALA Annual Report had been published the previous week. The World Wide Academy has developed quickly and effectively in a short time with stand alone funding and world wide capacity building. Much work is being done regarding the consideration of IALA change of state.



## 5.9 Trinity House 500<sup>th</sup> Anniversary

Her Royal Highness The Princess Royal, Master, The Corporation of Trinity House, graciously attended the 18th IALA Conference on Friday 30th May 2014 from 0850 until 1235. The Royal visit was to mark the 500th Anniversary of the Corporation of Trinity House. Her Royal Highness was welcomed on arrival by Senor Enrique Pena González the Director of the PALEXCO Congress

Centre and Mr David Gordon – President of IALA. The President of Puertos del Estado, Señor José Llorca presented a number of Spanish Dignitaries before Mr Gary Prosser, Secretary-General of IALA escorted Her Royal Highness to observe Technical Session 4.1. The Deputy Master of the Corporation of Trinity House, Captain Ian McNaught, then presented the Chief Executives of the Northern Lighthouse Board and the Commissioners of Irish Lights to Her Royal Highness, followed by the Chairs and Vice Chairs of the standing IALA Committees and the speakers of Technical Session 4.1.



Her Royal Highness then returned to the Gaviota Auditorium where the IALA Secretary-General gave a welcoming introduction before Her Royal Highness graciously delivered an address celebrating the 500th Anniversary of the Corporation of Trinity House. This drew attention to the fact that seafarers were still suffering from preventable maritime accidents. The Princess Royal considered that a debt of gratitude was owed to seafarers on whom world trade depended and that it was everyone's responsibility to ensure that their safety was preserved, particularly through the appropriate use of the modern technology that the Conference had focussed on. In closing, Her Royal Highness drew attention to the crucial role played by IALA in that process. The President of Puertos del Estado thanked Her Royal Highness for the address before The Princess Royal observed the first paper of Technical Session 4.2.

Mr Jose Llorca, President of Puertos del Estado thanked HRH for her attendance, stating that it was a privilege to host the Master of Trinity House on such an historic occasion. Spain and the United Kingdom have important links to the sea and maritime commercial activity and consequently there is an on-going need to work for greater safety and removal of threats. He acknowledged the role of IALA in this work. The full text of his speech is at ANNEX N.

The IALA Secretary-General and the Deputy Master of the Corporation of Trinity House then escorted Her Royal Highness through the IALA Industrial Member's exhibition where The Princess Royal expressed considerable interest in the technical developments demonstrated by a large number of exhibitors. The Delegate of the Government in Galicia, D. Samuel Juárez and the President and Secretary General of IALA bade farewell to Her Royal Highness on the departure for visits to A Coruña City Hall and the Torre des Hércules.

## **ANNEX B      Technical Sessions**

Sixteen technical sessions were held. The rapporteurs for the technical sessions were Mr Seamus Doyle, Dr Mike Hadley, Mr Wim van der Haijden, Mr Mahesh Alimchandani, Mr Gerry Brine, Ms Jillian Carson-Jackson and Mr David Jeffkins.

### **6      Technical Session 1.1 – Aids to Navigation Provision 1**

Chair:            Mr Ómar Fritz Eriksson (Denmark)

Vice Chair      Mr Amadou Ndiaye (Senegal)

#### ***Introduction by Chair***

Ómar Fritz Eriksson welcomed delegates to the first technical session of the Conference. He introduced his vice chairman and emphasised the importance of the provision of Aids to Navigation (AtoN). Questions were taken after each presentation and at the end of the session.

#### **6.1      Effective Intensity – Is it Effective?**

##### ***Author and presenter***



Mr Malcolm Nicholson, General Lighthouse Authorities UK and Ireland, UK.

##### ***Abstract***

Since the invention of flashing signal lights, the question of how a flash of light compares with a continuous ('fixed' or 'steady') light has been pondered. The increase in intensity or efficiency, as a result of focussing or switching the light source, is offset by the fact that a flash of light is not seen so effectively by the observer due to the inertia of human visual perception.

The currently recommended method of quantifying the effects of a flashing light on human visual perception is a photometric quantity called effective intensity, which is the 'fixed light equivalent' of a flash of light. The definition of effective intensity intends the flash to be viewed at the threshold of visual perception, but that is not how marine aids to navigation (AtoN) lights are viewed. By international agreement, the range of marine AtoN lights is calculated from an observer illuminance above the threshold of perception. Therefore, the use of effective intensity is not valid for determining the range of a marine AtoN flashing light.

Experimental work carried out in the 1930s studied flashing lights above the threshold of visual perception (supra-threshold). Further scientific studies carried out in the 1930s and 1960s suggested modifying the Blondel-Rey model for effective intensity so that it could be used at supra-threshold levels by linking the value of illuminance at the observer to a time-constant for visual inertia (often known as  $a$ ) in the equation for the Blondel-Rey model. Since the term 'effective intensity' is only valid at the threshold of visual perception, it is suggested that the term assigned to perception of a flash above threshold be 'apparent intensity'.

The use of apparent intensity should enable lighthouse authorities to model the effect of different flash profiles at levels of illuminance from 0.2 microlux (currently recommended for AtoN lights at night with no background lighting) to higher levels of illuminance. This is particularly pertinent for leading lights and lights with minor and substantial background lighting.

To that end the General Lighthouse Authorities of the United Kingdom have been collaborating with Leeds University to carry out a repeat of the original 1930s experiment of Toulmin-Smith & Green extending the scope of the experiment to higher levels of illuminance and looking for models with a better fit to the experimental data.

An assessment of the results was given and the impact of moving to an apparent intensity model will be outlined and explained

***The key points of the presentation were:***

1. Background.
2. Equipment.
3. Experiment.
4. Results.
5. Conclusions.

***Questions***

When asked if IALA's acceptance of the emerging intensity model would mean adjusting the flash durations of existing lights or adjusting their nominal range, it was stated that a 'win – win' situation is expected. Either the flash duration could be halved thereby using reduce power or the range given on the chart can be extended. However, it was noted that there would be some resulting work for Administrations.

## **6.2 Integrated AtoN information systems (I-ATONIS Service) and added value applications**

***Authors and presenters***



Authors and presenters: Mr Juan Francisco Rebollo, Puertos del Estado, Mr Carlos Calvo, Santander Port Authority and Mr Marcos López, Maritime Section - GMV, Spain.

Co-authors: Mr. Eduardo González, Barcelona Port Authority, Mr. Enrique Tortosa, University of Madrid and Mr. Antonio Cebrián, Barcelona Port Authority, Spain.

***Abstract***

The "I-ATONIS Service" is the integration of procedures that enable the almost immediate availability of information generated locally in a unified database (accessible over the Internet) and its distribution through AIS-AtoN messages.

Advances in the integration of remote monitoring information from different devices of equipment and the use of these information systems to generate synthetic AIS-AtoN messages in buoys are presented in this paper.

A new remote monitoring system that enables information to be connected to other of the organisations' internal management systems – like the unified nation-wide AtoN information systems and service status transmissions via AIS-AtoN messages – is also presented in this paper.

***The key points of the presentation were:***

1. Developing the old IALA initiative e-ANSI, using the AIS devices for broadcasting the safety information, without replacing the official way through radio warnings and Notices to Mariners.
2. Puertos del Estado has a central database for its AtoN inventory and the status of service. The AtoN service provider uses a Web based facility for automatically updating the database (PORTAL-AtoN). This updated information is accessible via the Web. Now the I-ATONIS Service uses the information from the Remote Control Systems directly in the event of an AtoN fault for updating the AtoN service information.
3. The Remote Control System should be a platform for the provision of information not only to the AtoN manager but also to management, safety or security personnel in the Port Authority or Port Community (Stakeholders).
4. Puertos del Estado has a network of AIS-SBS in some ports. The I-ATONIS aims to provide an efficient way to send information on AtoN status through the Port-AIS network, taking into account the information in IALA Recommendation A-124 regarding message #21 and text messages, in two ways: locally from the Remote Control System or by the central node of Puertos del Estado, which includes the other AtoN that do not have any associated Remote Control System.

**6.3 Conversion of light buoys in the North and Baltic Sea on compact lighting units with LED- and solar technology, AIS and remote monitoring units with LED- and solar technology, AIS and remote monitoring**

***Author and presenter***



Mr. Peter Schneider, Federal Waterways and Shipping Administration, Germany.

***Abstract***

The German Waterways and Shipping Administration (WSV) operates approximately 4000 floating aids to navigation in the North and Baltic Sea. Nearly 1500 of them are lighted (light buoys, light vessels). The gas technique, which had originally been used for lighting and electric incandescent lamps systems installed, have been successively replaced by LED and solar technology, starting in 2004. With two classes of luminosity and the compact photovoltaic-powered carrier systems “Solarkompaktaufsatz” (SKA, i.e. solar compact unit) and “Integrated Power System Lantern” (IPSL) about 95% of the lighting requirements of the German coast have been accomplished. These systems are also in use in inland waterways and ports. In addition to the LED and solar technology further functions such as AIS and remote monitoring have been implemented. The

individual development and conversion steps were explained within the presentation. Furthermore the results of an economic feasibility study concerning the coast-wide conversion from steel to plastic buoys was presented.

***The key points of the presentation were:***

1. Nearly 1500 light buoys on the German coast have been converted to LED and solar technology.
2. With two classes of luminosity and compact photovoltaic-powered carrier systems about 95% of the lighting requirements of the German coast have been accomplished.
3. In addition further functions such as AIS and remote monitoring have been implemented.
4. Main advantages: long lifetime of the components, reduced maintenance, easy handling, safety, cost savings.
5. The coast-wide conversion from steel to plastic buoys is in preparation (economic feasibility study, budgetary announcements, preparation of tenders).

***Questions***

With regard to experience with the colour retention of plastic buoys, it was stated that the buoys are built using plastic containing a colour compound the durability of which is affected by ultra-violet light. The required durability is specified in the relevant procurement tender document.

**6.4 Implementing a new modularly designed Radar Service during continuous nautical operation**

***Author and presenter***



Author: Mr Mark Thumann, Federal Waterways and Shipping Administration, Germany

Presenter: Mr Sascha Heesch, Federal Waterways and Shipping Administration, Germany

***Abstract***

Traffic Services are an important element of the Maritime Traffic Technology System (MTTS). This especially includes the coast-wide Radar Services, the ship data processing as well as the traffic display in the Vessel Traffic Service centres (VTS centres). Traffic Systems are being recapitalized. Here, technical and organizational challenges have to be met when systems are developed, designed, tested and finally operated.

Along the German Coast, nine decentralized VTS centres have been implemented. They are linked to each other via a communication interface. Data of 47 remote Radar stations will be processed in three Value-added Data Processing Centres (VTR) and will be distributed and displayed in the VTS centres. The main challenges of the project are: -

- to avoid any impact on the 7/24 operation of the VTS centres;
- to design a flexible and expansible system with open interfaces which is available at any time;
- a coast-wide use of the same technology;
- an early use of the displays while the radar antennas are still replaced.

The project was completed by a three step approach:

1. Dynamic design process including so-called Sprint-Tests every two months. Here, the customer and the designer will further develop and agree upon a detailed specification of the requirements for the final product.
2. During operation, the present systems and the new system are operated in parallel at the same time. Here, the real challenge is to operate the existing and the new radar sensors at the same time and to operate the communication interfaces of the present system.
3. The final operational capability and the removal of the existing systems start when the radar sensors have been replaced.

***The key points of the presentation were:***

1. VTS-Systems with radar out of various areas.
2. New modular system approach.
3. Incremental system development;
4. Parallel view of new and old system for user acceptability.
5. No downtime during sensor exchange.

***Questions***

It was confirmed that the system utilises the S-100 interface and that the radar station 'set-up' is specific to each radar interfaced.

## **6.5 Discussion – Technical Session 1.1**

In response to a question about the definition of short and long range, as regards lights, it was said that this can differ from country to country, taking into account such issues as traffic density. However, it was suggested that light ranges could be assessed using the IMO classification of the phases of navigation. This would lead to short range being 1 to 5NM, coastal / medium range 5 to 15 NM and long range greater than 15NM.

When asked about whether perceived intensity versus light duration had pulse width at fast rates been considered when testing perceived intensity, it was said that this had been considered with results between 60 to 100Hz (younger to older observers) but that this had no effect on range at distance.

## **7 Technical Session 1.2 – AtoN Provision 2**

Chair: Mr Carlos Calvo, Puerto Santander, Spain

Vice Chair Mr Adam Hay, Nawae Construction Ltd., Papua New Guinea

### **7.1 New lighthouse at the North enlargement of Valencia harbour**

***Author and presenter***



Mr Ignacio Pascual Navarro, Port Authority of Valencia, Spain.

### **Abstract**

The main components of the lighthouse are:

- reinforced concrete base-house;
- lattice tower, to reach the necessary height of 35 meters for the luminous signal, completely made of composite materials based on carbon and glass fibre, melted on a polymeric matrix;
- main light beacon, comprising an LED lamp of 70 watts, with a meantime between failure (MTBF) of 100,000 hours and a stationary intensity of 1.300.000 candles, giving a range of 25 nautical miles;
- emergency light beacon, comprising an LED lamp of 10 watts, with a MTBF of 100.000 hours, and a stationary intensity of 186.000 candles, giving a range of 20 nautical miles;
- main power supply system, using solar and wind energy, produced by nine photovoltaic boards with ASI technology, of 12 volts and 80 watts, fixed on the tower structure, and a vertical axis wind generator (Windside), of 24 volts and 9 amperes.

### **The key points of the presentation were:**

1. Lighthouse made with new materials and technology.
2. Minimum electric consumption.
3. Minimum maintenance.
4. Sun and wind energy.
5. Composite material.

### **Questions**

A question was raised about the expected lifetime of the construction. The speaker responded that this will certainly be over 100 years.

On the question of the flexibility of the construction, the speaker responded that the design is dedicated to the location and is not flexible.

Regarding the cost of the lighthouse, the initial calculation was €1,000,000 while the final construction cost was €800,000. The construction was completed in eight months.

On the question of the colours used, the carbon fibre construction is black, the staircase is yellow. Three white stripes are used to provide a daymark. There is a platform on top to clean the solar panels.

## **7.2 The Processes in the Maritime Transport Chain and how to link them**

### **Author and presenter**



Mr Dirk Eckhoff, Federal Waterways and Shipping Administration, Germany.

### **Abstract**

One main reason for marine vessel traffic is to transport cargo from port A to port B. The world of transport has growing demands to maximise the throughput of the waterways.

In many regions of the world the first step to optimize the waterways' throughput is to provide data to the stakeholder involved in the transport. By that many stakeholders know the status and maybe the planning of their neighbours' processes.

But in many cases the stakeholder does not get required data. The stakeholders use different data sources, distribute data on separate networks, the data is not consistent and the planning and decisions are not transparent to other stakeholders.

But even if all these aspects were solved in a positive way and all stakeholders were interconnected and received the data they demand, would it help the single stakeholder to retrieve the needed information from that data? Is it sufficient just to exchange data to maximise the throughput of the waterway?

Are the stakeholders not heading for different aims? One stakeholder wants to optimize his own process to make more profit, the second one wants to provide more safety and another one wants to make customs more efficient. There may even be conflicting aims.

How to find and to achieve the maximum throughput of the waterway and still considering the different aims of the stakeholders? Do we need one overall system with supervisor or co-ordinator functions?

This paper discussed ideas to optimize the maritime transport by respecting the different aims of the stakeholders.

### ***The key points of the presentation were:***

1. Increasing number and size of vessels requires improvement in the traffic flow.
2. For improvement of the flow the entire transport chain, berth to berth and beyond should be considered.
3. Therefore arrangements between the stakeholders of the transport chain are recommended.

### ***Questions***

On the question of expanding vessel monitoring to include the berth to berth information, noting that the requirement onboard is to carry out the voyage planning task, the speaker said that from a technical perspective it should not be a problem to bring back on berth to berth information to coastal VTS but there might be an issue in terms of the extent of each VTS' area of responsibility impeding information exchange.

On the question if there is a role for IALA in developing this concept, the presenter said that there is certainly a role for IALA for this.

On the issue of moving beyond VTS and into the realm of vessel traffic monitoring, the speaker responded that this could be compared with air traffic management. Air Traffic Control is at the same point as Vessel Traffic Services, in needing to give guidance to the separate air traffic areas and they feel they need to link them.

Considering if the presented project goes beyond berth to berth, e.g. did the stakeholder research look at road transport into port, the speaker responded that it did. However, if it is considered that any of the hinterland transport is affecting the maritime phase then it should be covered in the planning process.

### 7.3 Evolution of Remote Monitoring Systems: Examples of systems at A Coruña and Ferrol Port Authorities (Galicia region, Spain)

**Author and presenter**



Mr Antonio MARTINEZ, Mediterraneo Senales Maritimas S.L.L. (MSM), Spain.

**Abstract**

As it is well known, new technologies are advancing at dizzying speeds. It is certainly the case for remote control and monitoring systems intended for aids to navigation. Since the beginning of automation of lighthouses and beacons until today, both data acquisition systems and communication methods have taken a big step. The examples of two remote monitoring systems at A Coruna and Ferrol Port Authorities (Galicia Region) in Spain illustrate this evolution. But where does this evolution remain? This presentation gives some brushstrokes on where this technology is evolving to, in a time in which everything is possible in the world of remote monitoring.

**The key points of the presentation were:**

1. What is the departure point in remote monitoring and control systems?
2. Which communication methods applicable to aids to navigation are available nowadays?
3. Which considerations are to be taken into account at the time of establishing a remote control and monitoring system?
4. Which possibilities of remote monitoring and control can be implemented at present?
5. Where are monitoring systems evolving to?

**Questions**

For the remote monitoring task GPRS and VHF communications are used; the question was if this includes AIS. The speaker noted that UHF and VHF are used but not AIS. One of the frequencies used is 86 MHz.

### 7.4 Aids to Navigation engineering of Yangtze River estuary deepwater channel development project

**Author and presenter**



Author: Mr Jiahua LIU, Shanghai Maritime Safety Administration, China.

Presenter: Prof Jianyun Yang, Shanghai Waterway Engineering Design and Consulting Co. Ltd., China.

### **Abstract**

The Yangtze River estuary is the largest river mouth in China. The deep-water channel development project commenced in 1998 and terminated in 2010. To ensure the achievement of the intended depth, the channel was dredged and an underwater structure of about 120 km composed of distributary mouth, guiding dikes and T-shaped dike clusters, were constructed successively.

The construction project gave rise to great changes in the environmental conditions of this water area. This presentation offered a systematic introduction of the characteristics of the AtoN project with its focus on project solutions and experience concerning the following questions during the past 10 years and more:

- AtoN deployment for compound channels;
- a number of warning systems adopted for newly built guiding dikes;
- measures adopted for light beacon structures in cases of uneven sedimentation of guiding dikes;
- solutions for drifting buoys;
- adjustment of lighted buoys during long navigation channel dredging.

### ***The key points of the presentation were:***

1. AtoN.
2. Project.
3. Yangtze River estuary.
4. Deep-water channel.
5. Lighted buoy.

## **7.5 E-200 Explained**

### ***Author and presenter***



Mr Malcolm Nicholson, General Lighthouse Authorities UK and Ireland, UK.

### **Abstract**

In 2008 IALA published the E-200 suite of Recommendations. It was a culmination of the work carried out by the IALA Ad-hoc Specialist Working Group over a number of years. Their remit was to simplify, update and gather together all the recommended methods for the calculation, determination, measurement and estimation of the performance of light signals. Not a simple task! Since the release of E-200 many members have commented on the ease of use and the effectiveness of grouping these documents together.

The presentation gave a history of events, including the decisions made while developing E-200, an overview of the technical content, explained in simple terms, how to use E-200 and attempted to address some of the areas that require improvement.

***The key points of the presentation were:***

1. History.
2. Methodology.
3. Ease of use.
4. Outline of E-200.
5. Recommended updates.

## **8 Technical Session 1.3 – Aids to Navigation Provision 3**

Chair: Mr David Jeffkins, Australian Maritime Safety Authority, Australia

Vice Chair: Mr Kribashiu Coopoo, Transnet National Ports Authority, South Africa

### **8.1 A New Radio System for the German Coast - Innovative applications for conventional VHF**

***Author and presenter***



Mr Ralf Oppermann, Schnoor Industrieelektronik GmbH & Co.KG, Germany.

***Abstract***

The German Federal Maritime Authority decided to introduce a completely new infrastructure for the German coastal waters VHF communication system. Radio Specialist Schnoor Industrieelektronik GmbH & Co.KG designed and built an innovative IP-based system including simulcast elements which are introduced in the paper in more detail. The IP transport protocol is used throughout the system, and therefore supports the use of industry standard components. In addition, IP allows the design of a highly redundant system topology, which permits keeping the system up and running after any component failure that might occur. The use of simulcast transmission with some of the over 150 base stations base stations connected via IP required the development of a solution for transmitter synchronization since IP transport time is not fixed. The fact that VTS centre equipment, radio sites and the backhaul network all needed to be replaced had to be taken into consideration in the design phase to maintain continuous service for the users during the migration phase from existing equipment. At the same time, doubling all equipment during migration would have resulted in excessive costs. The design of the system takes this into account combining smooth migration with reasonable cost. State-of the art technology and systems make good old VHF FM radio a reliable tool for the future.

***The key points of the presentation were:***

1. VHF system for German coastal waters.
2. Completely IP-based system.
3. Redundancy to stay in service from failures of a single element to loss of a complete site.
4. VHF simulcast over IP.
5. Smooth migration from existing system.

**8.2 Implementation of the Voice/DSC VHF Radio Communication Service with Simulcast Broadcasting at the German Coast**

***Author and presenter***



Mr. Heinz Park, Federal Waterways and Shipping Administration, Germany.

***Abstract***

The presentation introduced the new highly reliable coastal wide VHF radio communication service along the German coast with open technical interfaces and standards. Transfer of voice data is achieved by Voice-over-IP (VoIP) with the coastal wide network. Access to the radio sites is possible from every coastal VTS centre. Most of the maintenance tasks can be done remotely. For special locations, long distance radio coverage on one VHF channel is needed. In this case simulcast transmission with a common frequency is helpful. The challenge is to transmit from two or more base stations at exactly the same time while the voice transfer over the IP-network is routed via different means and therefore will be delayed. The presentation showed the challenges and the resulting layout of the simulcast transmission in combination with VoIP technology. In addition it shown, how existing radio units were replaced and new radio sites installed while VTS centres are operational.

***The key points of the presentation were:***

1. Existing VHF radio communication.
2. New VHF communication service system architecture.
3. Migration to the new communication service.
4. Principle of simulcast transmission.
5. Technical operation and remote administration.

### 8.3 Aids to Navigation and Automatic Identification System: a winning combination for safety support - the Italian experience.

#### **Author and presenter**



Admiral Piero Pellizzari, Italian Coast Guard, Italy

#### **Abstract**

The Italian Coast Guard (ICG) features centralisation of Coast Guard functions in one organization, improving overall preparedness and synergic response capabilities at sea.

As the Italian National Competent Authority for traffic monitoring, the ICG manages a platform to provide Vessel Traffic Management Information Systems (VTMIS) data/services and an interface sharing transport-related information with the European Union SafeSeaNet and CleanSeaNet systems. VTS data are enhanced with the information supplied by AIS, LRIT, Vessel Monitoring Systems (VMS) and other satellite-based monitoring assets, as well as with available centralized databases.

The ICG is bound to provide VTMIS-based information data to other national Administrations in charge of military and civilian defence, maritime surveillance, public security and assistance.

An AIS network (consisting of 60 base stations, up to 100 nautical miles average range) was implemented in 2005 and upgraded in 2012-2013 to comply with IALA Recommendation A-124 on “The AIS Service” (December 2012) and ITU Recommendation ITU-R M.1371-4 issued in April 2010.

Main features:

- AIS Embedded Server, a fully solid-state device featuring two separate servers, thus either supporting redundancy or the simultaneous interface to two Transmission Control Protocol (TCP) networks;
- ATON\_DAT “Send or receive AtoN AIS stations data” service, referred to in IALA Recommendation A124;
- enable the future adoption of anti-spoofing techniques to improve quality of AIS information received.

The information gathered is collected into a centralised application with graphical interface named PELAGUS, allowing data exchange with external systems (20 million pieces of information per day, up to 40 million in heavy duct effect conditions). PELAGUS provides capability of transmission of ITU messages 21 ‘Aids-to-Navigation report’ by one or more base stations, and features a technique to gradually reduce (until cancellation) the frequency of broadcasts for each of the services available, thus allowing saving of more than 50% of the slots available in the VHF data link area for transmission to/from vessels.

All Italian VTS Centres and Coast Guard offices are provided with a minimum set of Maritime Mobile Service identity (MMSI) to be associated with Virtual Aids to Navigation (VAtoN), used to pinpoint location of any incidents occurring within their own respective jurisdiction areas. Transmission schedules may be set by the operator.

Over the last 25 years, the Italian Government has issued several tens of protected marine areas, the geographical boundaries of which have to be physically marked using buoys complying with the relevant regulations issued by IALA.

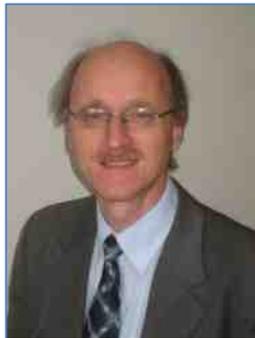
The Italian Coast Guard has recently experimented with the system feature allowing AtoN markers that are broadcast by the National AIS network to be shown on the chart. Vessels involved are: SOLAS vessels, plus pleasure craft greater than 45 meters and fishing vessels greater than 15 metres.

***The key points of the presentation were:***

1. Centralisation of coast guard functions in one organization (the Italian Coast Guard).
2. Availability of a centralized platform to manage and exchange VTMIS data/services with external systems (both domestic and international).
3. Implementation of an AIS network with centralization of information into PELAGUS application.
4. The possibility of managing virtual AtoN information through PELAGUS.
5. Enhancement of the marking of marine protected areas by use of virtual AtoN.

**8.4 VHF Data Exchange System (VDES) – a new means for data communication to support e-Navigation**

***Authors and presenters***



Mr Stefan Bober, Federal Waterways and Shipping Administration, Germany and Cdr Hideki Noguchi, Maritime Traffic Department, Japan Coast Guard

***Abstract***

The Automatic Identification System (AIS) was successfully introduced by IMO in 2002 for collision avoidance. Since then, more than 100,000 commercial ships and recreational vessels have been equipped with AIS. AIS is used in Vessel Traffic Services (VTS), as an aid to navigation (AtoN), in search and rescue and for satellite detection of ships.

Further, AIS has some capability for the exchange of (navigation) safety related data between ships and between ship and shore. This functionality is known as Application Specific Messages (ASM) and can be used to send, for example, meteorological and hydrographic data, area notices or route information.

However, recognising the potential of ASM and considering the development of e-Navigation, additional possibilities for data exchange between ships and between ship and shore are required beyond the current capability provided by AIS. The VHF Data Exchange System (VDES) must take into consideration the requirements of e-Navigation, while protecting the AIS VHF Data Layer (VDL) from overload as AIS populations increase.

The concept, technical features, possible applications and a roadmap of the VDES as being currently developed by IALA were introduced. Furthermore, its place in the IALA Maritime Radio Communication Plan (MRCP) was described. VDES will provide a worldwide, toll free, reliable and robust means for the exchange of navigation related information without compromising AIS capability. It is a further step into the field of maritime digital communication.

***The key points of the presentation were:***

1. VDES.
2. AIS.
3. Maritime Radiocommunication.
4. e-Navigation.
5. GMDSS.

## **8.5 Advances in radar aids to navigation**

***Author and presenter***



Mr Paul F Mueller, Tideland Signal Corporation, USA.

***Abstract***

Radar aids to navigation are increasingly important to marine safety as ship navigation moves toward a greater electronic contribution. A tremendous boom in the use of radio services in general, such as the Global Positioning System (GPS), other Global Navigation Satellite Systems (GNSS) and Automatic Identification System (AIS), coupled with advances in technology have resulted in availability of devices that would have been cost prohibitive or effectively impossible just a few years ago. Miniaturization leads to better integration of devices, such as AIS for an Aid to Navigation (AtoN) and a racon in the same package. Recent regulatory changes are allowing superior radars (at least for the S-band) to be installed. Some new radar technologies are inherently incompatible with existing racons and ways to mitigate this are discussed. New ideas such as the eRadar / eRacon positioning service (a positioning service independent of GNSS) are demonstrated in the trials of the European Union sponsored projects EfficienSea and ACCSEAS trials.

***The key points of the presentation were:***

1. Device miniaturization and integration bring down cost.
2. Low-cost digital signal processing also brings down cost new ideas become easier to trial.
3. Low-cost and small size allows increased product functionality.
4. Experimentation with new ideas become easier.
5. Regulatory changes foster environment for growth.

## 8.6 Discussion – Technical Session 1.3

It was confirmed that Italy currently has 12 port VTS sites but that the two sited to cover the Straits of Bonifacio and Messina could be considered to be coastal.

Responding to a question on whether there was a published standard for GPS time synchronisation in the VoIP-based VHF network, the German presenters stated that they were unaware of the existence of such a standard. However, if there was one, it would likely be associated with proprietary rights.

As regards the determining of distance based on the time delay of received signals, the problem is the uncertainty in the time taken for transmitters to start up after the beginning of the slot. This was quite slow in AIS and relatively fast in radars. The speaker added that the solution would be to tighten the specifications and have upgraded radios. Admiral Pellizzari added that the ITCG would have some information on this subject when their current trials were complete.

The Nautical Institute (NI) remarked that there had been a huge increase in the detection efficiencies of radars, yet the IMO Performance Standard (PS) had not been updated – it was a PS for radars available in the 1940s. The NI stated that their assertions were supported by studies conducted by them. Paul Mueller replied that it was up to IMO Member States to seek a revision of the PS, but generally radars today easily exceeded the stipulated PS. In particular, S Band radars performed far better than the PS. This was a regulatory issue, not a technical matter.

In response to a question about whether any tests had been carried out to ensure that the users (i.e. mariners) would not experience a degradation of service, the German presenters replied that the new VoIP standard offered a far superior level of service than that 'older VoIP' standard and this would not be a problem. When asked about the impact of a VoIP based system on the use of VHF DSC distress alerting, the presenters remarked that the VHF DSC alerting mechanism was not a voice-based service and so would not be impacted.

The height and type of the VHF antenna were quoted as the significant factors in determining VHF coverage. It was reported that average coverage for the German communications system described was 50 nm.

Sadly, it was confirmed that there is no technical solution that would enable a VTS operator to continue tracking a vessel if its AIS is switched off and the vessel is outside radar range; it is considered an operational matter.

## 9 Technical Session 2.1 – e-Navigation & Beyond 1

Chair: Mr Bill Cairns, US Coast Guard, USA.

Vice Chair: Mr Min-Su Jeon, Korea Association of Aids to Navigation, Korea.

### 9.1 e-Navigation and the ACCSEAS project

***Author and presenter***



Dr Alwyn Williams, General Lighthouse Authorities UK and Ireland, UK.

**Abstract**

The International Maritime Organisation’s concept of e-Navigation is defined as “the harmonised collection, integration, exchange, presentation and analysis of maritime information on-board and ashore by electronic means to enhance berth-to-berth navigation and related services, for safety and security at sea and protection of the marine environment”. The aims of e-Navigation are numerous, but are based around improving maritime safety and efficiency.

The North Sea Region of Europe is a crossroads of regional and global shipping and is well positioned to benefit from e-Navigation, to provide safe and efficient access to the region’s busy ports. The North Sea Region presents major challenges to future maritime safety and the efficient movement of goods and people, because of the growth of shipping, both in terms of vessel numbers and size, and the increase in off-shore structures, whether platforms or wind farms. The ACCSEAS project uses the North Sea Region as a prime example for demonstrating the potential benefits of innovative solutions based on e-Navigation.

**The key points of the presentation were:**

1. Regional e-navigation testbed.
2. Options for Resilient PNT (Positioning, Navigation, Timing).
3. Development of innovative services.
4. Integrated using the Maritime Cloud.

**9.2 Performance Simulation of the Future Korean eLoran System**

**Author and presenter**



Mr Joon Hyo Rhee, Yonsei University, Republic of Korea.

**Abstract**

During the 16 days of GPS jamming from North Korea in 2012, it was reported that 1,016 airplanes and 254 ships in South Korea could not receive GPS signals. To provide a complementary positioning, navigation and timing (PNT) system to GPS, the South Korean government recently decided to deploy an eLoran system which is a high-power terrestrial radionavigation system. In a movement towards eLoran in Korea, initial performance simulation results of the future Korean eLoran system are presented in this paper. The eLoran performance simulation tool described in this paper is able to accommodate environmental variables of Korea and visualise expected navigation accuracy of the eLoran system, given arbitrary transmitter locations and transmission powers. In addition to the simulation results, the current status and future plans for deploying eLoran in Korea are presented.

***The key points of the presentation were:***

1. Korean eLoran program;
2. Complementary PNT system;
3. eLoran performance simulation;
4. Intentional high-power GPS jamming;
5. Resilient PNT.

***Questions***

On the question of the impact of sky waves and the low frequency aspect of Loran-C on the simulations and whether this was taken into account, the speaker responded that this factor was not considered in the simulations but the effective conductivity and other effects of the ground were considered. The coverage of the system is quite small for Korea and there is unlikely to be an effect from sky wave.

Because there are intentional GPS jammers in Korea, there was a question if jamming of eLoran was investigated. It was said that eLoran can also be jammed by very large transmitters requiring significant infrastructure. However it would take high power to do this, higher power than eLoran. It was remarked from the audience that amateur radio operators are using equipment up to a 1 kW.

### **9.3 Recapitalization of the MF radio beacon system based on VRS**

***Author and presenter***



Author and presenter: Mr Michael Hoppe, Federal Waterways and Shipping Administration, Germany.

Presenter: Jesper Backstedt, Swedish Maritime Administration, Sweden.

***Abstract***

Germany and Sweden have been providing a DGPS radio beacon service for maritime usage for almost twenty years. Due to the fact that most of the hardware and software of the DGPS system was installed around 1995, the whole service is getting more and more difficult to operate and maintain. In addition it could also be necessary to provide augmentation information for future GNSS signals from GPS, Galileo, GLONASS or COMPASS. Therefore a re-engineering and further development of the existing maritime DGPS service towards a modernized DGNSS service is necessary to fulfil future maritime requirements. Germany has decided to recapitalize the existing DGPS system based on the concept of virtual reference stations (VRS). Sweden is also investigating this approach and is developing a proof of concept in this regard. The paper generally explains the plan to recapitalize the existing DGPS service based on the VRS concept and the use of Pre-Broadcast-Monitoring and the transmission of GNSS corrections via IALA MF radio beacons and AIS-Message #17. The paper further reports about the various tests and developments regarding the VRS implementation in Germany and Sweden.

***The key points of the presentation were:***

1. Recapitalization of DGPS MF radio beacon network in Germany and Sweden.
2. Virtual reference station (VRS) as a method of providing DGNSS corrections.
3. Pre Broadcast Monitoring as improved method to provide Integrity.
4. Covers the Swedish initiative within VRS.
5. Presents comparative measurements between legacy and VRS solution.

***Questions***

A question was raised about how to evaluate the dependency of VRS on the IT infrastructure: removing some components from the sites makes the system more reliant on internet communications. The speaker agreed with this. When using more reference stations, it will be more based on communications networks than the old system. Care is necessary to provide high quality networks for relaying data from the server to the transmitters. There are various inputs, so high availability is not required for each single point. However network connections are needed as one option, fall back is needed in case no reference station streams are coming to the site. This is a point which needs some engineering and protection against having only one connection is required. It was emphasised is that the internet is used for the test solution, but that the final solution will be looking to use leased lines.

#### **9.4 Ship domain observed in AIS data**

***Author and presenter***



Mr Tue Lehn-Schiøler, Rambøll, Denmark.

***Abstract***

In this work the minimum ship domain in which a navigator feels comfortable is estimated. That is, an estimate of the free space surrounding a ship into which no other ship or object should enter. This is very useful when estimating the maximum flow through a channel or a bridge span. The paper benefits from the introduction of Automatic Identification System (AIS) data as it is now much easier to conduct studies involving a large number of observations. Observations are based on ships sailing in southern Danish waters during a four year period, and from the observations it is estimated how close ships pass each other and fixed objects in open sea navigation. The main result is the establishment of an empirical minimum ship domain related to a comfortable navigational distance.

***The key points of the presentation were:***

1. Ship domain.
2. AIS.
3. Navigational safety.
4. Formal Safety Assessment.
5. Traffic flow.

### **Questions**

Can the ellipse, found in areas where there was enough available sea room, be larger than was used during the study? If one is using the sea area to the maximum, could the ellipse be used as a risk indicator? The speaker responded that it could perhaps be an indication of risk or at least an indicator of how the water is utilised. If there is a short period with high attention, it is not an issue with overlapping ellipses.

## **9.5 The Implications of Using Non-Approved PNT Devices at Sea**

### **Author and presenter**



Author: Jan Šafář, General Lighthouse Authorities, UK & Ireland.

Presenter: Dr Alan Grant, General Lighthouse Authorities, UK & Ireland.

### **Abstract**

The use of smart phones and tablets for positioning and navigation is increasing, not only at sea, but also within other transport sectors. Leisure craft users can use these phones and tablets, but they are not approved for use on SOLAS [1] vessels, although there may be a temptation to use such systems on the bridge of SOLAS vessels. This paper reports the results of trials carried out on board a GLA vessel with several of these devices and draws some conclusions about their performance and usability. The ‘apps’ reviewed have been developed for the leisure user, to the publishers’ specifications. They are often very easy to use, highly configurable and informative. The integration of the many different sensors (GPS, accelerometer, gyros) appears to aid the performance, but affects update rate. It is interesting to note that e-Navigation will develop greater integration between the various sensors available on the bridge, so there may be lessons to learn from these devices.

### **The key points of the presentation were:**

1. Smart phones.
2. SOLAS vessel.
3. Non-approved devices.

### **Questions**

Concern was expressed about the use of the devices presented, although it is known that they will be used. IALA and other bodies should be concentrating on the official carriage requirements, in particular for SOLAS ships. Concern was also expressed about the charts being used, not only the issue of using the right charts, but also how the data is presented.

## 9.6 IALA role in IMO SIP implementation

### *Author and presenter*



Mr John Erik Hagen

### **Abstract**

VTS plays an important role in e-navigation. It is felt that IALA can play a very important role regarding the Strategy Implementation Plan (SIP) work and looking at the tasks in the SIP a total of 18 tasks, and that IALA, together with member states, can play a very important role, in particular in Task 8 – automatic ship reporting, Task 15 – radio infrastructure and Task 17 – Maritime Service Portfolios.

## 10 Technical Session 2.2 – e-Navigation & Beyond 2

Chair: Mr Mike Sollosi, United States Coast Guard, USA

Vice Chair Mr Michael Skov, Danish Maritime Authority, Denmark.

### 10.1 AIS Aids to Navigation: Development of IMO Policy and New Symbols

#### *Author and presenter*



Cdr Hideki Noguchi, Maritime Traffic Department, Japan Coast Guard, Japan

#### **Abstract**

AIS Aids to Navigation (AtoN) are effective and useful tools for the safety of navigation. However, with the latest technology, the use of AIS AtoN, especially virtual AIS AtoN, require a policy that is understandable for users and new symbology that clearly show the type of AIS AtoN, in order to avoid the confusion to the users.

Therefore, Japan Coast Guard proposed the development of policy and new symbols for AIS AtoN to IMO and co-ordinated the Correspondence Group (CG) for two years. Although the draft policy developed by the CG was approved by the IMO NAV Sub-Committee, there were some differences between the draft IMO policy and the IALA Recommendation and Guideline on virtual AtoN (VAtoN). These differences will be applicable for other future VAtoN and so a study of the IMO policy will also be necessary for the development of the VAtoN.

The presentation describes the discussion within the CG and the NAV Sub-Committee, explains the differences and identifies the subject that need to be considered in the development and deployment of future VAtON.

***The key points of the presentation were:***

1. AIS Aids to Navigation (AIS AtoN).
2. IMO Policy.
3. Symbols.
4. AIS Application Specific Message (AIS ASM).

***Questions***

The Nautical Institute (NI) stated that it was important to consult with users before deploying AIS AtoN. Also, mariners are confused with regards to AIS AtoN symbology. As an example, an observation by a shipmaster was that in one port the AIS AtoN symbol was used to indicate a bridge abutment and also a ship reporting point; “How was he meant to interpret the display?” Rather, mariners are recommending the use of lines and / or shapes. It was also observed that training centres display prominent posters covering the IALA Maritime Buoyage System and IALA / IMO was requested to consider producing something similar for AIS AtoN symbology.

The thrust of the comments was accepted by the speaker, who said that the Japanese Coast Guard are currently conducting a study embracing a wide spread of AIS stakeholders. He agreed that training of mariners was crucial.

In response to a query about how a VTS coordinate the promulgation of AIS AtoN with the IHO, the speaker replied that close cooperation was indeed required and that IMO was well aware of the need for close co-operation in this regard.

It was observed the implications of the IMO AIS carriage requirements has led s to a difference between the users who ought to see broadcast AIS information and those who actually see it. This was acknowledged to be an important issue for Authorities and VTSs.

Trinity House is considering using AIS Virtual Aids to Navigation but has concerns about the on going integrity of the position of any virtual AIS AtoN broadcast, especially if used to mark a wreck in an emergency. They added that VTS ought to monitor the broadcast position and that not all ships would see AIS AtoN.

## **10.2 The use of AIS Application Specific Messaging (ASM) with Virtual Aids in e-Navigation**

***Author and presenter***



Mr Jorge Arroyo, US Coast Guard, USA

***Abstract***

The presentation deviated from the published paper covering some additional associated topics. It focused on the United States’ AIS infrastructure and the regulations governing it. The Nation-wide AIS Project (NAIS) was introduced, followed by the United States Army Corps of Engineers (USACE) River Information System (RIS) and its use of the Real-Time Current-Velocity System.

The presentation then covered the National Oceanic and Atmospheric Administration (NOAA) Physical Oceanographic Real-Time System test bed in Tampa Bay. Use of Geo-referenced information in an Area Notice for the protection of the Right whale in the approaches to Chesapeake Bay and for the America's Cup in San Francisco Bay were discussed. Use of VAtON, following consultation with users, was indicated, together with the statement that over 50 VAtON have been established. Progress towards eAtON was stated, with the lessons learned from this project. The presentation concluded with reference to the growing use of ASM and the close co-operation between IALA and RTCM.

***The key points of the presentation were:***

1. The United States Nation-wide Automatic Identification System (NAIS) Network.
2. Use of real-time and geo-referenced information.
3. Use of AIS Application Specific Messages (ASM) in the United States.
4. eAtON and the lessons being learned during its introduction.
5. Lessons learned on how AIS ASM can be improved upon by using the Radio Technical Commission for Maritime Services (RTCM) AIS ASM Guideline.

### **10.3 The European Satellite-AIS Data Processing Centre**

***Author and presenter***



Mr Gaëtan Fabritius, CLS, France.

***Abstract***

This presentation highlighted how important a Data Processing Centre with regard to operational use of SAT-AIS information, in particular within an e-Navigation context. Indeed, the volume of data involved prevents operational teams from easily extracting the useful information (anomalies) without the support of enhanced algorithms able to automatically detect inconsistencies or errors, under configurable criteria.

***The key points of the presentation were:***

1. Enhanced SAT-AIS services.
2. e-Navigation.
3. Data validation and integrity.

## 10.4 Behaviour Recognition Assisting Maritime Situational Awareness

### *Author and presenter*



Mr Florian A Gruber, Frequentis AG, Austria.

### **Abstract**

At present, various sensor based tracking systems, such as the Automatic Identification System (AIS) and Maritime Communication Systems (MCS), are used globally in Mission Critical Control Centres. National and local authorities established shore based AIS/MCS infrastructure, networks and services. The presentation focused on analysis of additional possibilities for decision support for Centre operators with navigation and logistic tasks.

The aspects taken into account are that the operators are the experts in analysing vessel behaviour and the authorities decide which behaviour needs to be recognised. Today's systems mainly offer only passive decision support by displaying traffic situations or only recording vessel behaviour for later analysis.

Some technology driven implementations tend to overload the operators with information, ignoring the human factor and even decreasing situational awareness. The conclusion is that human centric designed behaviour recognition, harmonized with existing local services, can raise situational awareness thus supporting calamity abatement and logistic tasks.

### ***The key points of the presentation were:***

1. Mission Critical Control Centre;
2. Situational Awareness.
3. Decision Support.
4. Behaviour Recognition.
5. Human Centric Design.

## 10.5 Achievement of AIS AtoN in Turkey (finalizing project)

### *Author and presenter*



Capt. Mustafa Celalettin Uysal, Directorate General of Coastal Safety (DGCS), Turkey.

**Abstract**

The existing 85 remotely controlled Aids to Navigation (AtoN) stations in the Turkish straits have been upgraded. In addition, a new project, named SOTAS, which includes the installation of 382 AIS AtoN stations, are being integrated with new light-emitting diode (LED) lanterns and the establishing of remote control for these stations over a Global System for Mobile Communications (GSM) / General Packet Radio Service (GPRS) and Asymmetric Digital Subscriber Line (ADSL) network, has been completed throughout all Turkish waters. After finalising the project, 84% of AtoN are now remotely controlled, which was an organisation quality target. SOTAS aims to monitor and manage the AtoN stations, to collect information from AtoN and to observe the vessel traffic along the Turkish coast. DGCS uses the information collected for both improving the system itself and benefiting from the use of AIS for other purposes. The SOTAS system is also key for e-Navigation developments in Turkey. By using the system, users may utilise integral advanced features.

**The key points of the presentation were:**

1. Short introduction of Turkish National Aids to Navigation Authority.
2. General Technical Specification of AIS AtoN for Turkey.
3. SOTAS stations.
4. SOTAS centre software and features.
5. Conclusion.

**10.6 Discussion – Technical Session 2.2**

It was stated by the Chairman of the VTS Committee that the VTS operator's experience has noticeably improved since the introduction of AIS. It was observed that the best approach to vessel traffic monitoring is a combination of radar and AIS data using an appropriate fusing / correlation algorithm, linked to the IMO requirement for interaction with the vessel traffic and responding to traffic situations developing in the VTS area.

**11 Technical Session 2.3 – e-Navigation & Beyond (3)**

Chair: Ms Peggy Browning, ExactEearth, Canada.

Vice Chair: Mr Sebastian Espinar, Puertos del Estado, Spain.

**11.1 Communication for e-Navigation**

**Author and presenter**



Mr Rolf Zetterberg, Swedish Maritime Administration, Sweden.

**Abstract**

In the early phase of the development of the e-Navigation concept, IMO stated that communication is, together with accurate positioning systems and electronic charts, the main pillars of e-Navigation. This initiated a comprehensive work within IALA and other organisations, in order to find the best ways to fulfil the communication requirements for e-Navigation.

This paper briefly describes this work, which still is on-going, the guidance given by the IMO 'Strategic Implementation Plan for e-Navigation' and the role of IALA in this process. The different steps towards the presently proposed system, VHF Data Exchange System (VDES), are described.

The IALA Maritime Radio Communications Plan was presented briefly as a supporting document for this process.

The need for further work, standardization, carriage requirements and implementation on board and ashore, is discussed.

**The key points of the presentation were:**

1. Increasing need for data communication - a facilitator for e-Navigation.
2. IMO SIP gives guidance regarding architecture and communication requirements.
3. Highest demand for communication in coastal areas.
4. IALA has a leading role in definition of a new VHF-based data communication system.
5. Voluntarily implementation possible if the offered services are attractive.
6. E-Navigation Strategic Implementation Plan (SIP).
7. Inclusion of e-Navigation concept model diagram.
8. Reference to the 'maritime cloud'.

**11.2 IALA's VHF Data Exchange System (VDES) – a Foundation for e-Navigation Communications and GMDSS Modernisation**

**Author and presenter**



Mr William D. Kautz, US Coast Guard, USA.

**Abstract**

VHF data communications will provide the core for robust high-speed/large volume data exchange amongst ships, shore stations, and satellites. The AIS has significantly contributed to the safety of navigation, and the carriage and use of AIS onboard vessels is expanding. Various applications of AIS such as AIS-AtN, Class-B AIS, AIS-SART, AIS-MOB, EPIRB-AIS, and satellite detection of AIS, are useful and valuable for not only the safety of navigation but also safety of life, marine environment protection, assurance of maritime security, assistance of search and rescue missions and efficiency of shipping; however, the AIS, as a navigation safety system, not a communications system, is not capable of handling, nor was it ever intended for high-speed/large volume data exchange.

E-Navigation requirements for robust and efficient communications coupled with the need to protect AIS for its original purpose of safety of navigation, while making use of the broad AIS capabilities formed the basis of IALA's e-Navigation Committee's decision to develop a concept known as VHF Data Exchange System (VDES). The VDES is a VHF maritime data communication system that includes functions of AIS, facilitates e-navigation, supports GMDSS modernization, and general maritime communications. VDES uses Recommendation ITU-R M.1842-1 techniques to solve the limitation of AIS data exchange. The VDES has great capabilities for robust and fully automated communications and will influence the whole maritime society with enhancement of safety, security, protection of the environment and logistics.

Because of its advanced capability for AIS technology with robust high-speed/large volume data exchange between ships and between ship and shore, the VDES will be able to become the core element in e-navigation and could also significantly contribute to the modernization of GMDSS.

This presentation focused on technology for new AIS-like TDMA data exchange and high speed/high volume VHF data exchange applications for e-Navigation as well as VDES/AIS possibilities in vessel distress, GMDSS and SAR. It also explained the IALA vision for fully automated communications in e-Navigation.

***The key points of the presentation were:***

1. ITU, IMO, and IALA have recognized the efficiency and necessity for digital communications; and ITU has produced technical standards, revised the VHF marine band (RR Appendix 18) to designate channels for VHF data exchange, and has authorized channels for testing AIS-like applications.
2. The VHF Data Exchange System (VDES) is a VHF maritime data communication system that includes functions of AIS, facilitates e-navigation, supports GMDSS modernization, and general maritime communications; and has the potential to provide robust and higher speed data communications for the mariner.
3. An ideal e-Navigation communications system would operate automatically, selecting the best communications technology, channel, and characteristics in accordance with the ship's location, and the type of data to be exchanged.
4. The VDES, as envisioned by IALA and presented to ITU, addresses the identified improvement for the AIS along with essential digital communications contributions for e-Navigation and GMDSS Modernization.
5. AIS is commonly used by all classes of vessels, has ashore VHF infrastructure, and can be detected by satellite, which could make VDES/AIS distress implementation possible with minimal cost to shipping and could allow for the eventual replacement of VHF DSC both on ships and ashore.

### **11.3 Common Maritime Data Structure for e-Navigation and the Maritime Cloud**

***Author and presenter***



Author and presenter: Dr Nick Ward, General Lighthouse Authorities, UK and Ireland.

Co-author and presenter: Mr Thomas Christensen, Danish Maritime Authority, Denmark.

**Abstract**

The Usability of e-Navigation depends on harmonization of information presentation and generic standards for equipment, allowing familiarization and simplification of training. These goals will only be achieved through the introduction of a Common Maritime Information System and Data Structure.

The IHO Registry has been adopted as a common baseline, providing a framework for a Common Maritime Data Structure (CMDS).

Product specifications, based on data models and conforming to the IHO S-100 standard are being prepared.

S-100 provides the data framework for the development of the next generation of Electronic Navigation Charts (ENC) products, as well as other related digital products required for hydrographic, maritime and Geographic Information Systems (GIS) applications.

The benefits for end-users, operators and service providers of standardized exchange of information are increased efficiency, fewer errors, simpler training and common equipment and interfacing.

The ways in which the CMDS will be used are still being explored. Maritime Service Portfolios provide an organised presentation of technical and operational services and the concept of a Maritime Cloud is being developed by the Danish Maritime Authority as an all-embracing information system that can serve the whole maritime sector.

***The key points of the presentation were:***

1. Usability of e-Navigation depends on harmonization of information.
2. The IHO Registry has been adopted as a common baseline.
3. Product specifications, based on data models and conforming to the IHO S-100 standard are being prepared.
4. The concept of a Maritime Cloud is being developed by the Danish Maritime Authority.
5. This will be an all-embracing information system that can serve the whole maritime sector.
6. An example can be viewed at website [maritimecloud.net](http://maritimecloud.net).

**11.4 Improvement of Maritime Information and Communication System (MICS): e-navigation for small ships**

***Author and presenter***

Cdr Hideki Noguchi, Japan Coast Guard, Japan.

***Abstract***

In Japan, about 40% of maritime accidents are caused by pleasure crafts and about 30% are caused by fishing boats. The lack of information becomes one of the causes of the accident due to the poorer communication capability of those non-SOLAS ships compared with SOLAS ships.

The Japan Coast Guard (JCG) has operated the Maritime Information and Communication System (MICS) since 2001. The MICS uses internet and provides information needed for safe navigation to mainly owners or users of small boats and crafts. However, the MICS is useable only on land and is a passive system which cannot provide necessary information unless the user connects the internet.

In order to solve these shortcomings, the JCG has improved the MICS. The major subject of the improvement is to send necessary information as soon as possible by using automatic e-mail delivery system. At the present time, more than 10,000 users are registered and already received the necessary information.

***The key points of the presentation were:***

1. e-Navigation.
2. Non-SOLAS ships.
3. Mobile phone.
4. Automatic mail delivery system.

## **11.5 Maritime Domain Awareness, the Chilean experience**

***Author and presenter***



Cdr. James Crawford, Directorate General of the Maritime Territory and Merchant Marine, Chile.

***Abstract***

Oceans are global pathways that maintain national prosperity and are vital to national security. The maritime domain awareness (MDA) is defined as all areas and things of, above, under, down, in relation to, adjacent to, or bordering on a sea, ocean, or other navigable waterway, including all maritime-related activities, infrastructure, people, cargo, and vessels and other conveyances. Terrorist organizations recognize this and also realize the importance of exploiting the maritime domain.

The basis for effective prevention measures is to be alert and aware of the threat, along with a credible deterrent and interdiction capabilities. The environment of the XXI century maritime threats demand a holistic vision, with a broad scope, which is pursued through the MDA.

The author discussed applying the concept MDA in Chile. Inside the Chilean Navy, the MDA concept has been adopted as ‘surveillance, monitoring, warning and response’ of the national maritime area of responsibility, which is implemented by the Directorate of the Maritime Safety, Security and Operations (DIRSOMAR), the Technical Directorate dependent on DIRECTEMAR that embraces all areas related to maritime safety (technical inspection of ships, meteorology, marine police, pilotage service, search and rescue and aids to navigation). All the information received is centralized in a set of applications called ‘GRAFIMAR’, which can generate a complete picture of the maritime surface jurisdictional area.

Thus DIRECTEMAR focuses its activities through a strategic perspective oriented to an effective and timely knowledge of all the activities taking place in the maritime, river and lake area of responsibility, which could affect national security and the development of its maritime interests, in order to alert, prevent, protect and provide the appropriate response required. This comprehensive concept is the reference for the actions of DIRECTEMAR, introducing a higher systemic framework that allows subordinate commanders to understand and guide their work at different levels and stages.

DIRECTEMAR applies the MDA concept graphically, through “GRAFIMAR”, which is fed by own and third party sensors with information from open and closed sources, and other agencies, generating different “layers” data, with detailed information about the activities developed in maritime port terminals in different countries, identification and control of the staff working in them, ships positions in order to react promptly and efficiently to emergencies in the area.

***The key points of the presentation were:***

1. The oceans are global pathways that maintain national prosperity and are vital to national security.
2. Terrorist organizations recognize the importance of exploiting the maritime domain.
3. The basis for effective prevention measures is to be alert and aware of the threat, along with a credible response.
4. Inside the Chilean Navy, the MDA concept has been adopted as ‘surveillance, monitoring, warning and response’.
5. No matter what the level of threat, information that feeds the maritime surface picture, is always kept at their highest level of availability.

## **12 Technical Session 2.4 – e-Navigation & Beyond (4)**

Chair: Dr Nick Ward, General Lighthouse Authorities, UK & Ireland.

Vice Chair: Ms Catherine Steenberg, Force Technology, Denmark.

### **12.1 R-Mode using Transmissions from existing IALA radiobeacon installations**

***Author and presenter***



Author and Presenter: Mr Michael Hoppe, Federal Waterways and Shipping Administration, Germany.

Co-authors: Mr Jan Hendrik Oltmann, Federal Waterways and Shipping Administration, Germany and Mr Pieter Paap, Ministry of Infrastructure and the Environment, The Netherlands.

***Abstract***

Position fixing systems are identified as one strategic key element of e-navigation. Existing and future Global Navigation Satellite Systems (GNSS), such as GPS, GLONASS and GALILEO, are fundamental infrastructures for global determination of Positioning, Navigation & Timing (PNT) data. IALA has introduced the term ‘integrated PNT device’ to describe the on-board part of a maritime integrated PNT system. Additionally, terrestrial services are used to improve performance or to ensure backup functionality to overcome the vulnerability of GNSS. As a contribution to the development of redundant positioning, a terrestrial backup navigation system, based on ranging signals (R-Mode) transmitted from MF radio beacons and/or AIS base stations was proposed by the German Federal Waterways and Shipping Administration. To further develop the concept of the new system, it was decided to perform a feasibility study as well as a practical field demonstration within a transnational EU sponsored project named ACCSEAS (Accessibility for Shipping, Efficiency, Advantages and Sustainability). One aim within the ACCSEAS project is the implementation of a test bed on the Dutch Coast, which should enable a proof of concept for the proposed R-Mode using MF transmission from an IALA radio beacon station. The full paper gives a general explanation of the R-Mode system concept and various implementation methods.

***The key points of the presentation were:***

1. Resilient PNT as a core element of e-Navigation.
2. R-Mode as candidate for a terrestrial backup radio navigation system.
3. Use of R-Mode on a globally distributed maritime infrastructure such as MF radio beacons and AIS shore infrastructure.
4. 4 Using the EU funded sponsored project ACCSEAS as a platform to perform an R-Mode feasibility study and practical field tests.
5. Installation of an R-Mode test bed on the Dutch coast to enable proof of concept for using MF transmission from an IALA radio beacon station in Ijmuiden.

***Questions***

In response to a question as to whether the methodology being described could be applied to other forms of signalling, the response was, in general, yes. Each signal is taken as a 'signal of opportunity' and so, potentially, signals such as NAVTEX could be used.

**12.2 To infinity and beyond.... What is the future for Maritime Communications?**

***Author and presenter***



Mrs Jillian Carson-Jackson, Australian Maritime Safety Authority, Australia.

Co-author: Mr Peter Pokorny, Australian Maritime Safety Authority.

***Abstract***

e-Navigation – both ship and shore – will depend on communication capabilities. Radiotelephony has been the cornerstone of maritime communications for decades – but what role might it have in a modern e-Navigation world?

The Automatic Identification System (AIS) was a breakthrough in sending digital information over analogue VHF radio channels. AIS has a specific purpose that is clearly identified in the Safety of Life at Sea Convention (SOLAS) Chapter V. The design of the system and the speed of transmission of information meet this existing need, but what about future requirements?

How might one be able to address the increasing need for communications ship-shore / shore-ship and ship-ship? Is it a 'dream' that this information can be sent within the framework of the existing analogue, maritime radio frequency spectrum?

***The key points of the presentation were:***

1. Spectrum changes identified in WRC 2012 make the development of the VHF Data Exchange System (VDES) possible.
2. The approach is not changing the spectrum, but making better use of what is available.
3. The VDES has the possibility to revolutionise how data is sent and received in the maritime environment.

4. Development of the VDES will enable digital data communications ship/shore; shore/ship; ship/ship – a possibility for data to be sent via satellite.
5. Development of the system will require close cooperation with ITU, IMO and support from IALA, CIRM and related organization.

**Question**

A speaker from the floor made the statement that is necessary to ensure that developments in e-Navigation are user driven and there is a need for an organisation to ensure that VDES is taken well in hand to ensure that development in technology does not lose sight of the person using the data.

### **12.3 Product Specification Demystified**

**Author and presenter**



Mr Peter Hooijmans, Rijkswaterstraat National Vessel Traffic Management Centre, Ministry of infrastructure and the Environment, Netherlands.

Co-author: Mr Jarle Hauge, Norwegian Coastal Administration.

**Abstract**

Data-modelling, Data-exchange, Registry, Registers, Product Specifications, common language for software developers but less common for the future e-Navigation service providers and service receivers. The presentation gave an explanation about the IHO-GI Registry, its role in the development of e-Navigation and the necessity for Product Specifications. It also gave an insight into what Product Specifications are, what they are for and what is necessary for their development..

**The key points of the presentation were:**

1. Common Maritime Data Model.
2. Usage and purpose of a registry.
3. Development of product specification .
4. IALA Guideline on Developing an IALA S-100 Product Specification.

## 12.4 Navigation aids information service in e-Navigation

### *Author and presenter*



Author: Mr Lu Xiang, Shanghai Maritime Safety Administration, China.

Co-author: Mr Jinxing Shao, Shanghai Maritime Safety Administration.

Co-author: Ms Zhiping Ren, Shanghai Maritime Safety Administration, China.

Presenter: Dr Guojun Peng, Marine Navigation & Pilot Technology Research Centre of Jimei University, China.

### **Abstract**

The definition of e-Navigation stresses that AtoN are an important part of navigation-aids and play an important role in maritime security. In order to distribute real-time Aids to Navigation (AtoN) Navigation-aids information comprehensively, accurately and intuitively, an AtoN Navigation-aids information distribution system is designed and developed by using computer network technology, modern communication technology and some key technologies such as GPS, AIS, ECDIS and Web. The system implements a comprehensive display function of 360° channel panoramic view (virtual three-dimensional) based on Image-Based Modelling and Rendering (IBMR) AtoN, AtoN and channel information based on Remote Sensing (RS) image and physical and virtual AtoN information based on, amongst other sources, the Automatic Identification System (AIS). The users can acquire scientific, comprehensive, timely, accurate, and intuitive AtoN information on Internet by using a common Web browser, which can improve the safety index of marine traffic and operational efficiency of port and vessels and protect the marine environment.

### ***The key points of the presentation were:***

1. Aids-to-Navigation.
2. Navigation-aids Information.
3. Real-time Distribution.
4. Function Realisation.

### **1.4.4 Questions**

In response to the question about whether China is considering using the maritime cloud concept in the work currently being undertaken, Dr Peng replied that China must pay great attention to innovation and is currently launching projects learning from the EU sponsored project Mona Lisa and more university research work is being done in China in this area.

Dr Peng answered a question aimed generally at all the speakers. It was asked when manufacturers might expect to see 'cash flow' as a result of the topics being discussed during the session. Dr Peng emphasised the difficulty and time-consuming nature of the research being presented. He added that much of the data being produced in China is being made freely available, thanks to the sponsorship provide by the government. He suggested that he and the questioner meet for a more detailed discussion following the session.

The Chairmen commented that the commitment to e-Navigation by China MSA is impressive.

## 12.5 Development of S-100 based new Product Specification for AtoN and Method for Integration with Legacy Systems

### *Author and presenter*



Author and Presenter: Prof Suhyun Park, Dongseo University, Republic of Korea.

Co-author: Mr. Kim Jong-Uk, Dongseo University, Korea.

### **Abstract**

Currently in the maritime field, there is a great deal of interest in e-Navigation as a basis for the integration and utilization of various maritime and maritime-related data. Implementations in the e-Navigation environment seem to be centring on the International Hydrographic Organization's (IHO) S-100, which is being utilised as a base data model and means of data utilisation. The Aids to Navigation (AtoN) field is also showing growing interest in S-100-based data and services. Indeed, in light of the current directions of e-Navigation, development of S-100-based product specifications for description and distribution of data has become a necessity. On top of the S-100-based product specifications developed, the facilitation of S-100-based data integration and utilisation promises fully interoperable S-100-based information services. However, replacing existing legacy systems with S-100 compatible ones is prohibitively costly and time expensive. In the present study, an S-100-based new product specification for AtoN data was developed, on which basis it was possible to devise a way to integrate new S-100-based services and legacy systems without modifying them.

### ***The key points of the presentation were:***

1. e-Navigation.
2. S-100.
3. AtoN.
4. AtoN product specification.

## 12.6 Discussion – Technical Session 2.4

An observation was made from the floor that one of the issues highlighted in the final presentation was the duplication of entries in different domains and how they can be harmonized. It was stated that IHO has created S-99, which is the standard on 'Operational Procedures for the Organization and Management of the S-100 Geospatial Information Registry'. This standard gives some answers to the problem identified. In essence no duplications should exist if possible but rather features of other domains can be utilized and expanded through additional attributes or enumerations.

On the topic of 'legacy systems integration' it was said that it is expected that interoperability should be achieved as far as possible. It was also highlighted that in other industries the services of Data Service Providers (DSP) are utilised to achieve this and that IALA may think of utilising this concept as well. Industry may be able to help, as technical handling of different versions of systems is not necessarily the main domain of coastal administrations and other governmental bodies.

Professor Park responded to a comment about collaborative working in developing S-100 product specifications that the ARM Committee may be well placed to assist in the development of S-100 product specifications at IALA and that, in general, collaborative working is the way to proceed.

### **13 Technical Session 3.1 – Global Navigation (1)**

Chair: Mr Tuncay Cehreli, Coastal Safety, Turkey.

Vice Chair: Mr Jose Manuel Diaz, Centro Jovellanos, Spain.

#### **13.1 VTS Fehmarn Belt - A Danish/German Project.**

##### ***Author and presenter***



Mr Hartmut Hilmer, Federal Waterways and Shipping Administration, Germany.

##### ***Abstract***

The Kingdom of Denmark and the Federal Republic of Germany concluded a treaty on a fixed link across the Fehmarnbelt in September 2008. Since this date the planning of the bilateral project has been in progress. Following several investigations the countries decided to cross the Belt with a tunnel instead of a bridge. As a result of the formal safety assessment for safe navigation in the sound between Denmark and Germany, a Vessel Traffic Service System (VTS) will be installed for the construction phase to reduce the danger to the shipping of accidents between ships as well as between ships and construction gear by about 60%. The responsible Danish and German Authorities agreed to implement an independent temporary VTS Centre in the premises of the VTS Centre Travemünde. The advantages are obvious. The agreed solution reduces costs and stimulates teamwork between the VTS 'Fehmarn Belt' and the adjacent VTS-sectors of the VTS Travemünde. A Danish / German administration group (DenGer-Adm. Gr.) agreed to man the VTS 'Fehmarn Belt' by Danish and German personnel working together headed by one manager from each country. The communication language used in the VTS Centre as well as external communication will be English. The operating procedures, the technical equipment and the education of the staff will be in accordance with international requirements. This Danish / German project demonstrates the close cooperation between the maritime authorities of two adjacent neighbouring countries to ensure vessel traffic safety in common sea areas.

##### ***The key points of the presentation were:***

1. Safety of navigation.
2. Risk reduction measures.
3. Temporary VTS.

## 13.2 Finding Solutions before Accidents Happen

### *Author and presenter*



Dr Hasan Terzi, Directorate General of Coastal Safety, Turkey.

### **Abstract**

The rules and regulations to ensure and enhance safety at sea are usually revised or developed after investigating serious maritime accidents. But isn't it possible to do this before the accidents happen?

The same things that cause accidents cause near misses. By reporting and analysing near misses (NM) learn important lessons can be learned and remedial action taken before a full scale accident occurs. Although the necessity of reporting near misses considered, there are various barriers that prevent to report them. And also there are no any rules and regulations to report NMs at VTS area.

To determine NMS, in a VTS area, the criteria specified for some cases can be detected automatically by technological means such as AIS data. But this method is very limited and possible to have only few kinds of NMs. If it is required to get all NMs the best solution is creating a NMs reporting system in the organization. For an effective, efficient and sustainable NM reporting system the system should be based on the elements of positive safety culture: Just culture, reporting culture, learning culture and informed culture.

### ***The key points of the presentation were:***

1. Safety Culture.
2. Near Miss Management System for VTS.
3. Enhancing Maritime Safety.
4. Maritime Safety Regulations.

## 13.3 Close quarter situations reporting by Ushant VTS

### *Author and presenter*



Cdr Jean-Charles Cornillou, CEREMA, France.

**Abstract**

In case of a close-quarter situation detected by Ushant VTS, in compliance to the ‘rule of the road’, it is not obvious to demonstrate an infringement for the rules 16 relative to the ‘action by the give-way vessel’ should be balanced with rule 17 relative to the ‘action of the stand-on vessel’. Hence a mail is sent to the company of the give-way vessel exposing the analysis of the situation by the VTS with documentary evidences including radar screen prints if necessary. A copy is sent to the Flag State Authority and the Class Society delivering the ISM certificate.

The procedure has been in force for six years with Ushant VTS receiving positive feed-back from companies, Flag States and Class Societies. Internal feed-back is also very positive for operators training and the quality system of the centre. The number of close-quarter reporting has become a real indicator of the VTS activity.

**The key points of the presentation were:**

1. Definitions.
2. Ushant Traffic VTS presentation.
3. Action taken by Ushant Traffic VTS.
4. The ICAO “Airprox” procedure.
5. The interest of reporting close-quarter situations.

**13.4 Spanish Maritime Safety Agency - VTS in Spain**

**Author and presenter**



Mr Juan Luis Pedrosa, Spanish Maritime Safety Agency, Spain.

**Abstract**

The services of search and rescue, maritime traffic control, and pollution prevention and response are provided by the 20 Maritime Rescue Coordination and VTS Centres of the Spanish Maritime Safety Agency. The operators are certified to undertake their VTS duties in accordance with IALA and IMO recommendations. They follow a training course at Jovellanos Centre and an ‘on the job training period’ at the MRCC.

MRCCs are equipped with state of art monitoring systems and communication technologies to give VTS in the Traffic Separation Schemes and in the Particular Sensitive Areas in which vessel reporting is mandatory. The MRCCs also monitor the traffic in some ports with which there are Agreements in place. Different tools store this information, required to prevent and respond to maritime safety and pollution emergencies. Vessel related safety data is registered and exchanged with the rest of the Member States.

**The key points of the presentation were:**

1. Spanish Maritime Safety Agency’s services.
2. Spanish Maritime Safety Agency’s resources.
3. MRCC and VTS Centres in Spain.

4. TSS and PSSA in Spain.
5. VTS Training in Spain.

### 13.5 Discussion – Technical Session 3.1

The discussion was focused on the presentations on near misses.

Russia commented that their Coastal VTS witness ships straying into separation zones when navigating in the vicinity of Traffic Separation Schemes. Port VTS did not face this problem as ships complied with the VTS Traffic Organisation Service. There were many cases of ‘near groundings’; it was VTSO intervention that prevented accidents. In near miss cases, they alerted the ship and advised the ship’s company.

The speaker added that it was important to collect data on near misses, as there was pressure from the French government to do so. It was felt that the IALA VTS Committee ought to deal with this issue. The Chairman of the VTS Committee added that reporting guidelines for incidents / near misses was on the committee’s agenda, but that this could be enhanced with the addition of encouragement to develop a safety culture.

There was a question about what more could be done to enhance safety culture. The speaker replied that this was a long term process and there were no easy answer. France had started to examine this issue in 2007; some years later, they drew on the Air Traffic Control experience. Now there was growing body of information on near misses, allowing inferences to be drawn. Turkey added that the positive aspects of the safety culture should be considered – such as it being a just culture and a flexible culture.

A comment from the floor was that it was now an EU directive for coastal states to report, but that states were unsure if there was any action being taken by Flag States or shipping companies.

In response to a question on the veracity of the statement ‘there was a reduction of 30% in risk and accidents if automatic monitoring was introduced’, Germany stated that the information came from the maritime authority, but this information would be rechecked.

## 14 Technical Session 3.2 – Global Navigation (2)

Chair: Mr Mahesh Alimchandani, Australian Maritime Safety Authority, Australia.

Vice Chair: Mr Michel Cousquer, CEREMA, France.

### 14.1 A Methodology to allow VTS Centres to Monitor, in real-time, the Performance of the AIS infrastructure consisting of Shore-based AIS Networks and AIS-equipped Vessels, to ensure the Optimal Performance of the AIS system

#### *Author and presenter*



Author and presenter: Captain Pete Dolan, Pharos Marine/Automatic Power, Inc., USA

Author: Mr Magnus Nyberg, Pharos Marine Automatic Power Inc, USA.

**Abstract**

AIS technology is well-established and is in use world-wide. With governing Directives, Standards, Recommendations and Guidelines established by IMO, ITU, IEC, and IALA that dictate the performance requirements for AIS equipment, AIS protocols and AIS architecture, one may be led to a false sense that AIS systems are operating at a higher level of performance than is actually the case.

This presentation indicates a methodology to continually monitor the AIS system to ensure that the system is performing at as high a level as possible. Such monitoring is particularly important to ensure that the integrity of the AIS system is not diminished as new applications to enhance e-navigation are added to the AIS system and users find unique ways to piggyback functions on a free AIS communications network.

**The key points of the presentation were:**

1. Monitoring the performance of the VHF Data Link (VDL) in real time.
2. Monitoring the performance of AIS radios in real time.
3. Monitoring the quality and accuracy of the information transmitted in AIS messages in real time.

**14.2 Analogy between the VTS Centres Human Machine Interface and the Vessels' Integrated Bridge**

**Author and presenter**



Mr Dirk Eckhoff, Federal Waterways and Shipping Administration, Germany.

**Abstract**

One prominent aspect of modern vessels is the integrated bridge or integrated bridge design. Like a VTS centre (VTC) a vessel's bridge has displays for traffic monitoring, met-hydro data, waterways condition and communication facilities. The report compares the state of the art of VTC's human machine interface (HMI) with a vessel's integrated bridge.

Are there improvements for both, ship- and shore-HMI also with respect to usability and ergonomics? Can the data be presented in a more comprehensible way or have we reached the limits of integration? Will the transformation and adoption of a vessel's integrated navigation system to VTS applications or vice versa supports the harmonization between ship and shore?

The presentation discussed if and what the VTC HMI and the vessels' integrated bridge design can learn from each other.

**The key points of the presentation were:**

1. Vessel Bridge and VTC – Workstation analogies can be used to improve both sides.
2. Only data exchange will not be sufficient.
3. The workflow between vessel and VTS should be considered.
4. The analysis of the workplace and task can help to provide the operators on board and ashore only with the needed information.

### 14.3 Improvement of VTS operation capability with the introduction of Ku-band Solid-State Radar

#### *Author and presenter*



Author: Cdr Hiroaki Tanaka, Maritime Traffic Department, Japan Coast Guard, Japan.

Co-author: Cdr Kazuyuki Tanaka, Maritime Traffic Department, Japan Coast Guard, Japan.

Presenter: Cdr Hideki Noguchi, Maritime Traffic Department, Japan Coast Guard, Japan.

#### **Abstract**

The Japan Coast Guard (JCG) has been using high resolution Ku-band radars as a VTS sensor since 1977. Whilst conventional radar uses a magnetron as an oscillator source, recently there has been remarkable progress in the semiconductor technology. Thus, new Ku-band radars using solid-state devices are possible can be developed. The JCG started to install the Ku-band solid-state radar as a VTS sensor in 2013. The digital signal processing technology has improved detection performance and rain/sea clutter suppression performance. Furthermore, as a result, costs and workload for maintenance, and spurious emissions, have been reduced through solid-state technology.

#### ***The key points of the presentation were:***

1. VTS.
2. Ku-band radar.
3. Solid-state radar.
4. Improvement of detection performance.

### 14.4 How Human Factors can help in improving Control Room Performance

#### *Author and presenter*



Author: Mr Volker Grantz, Frequentis AG, Austria.

Co-author and presenter: Mr Gerd Palmetzhofer, Frequentis AG, Austria.

**Abstract**

To optimize performance within a safety critical control room, two aspects have to be looked at in detail. On one side, there is the symbiosis between the human and the machine, while on the other hand there is the overall “production” process within the control room. The human-machine symbiosis requires a good understanding of human capabilities and human needs. This results in the ability to establish a dedicated human machine interface (HMI) design and a system matching those needs. Together with this a good understanding of the production process is necessary. Within the SESAR project ZeFMaP (Zero Failure at Maximum Productivity in safety critical control rooms) analysis has shown that tools, well established for example in a mass production industry, such as in the automotive industry, could also be applied for safety critical control rooms to optimize the production process. When these two aspects are taken into account and appropriate measures to optimize those two aspects are undertaken, the combination of them will help in improving the control room performance.

**The key points of the presentation were:**

1. Control room performance.
2. Human-Machine Symbiosis.
3. Task Analysis & Value stream in safety critical control rooms.
4. Usability & User experience.
5. User centred design.

**14.5 Reducing Operator Workload and Stress through Cooperative Human-Machine System**

**Author and presenter**



Mr Todd C. Schuett, Kongsberg Norcontrol IT, Norway.

**Abstract**

The presentation about operator stress explored the relationship of stress to workload, stress management strategies and how co-operative human-machine systems can reduce stress. The solutions offered in this presentation are the result of work conducted by the maritime group ‘Designing Dynamic Distributed Cooperative Human-Machine Systems’ (D3CoS), a research project funded by ARTEMIS Joint Undertaking. The presentation describes the Vessel Traffic Services (VTS) Trials, which are experiments conducted as part of the D3CoS project that sought to establish a relationship between workload and stress level. The presentation concludes with a description of a prototype co-operative human-machine system developed by the maritime group that shares data between shore-based and ship-based systems. The goal of the system is to reduce operator task load and thus operator stress.

***The key points of the presentation were:***

1. Some stress is necessary and good, but un-necessary operator stress should be reduced.
2. Reducing stress requires a comprehensive, integral approach that considers all stress-causing factors, but this paper considers only how smart automation in the form of cooperative human-machine systems can reduce operator stress.
3. Operator task load is directly related to operator stress. The more tasks an operator must perform, the more stress the operator experiences.
4. Data sharing between ship and shore-based systems, if used correctly, can reduce the number of tasks an operator must perform.

**14.6 Discussion – Technical Session 3.2**

When asked if there had been any experience or test analysis conducted of ship officers' or VTS operators' cognitive awareness, Dirk Eckhoff replied that he had nothing to report, as his main interest is in HMI. Tod Schuett said that a small amount of information is beginning to emerge from the SESAME Straits project from research into how operators make decisions and so some data would be available at the end of that project.

Supporting the 2<sup>nd</sup> presentation's statement about the importance of safety information on ships' bridges and in VTS Centres, it was asked how a way to help collaboration between ship and VTS Centres could be achieved?

Dirk Eckhoff responded by saying information transmitted from the VTS to on board, his concern is sending too much information. It is essential to determine appropriate and timely information. Tod Schuett added that in the route optimisation segment of the SESAME Straits project provision of the information is a key consideration.

It was observed that VTS Centres are finding that they have monitor waters beyond territorial seas which gave rise to the question can increasing stress levels be avoided when it is necessary to communicate / exchange information before the vessel moves into the risk area within the VTS Area, i.e. that is before the vessel enters territorial seas.

Dirk Eckhoff said that he was hopeful that a solution could be found but that more research on this useful topic needed to be conducted. So far research has been very basic and would require a more complete e-Navigation test bed / simulator to perform a number of rounds of VTS scenarios.

Volker Grantz said that from the current Frequentis research program includes maritime and air traffic management, where there is a move to reduce stress in critical situations by reducing non-critical information. The user or operator does not need all the available information in specific situations; in critical situations the operator should get only that information that is needed. Frequentis is currently conducting tests in this area and the belief is that the results will show that stress will be reduced.

Jean-Charles Cornillou said that he had been concerned for some time about ship and VTS manning for managing the HMI. He observed that for over 30 years there have been 2 operators at a coastal VTS to manage the task of the wide array of data and tasks. He then asked how many operators are needed?

Dirk Eckhoff responded by saying that, in Germany, with a view to minimising the workload of the operator measures are being taken, for example for automatic detection and alarming (decision support tools). It is clear that the moment you extend the area of surveillance the operator needs to view the enlarged area and so there is a need to focus the operator's attention. Thus it is necessary to focus on the 'real tasks' that need to be carried out.

It was then asked, of the last two speakers, whether, in their experience, fatigue is a factor and if so has any research or has there been a study on this topic?

Volker Grantz responded by saying that fatigue is certainly a factor. He used as an example arm fatigue and how important it is, when designing the layout of touch screens, to place at a convenient height the main functions that the operator uses frequently. Similar considerations can minimise eye fatigue and, for ear fatigue a calm silence in the operations room is essential.

Todd Schuett said that he did not have much to add. However he observed that in the extremely busy Port Operations Centre number 3 in Singapore operators are rotated every 45 minutes to avoid fatigue.

## **15 Technical Session 3.3 – Global Navigation (3)**

Chair: Mr Thomas Christensen, Danish Maritime Authority, Denmark.

Vice Chair Cdr Hideki Noguchi, Japan Coast Guard, Japan.

### **15.1 Enhancing VTMS data management with Service Oriented Architecture (SOA)- Case study: FTA's Vessel Traffic Management Systems**

#### ***Author and presenter***



Ms Kaisu Heikonen, Finnish Transport Agency, Finland.

#### ***Abstract***

Turning navigational and other maritime information into machine-readable digital form will open up new possibilities for using information both on board and ashore. The exchange of digital information is expected to increase not only between ship and shore but also between different shore-based actors. In the future it will be necessary to effectively connect a large number of shore-based information providers and consumers representing different areas of responsibilities and originating from an expanding geographical area. What has widely been seen and recognized as a suitable way to create an efficient environment for the required information exchange is the use of service-oriented architecture (SOA). The Finnish Transport Agency (FTA) also sees this as the most effective way to meet the future demands for information exchange. However, the FTA also expects to face some challenges before the technical systems can be expected to fully support the visions in practice.

#### ***The key points of the presentation were:***

1. e-Navigation and increased shore-to-shore information exchange in electronic format is expected to have many positive effects on the safety of navigation and the efficiency of maritime transport.
2. Increased shore-to-shore information exchange between authorities will increase the cost-effectiveness of maritime surveillance operations.
3. Opening maritime data to citizens and private companies will enable the creation of new added value services and thus help to create new business opportunities.
4. The use of service-oriented architecture (SOA) and service buses has widely been seen and recognized as a suitable way to create an efficient environment for all the required future information exchange.
5. There are also some technical and administrative challenges related to the introduction of SOA.

## 15.2 The Shipping Industry and Marine Spatial Planning - a Professional Approach

### *Author and presenter*



Mr David Patraiko, The Nautical Institute, UK.

### **Abstract**

Marine Spatial Planning (MSP) is defined by UNESCO as 'a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that are typically specified through the political process. MSP is an element of sea use management'.

The process of MSP has been adopted by many governments around the world and in April of 2014 the European Parliament endorsed a Directive for Maritime Spatial Planning which should help Member States develop plans to better coordinate the various activities that take place at sea, ensuring they are as efficient and sustainable as possible.

MSP seeks to co-ordinate the use of marine areas for many, often competing, stakeholders such as Shipping, Fishing, Energy, Aquaculture, Recreation, Mining etc. Such planning 'discussions' are usually held by government administrators who may have little specialist knowledge of the various stakeholder requirements. The shipping industry is often ill represented at these local, national, and regional discussions.

The Nautical Institute, in collaboration with the World Ocean Council, has produced the guide "The Shipping Industry and MSP - a professional approach" to assist anyone who has experience with shipping to represent the shipping industry's concerns at MSP consultations. The guide is also of value to MSP planners who wish to better understand the role and requirements of shipping. The guide covers an introduction to MSP and legal frameworks, and numerous operational issues such as ship manoeuvring characteristics, widths of shipping lanes, environmental and commercial impact and offers a range of case studies and links to further resources.

The guide is freely available as a download from [www.nautinst.org](http://www.nautinst.org). The guide inevitably builds on and identifies numerous IALA activities and has been produced in association with IALA.

### ***The key points of the presentation were:***

1. MSP seeks to coordinate all marine area users and stakeholders, and is a process being adopted by many governments around the world.
2. The shipping industry, including all IALA members must represent shipping professionally and articulately at MSP discussions globally.
3. The NI guide should be considered an aid to identify some critical issues important to shipping from an operational, commercial and legal point of view.
4. All MSP discussions are unique and must be explored on a one by one basis.
5. The NI MSP guide is freely available for download from [www.nautinst.org](http://www.nautinst.org).
6. The majority of EEZs would be subject to Marine Spatial Plans.
7. The European Parliament has issued a directive on Marine Spatial Planning to be complied

with by 2016.

### **Questions**

It was noted that Marine Spatial Planning is allocated in the working program of the ARM Committee.

## **15.3 Holistic Marine Spatial Planning – Safety Beyond The Environment**

### **Author and presenter**



Author: Mr Nick Lemon, Australian Maritime Safety Authority, Australia.

Author: Mr Alex Millett, Australian Maritime Safety Authority, Australia.

Presenter: Mr Mahesh Alimchandani, Australian Maritime Safety Authority, Australia.

### **Abstract**

The world's oceans and coastal waters are increasingly being used for growing range of human activities, including: shipping, recreational boating, commercial and recreational fishing, oil and gas exploration and extraction, research and, more recently, renewable energy.

Modern technologies, such as web-based GIS tools and near real-time tracking of ships now make it possible for maritime authorities to be more aware of such activities off their coasts. Maritime jurisdictional arrangements can be complex, with coastal states having a variety of rights and obligations within their territorial waters and EEZs.

Marine Spatial Planning (MSP) is coming of age. When combined with the related activity of Water Space Management, it offers some solutions to the challenge of multiple sectors making increasing demands on the world's coastal waters and high seas. It is clear that in an e-navigation era, MSP and Water Space Management will be becoming increasingly important activities.

This presentation discussed some of the tools, techniques, management and cooperation methods that can underpin MSP – and the important role that shore based navigation services and aids to navigation can play. The presentation also discussed developments in Australia, links between MSP and e-navigation and some of the common challenges faced.

### **The key points of the presentation were:**

1. The importance of MSP and the characteristics of effective Marine Spatial Planning.
2. MSP in Australia.
3. Web-based interactive tools to assist in Marine Spatial Planning.
4. Links with e-navigation.
5. Lessons learned.

### **Questions**

It was remarked that AIS data and tracking is extremely valuable for the Marine Spatial Planning process but some stakeholders are not aware of this capability.

## 15.4 Capacity Building Initiatives in the South West Pacific to enhance the Safety of Navigation.

### *Author and presenter*



Mr Brad Groves, Australian Maritime Safety Authority, Australia.

### **Abstract**

An important element of technical cooperation is capacity building, which aims to share expertise, resources, information and experiences in order to strengthen the skills, competencies and abilities of maritime personnel. This leads to improved capacity of individuals and institutions to develop implement and enforce the highest international shipping standards.

In recent years, technical cooperation efforts by AMSA, IMO and IALA have developed momentum, and delivered synergies; more so due to the leadership demonstrated by the recently-established IALA World Wide Academy.

This presentation discussed a number of key activities that have taken place, are currently being undertaken or are planned to be undertaken in the south west Pacific region and supported by the Australian Maritime Safety Authority.

### ***The key points of the presentation were:***

1. Navigation safety is an important aspect of shipping in the South Pacific.
2. The Australian Maritime Safety Authority contributes to technical cooperation in this region.
3. The efforts of IMO and IALA WWA recognized particularly by the Asia Pacific heads of maritime agencies forum.

### ***Questions***

It was noted that Japan has the Japan Co-operational Agency. Australia has more informal activities but not at the same level.

## 15.5 Increased Sustainability of Sea Transport by Integration of ICT and ITS Solutions: The MONALISA 2.0 project

### *Author and presenter*



Mr Mr Anders Brödje, Swedish Maritime Administration, Sweden.

### **Abstract**

Efficiency of ship operations can be further enhanced by the introduction of Sea Traffic Management (STM). The MONALISA 2.0 project contributes with a holistic approach to the maritime domain by developing means for the sharing of information in order to distribute, elaborate and process common data within the whole transport chain. Through the introduction of ICT and ITS solutions, STM is further advanced by the development of new tools enabling more efficient planning, booking, monitoring of sea traffic, cargoes and passengers. It is crucial that these e-solutions are developed in a common manner and experiences from the EU-project SESAR, within the aeronautical domain, is used in order to find the safest and most cost effective solutions. As a carrier of information, the voyage numbers will provide the ultimate keys for efficient cross sector intermodality, in order to obtain real sharing of maritime related information. By the implementation of this enhanced STM service it is envisaged that the environmental footprint of sea transport will be reduced even further while still reducing costs and raising safety levels.

### **The key points of the presentation were:**

1. Flow Management is established by: Single ship reporting areas, Area management (dynamic No-Go-Areas), Enhanced monitoring in critical areas, Arrival/departure management, and Capacity management.
2. Strategic Voyage Management Effective voyage management will, in full effect, allow for non-stop voyages at most economic speed from departure to arrival, with ports available and ready from loading/unloading “on-time” upon arrival. Strategic Voyage Management is enabled by: Single voyage ID, and Voyage ID assignment.
3. Dynamic Voyage Management builds on a Strategic Voyage Plan and Tactical Route Exchange. The Strategic Voyage Plan is an iterative operation between involved parties to be: Optimized, Supervised, Assisted, and Validated. The Tactical Route Exchange is a Dynamic Voyage Plan in conning mode on-board and builds on; Anti-collision purpose, AIS for transmission, Involves only parts of the voyage plan, Captain is always in command, and COLREGS are always in force.
4. Port CDM (Collaborative Decision Making) enables four collaborative arenas facilitating sustainable transports as a whole: Collaboration among actors operating within the port, Collaboration between the port and actors realizing sea voyages, Collaboration between the port and actors realizing inbound & outbound transportation (besides sea voyages), and Collaboration between ports within each collaborative arena.
5. SWIM (System Wide Information Management) facilitates the sharing of information between different systems supporting the STM make the right information available at the right place and at the right time.

### **Questions**

A question was raised regarding contracts already in existence that need to be taken into account when optimising shipping to save money such as bunkering or chartering contracts which may not be an incentive to ship owners and operators. The speaker said that the project had produced a report on Charter Party aspects that highlighted possible changes such as sharing benefits of just-in-time arrival but he acknowledged that it was a legitimate issue that needs to be further investigated.

## **16 Technical Session 3.4 – Global Navigation (4)**

Chair: Mr Michael Hoppe, Federal Waterways and Shipping Administration, Germany.

Vice Chair: Mr Jorge Teles, Direcção de Faróis, Portugal.

## 16.1 Innovative use of Aids to Navigation in marking Wave & Tidal Renewable Energy sites

### *Author and presenter*



Mr Peter Douglas, Northern Lighthouse Board, UK.

### **Abstract**

The Orkney Islands, lying to the North of the United Kingdom, are exposed to the full force of the Atlantic running into the North Sea. This produces energetic wave conditions and reported tidal streams of up to 16 knots; the area is considered to contain huge untapped energy extraction potential, including some 25% of Europe's tidal energy resource.

Northern Lighthouse Board is using this opportunity to test innovative means of marking such devices, which is a particularly demanding task in areas of high tidal flow. Risk assessment is undertaken using a combination of AIS-derived data, Geographic Information Systems and IALA's IWRAP Risk Assessment software. Marking options under consideration include Virtual AIS, High-flow buoys, shore markers, leading lines and lights-in-line. Experience gained in this environment is fed back into IALA to improve Recommendation O-139 on the Marking of Man-made Structures.

### ***The key points of the presentation were:***

1. The benefits of close involvement with device developers, and particularly test centres.
2. Feedback of lessons learned regarding IALA Recommendation O-139.
3. Requirement for a comprehensive Navigational Risk Assessment process.
4. Use of the 'IALA Toolbox' and other analysis techniques.
5. Potential for imaginative use of marking systems.

## 16.2 VTS a Risk Reducer - A Quantitative Study of the Effect of VTS Great Belt

### *Author and presenter*



Author and presenter: Mr Tue Lehn-Schiøler, Rambøll, Denmark.

Co-authors: M G Hansen, K. Melchild, T K Jensen, S Randrup-Thomsen, K A K Glibbery & F M Rasmussen, Rambøll, Denmark. F. Ennemark, Femern A/S.

**Abstract**

In the Danish waters of the Great Belt a Vessel Traffic Service (VTS) offers navigational assistance and information about conditions important to shipping and safety at sea. In this presentation a general method for evaluating the effect of a VTS in terms of how much VTS increases the navigational safety was presented. The method has been developed based on incident reports from Great Belt VTS. Results from the Great Belt VTS leads to a conservative estimate that the VTS is able to reduce the number of collisions and groundings by between 60% and 90%.

**The key points of the presentation were:**

1. Effect of VTS.
2. Formal Safety Assessments (FSA).
3. Navigational safety.
4. Quantitative analysis.
5. Offshore construction.

**16.3 The Safety of the Human Element in the Maintenance of Marine Aids to Navigation.**

**Author and presenter**



Cdr. James Crawford, Directorate General of the Maritime Territory and Merchant Marine, Chile.

**Abstract**

Marine traffic during the last four decades has quadrupled, reaching in the year 2008, 32 billion tons-miles, with a clear decreasing tend of accidents. Nevertheless, paradoxically, sometimes men or women who ensure the safety of others, through the maintenance of marine aids to navigation, perform their duties in unsafe conditions and without appropriate protection from the elements.

The present document reveals the analysis performed by the Chilean Aids to Navigation Service regarding the improvements introduced on personal safety equipment of lighthouse specialists.

**The key points of the presentation were:**

1. The human element which is a most important asset within the Chilean Aids to Navigation network.
2. Lighthouse specialists, as members of the Chilean Navy, in the field of risk prevention are governed by the 'Regulations for Risk Prevention and Protection of the Environment of the Navy'.
3. Rules for risk prevention provided by the Chilean Navy, do not make a specific reference to conditions or safety equipment and protective clothing for lighthouse specialists.
4. An analysis of the personal protection elements began by identifying the duties personnel performed, associated hazards they are exposed to and consequences to their physical well being.
5. The resulting new protective clothing aims at satisfying the minimum personal protection necessary and its compatibility to the different climates in the country and the variety of tasks performed.

## 16.4 Sea Peril Management and the Role of VTS

### *Author and presenter*



Capt. Ugur Karabay, Directorate General of Coastal Safety, Ministry of Transport, Maritime and Communication, Turkey.

### **Abstract**

Although ‘Occurring Sea Peril’ may seem unpredictable (fortuitous) by definition, minimising risk and damage with a proactive approach before a sea incident occurs is as important as managing the sea peril crisis when the unpredictable risk occurs. In order to prevent sinking, capsizing, collision, taking water or loss of lives and cargoes during severe weather and sea conditions, which especially occur under difficult meteorological conditions, local VTS Centres and Authorities can make a decision to bring a vessel into a safe harbour or into a relatively more secure waterway, if such options are available. A decision can be taken through opening straits or channels in an existing water way or through directing the vessel to a safe waiting area (drifting or anchorage) or, if possible, directly to berth at a safe port with proper VTS information and advice.

The presenter intended to establish a reference document which will study the liabilities / legal responsibilities of VTS Centres and Authorities in case of loss and damage and the matters which should be considered by VTS for minimizing risk and damage which may occur as a result of sea peril under any circumstance.

It is possible to minimise loss and damage by examining best practice and efficient VTS / Maritime Domain Management even if this subject is still not clear in all written rules and principles in current maritime law.

### ***The key points of the presentation were:***

1. Definition of Sea Peril in Maritime Law.
2. The Elements of ‘Perils of the Sea’.
3. What is the Main Purpose of VTS?
4. Where is the Connection between VTS and ‘Perils of the Sea’?
5. When and how can VTS be effective in mitigating ‘Perils of the Sea’?

## 16.5 Future VTS services in the six e-Navigation areas, beyond territorial waters

### *Author and presenter*



Capt Jon Leon Ervik, Norwegian Coastal Administration, Norway.

### **Abstract**

IMO has decided to implement five e-navigation solutions. The solutions seek to improve cooperation and interaction between ships, shore, and vice versa. Several maritime service portfolios will be developed to support ship traffic in the six defined areas, which go beyond the limits of territorial waters. In future, Vessel Traffic Services (VTS) will play a central role in enhanced safety and more efficient maritime traffic.

VTS is an important tool for authorities wanting to influence monitoring and maritime activities. The governmental authorities want to ensure a minimal loss of life and to prevent damage to the environment and property. In addition, VTS systems should play a central role in providing services to the maritime traffic.

The development of e-navigation raises important questions on the current status of VTS.

### ***The key points of the presentation were:***

1. Do we utilise the potential that VTS has to offer today?
2. Will e-Navigation challenge the freedom of the seas principle or support it?
3. Are there similarities or lessons to be learned from the aviation industry?
4. Do we already have the technology we need?
5. Have we already established practices that transcend territorial waters?

## 16.6 Discussion – Technical Session 3.4

An SMA representative thanked Jon Leon Ervik for 'finally seeing the light', to which he replied that Nordic countries never disagreed but that they might, from time to time, use different terminology.

In response to a question from the Vice Chairman, Peter Douglas acknowledged that many of the devices that he had described in his presentation have the potential to produce a scouring effect. In response to a question about whether this topic had been studied, Peter Douglas said that it hadn't but recognised that it was a potential difficulty that did need to be researched. However, to date, there was no real operational experience that has allowed operational issues to be identified.

The Chairman asked if there was any standardisation of the incident report form described by Tue Lehn Schiøler. The response was that the form was based on experience e at Belt VTS and that it was not known how other VTMS Centres recorded such information. However, it was agreed that standardisation would be beneficial.

## 17 Technical Session 4.1 – Management (1)

Chair: Capt. Phil Day, Northern Lighthouse Board, UK.

Vice Chair Mr Juan Francisco Rebollo, Puertos del Estado, Spain.

### 17.1 The co-operative inland waterways safety programme in South Africa

#### *Author and presenter*



Mr James Collocott, South African Maritime Safety Authority, South Africa.

#### **Abstract**

This presentation described the safety programme model for inland waterways that is being developed, implemented and tested on five (5) pilot dams in South Africa. Once the model has reached a certain maturity level, it will be progressively phased in on all the inland waterways in South Africa.

The Cooperative Inland Waterways Safety Programme (CIWSP) project is a partnership between multiple government entities and between the government and the community. The aim is to enhance the development of a best practice model to ensure a safe and structured inland maritime environment and culture, whilst protecting the country's precious water resources.

#### ***The key points of the presentation were:***

1. Pilot Project, building a model, which is being developed and tested at five dams. Once the model has reached a certain maturity level, it will be progressively phased in on all the inland waterways in South Africa.
2. Aim to address inland waterways safety, incident and environmental management.
3. Partnership between multiple government entities and between the government and the community.
4. One element of the programme is the implementation of standardised marine Aids to Navigation and demarcation markers on inland waterways.
5. The Programme will also be used as a platform to implement, test, or develop new innovations, some of which would benefit local communities.

## 17.2 Route Topology Modelling as a potential means to reconcile Marine Spatial Planning with Demands of Sea Traffic – the North Sea Region example

### *Author and presenter*



Mr Jan-Hendrik Oltmann, Federal Waterways and Shipping Administration, Germany.

### **Abstract**

With the advent of, in particular, many offshore renewable energy installations in coastal states' national waters and in coastal states' Exclusive Economical Zones (EEZ), there has emerged a need for Marine Spatial Planning (MSP). At best, MSP will assist in the negotiation of interests of different stakeholders, both ashore and on-board. As a result, sea areas formerly considered 'open sea' for shipping may not be that 'open' in the future; rather MSP will likely render the available sea space to just a grid of 'lanes', as soon as the plans materialize. Such a situation can clearly be foreseen in the North Sea Region (NSR), which is one of the most crowded shipping areas globally. While there is a positive attitude towards offshore sea area usage for renewable energy installations, the needs of shipping must be taken into account in the remaining sea areas, in regard to both an individual vessel's safe navigation as well as safe and efficient traffic flow.

A fundamental and therefore powerful tool to that end may be Route Topology Modelling (RTM). RTM builds on the fact that most traffic flows through clearly recognizable routes and not only when the available waterways and fairways are constrained by limitations, such as those introduced by MSP. By RTM, the routes where vessel traffic may take place are abstracted into a description model, which is composed of discrete legs, junctions, and nodes (e.g. ports), to each of which a set of appropriate attributes representing relevant static and dynamic features is attached. Thus, as a first step, a generic RTM is created. According to a specific rule base, the RTM of any given sea area can be constructed for a given point in time. The RTM derived for a specific sea area may then be used for a variety of applications, both shipboard and shore-based. Since the RTM is an application to the maritime domain of mathematical graph theory, the associated findings and tools for optimization, as developed by mathematics, may also be employed in the maritime domain.

The presentation introduced the features of RTM, both generically as well as by a live example, namely the emerging RTM in the North Sea Region in Northern Europe.

### ***The key points of the presentation were:***

1. Route Topology Model / Modelling (RTM).
2. Marine Spatial Planning (MSP).
3. Maritime Service Portfolios (MSPs).
4. Shipping lanes.
5. Graph Theory.

### **17.3 Introduction of an Operation & Maintenance (O&M) Framework for the Coastal Wide Aids to Navigation Network at the German Coast and Integrated Management System for Maintenance Process**

#### ***Author and presenter***



Author and presenter: Mr Sascha Heesch, Federal Waterways and Shipping Administration, Germany.

Co-author: Mr Thomas Kuckling, Federal Waterways and Shipping Administration, Germany.

#### ***Abstract***

The implementation of a new coast-wide service oriented system architecture along the German coast introduced not only state-of-the-art technology but also led to coast-wide standardisation. This system comprises three data processing centres as nodes, many remote shore stations for various Aids to Navigation (AtoN) technologies, such as radar and AIS, and supports nine VTS centres; it replaced nine proprietary VTS systems. As a consequence, the structure and the operations of the technical operation and maintenance also needed to be adapted. The concept of many different, discrete services co-ordinated by the overarching service oriented system architecture is instrumental for governance of the system at large and supports both an effective and efficient run-time system management. Each of the different services has certain stand-alone capabilities and is, by default, separated from other services both in terms of data processing and physically. Each service also has its own service management by means of which the intricacies of each service's technology are encapsulated. The introduction of the new coastal-wide service oriented system architecture required the technicians, who were formerly working independently, to co-operate closely, although they still belong to different bodies of the administration and are still operating from several locations on the German coast. This challenge was tackled by subdividing the different maintenance tasks into two groups, namely those that can only be done at one central point and those that need to be done at more than one location. This assignment resulted in synergies regarding the governance of the whole of the system from one site without grossly increasing workload at the decentralized sites. There were also synergies regarding the deployment of personnel due to the introduction of standardisation throughout. The consequential new work processes were introduced in and by a so-called Operation & Maintenance Framework, which essentially is a rulebook and which is binding for the different bodies of the administration involved. Thus, a harmonisation of the technical operation and maintenance for the coastal-wide system was achieved, which in turn may lead to further synergies in terms of, for instance, improved service quality. The presentation indicated the O&M framework, the challenges encountered and reported on experience gained.

#### ***The key points of the presentation were:***

1. Coastal-wide distributed modular VTS-System.
2. Manage coastal-wide distributed technical personnel.
3. Reduce MTTR (mean time to repair).
4. One modular management tool for all members of technical operations.
5. Create clear communication paths for customers and technicians.

## 17.4 Lessons on Disaster Preparedness of Aids to Navigation learned from the Great East Japan Earthquake

### *Authors and presenters*



Author: Cdr Kazuyuki Tanaka, Maritime Traffic Department, Japan Coast Guard, Japan.

Co-author and presenter: Cdr Hideki Noguchi, Maritime Traffic Department, Japan Coast Guard, Japan.

### **Abstract**

The Great East Japan Earthquake on 11th March 2011 caused huge tsunamis as well as earthquakes. 158 AtoN suffered damage including, for instance, the collapse of lighthouses, the shift of lighted buoys and the black out of AtoN. The Japan Coast Guard (JCG) has been recovering the damaged AtoN using a three-step method and 72% of them had been completely recovered by November 2013.

In the area which recorded JMA Seismic Intensity 6 upper or more, only 5 of 72 lighthouses which satisfied the earthquake-proof standards were slightly damaged, whilst 15% of the AtoN using stand alone power systems blacked out.

The JCG has learned many lessons from past disasters. Best use is made of past experience to install more disaster resilient AtoN systems, which ensure the safety of navigation even when a disaster occurs.

### ***The key points of the presentation were:***

1. The Great East Japan Earthquake.
2. Damaged AtoN caused by huge tsunamis.
3. Disaster resilient AtoN systems.

## 17.5 The Aids to Navigation (AtoN) Service in Spain

### ***Author and presenter***



Mr Javier Martin Santo Domingo, Puertos del Estado, Spain.

### **Abstract**

The presentation showed the Spanish model of service management in marine aids to navigation (AtoN), based on public regulation and inspection, with centralized regulation and a distributed inspection; the service providers can be public or private entities, according to the scenarios.

The maritime AtoN service has been developed in Spain based on three scenarios: Coastal Network, Port Signalling and Other Facilities Signalling. Thus, the service provider in the field of Coastal Network is the Central Government (Puertos del Estado) through the Port Authorities. For a signalling port, the authorities responsible for these facilities are: Port Authorities in its ports, and Regional Governments (Autonomous Communities) or individuals in the port facilities with concession. Other facilities' signalling are managed by the authorities responsible for these facilities, such as aquaculture, pipes, shore protection installations and wind farms.

Puertos del Estado co-ordinate 28 Port Authorities that provide this service, assuming their management, inspection and maintenance, in the geographical area assigned.

One of the functions of Puertos del Estado is the definition of all beacons, from which follows a procedure that includes an open stakeholders' consultation and the comments of a Consultative Inter-ministerial Committee, in which there are representatives of all agencies with competences in the safety of navigation.

The Coastal Network (coastal lighthouses and beacons, DGPS, etc.) annual cost is approximately EUR 10 million. There is a state tax called 'rate of marine aids to navigation', which is collected by each Port Authority.

There are 187 lighthouses and main lights (49 manned), 2059 beacons and 1228 floating aids; there are also 27 racons, 18 DGPS transmission stations, 15 AIS-SBS and 15 AIS AtoN.

#### ***The key points of the presentation were:***

1. Spanish Framework.
2. Provision of the AtoN Service in Spain.
3. AtoN Inspection.
4. 'Faros de España' (Spanish Lighthouses).
5. Function of Puertos del Estado's AtoN Area.

### **17.6 Discussion – Technical Session 4.1**

James Collocott was asked how the CIWSP waterways safety program is funded? He replied that it is an intergovernmental program, with all relevant departments participating and funding the project. Thus there is no funding for the program itself, funding comes from the areas that have a mandate to execute CIWSP.

James Collocott was then asked what methodologies are used to engage local communities and how to determine the volunteers. It was replied that there has been extensive engagement with local community, when it was found that people love their dams, just as much as love their lighthouses, and are very involved in the operations of the dams. There has also been an extensive programme to communicate, with various sessions featuring concepts to be tested and tried. Feedback has been received from the users, who were initially apprehensive, they were doing what they wanted to do but there was no control. As a result of the communications programme and its sessions, the realization grew that with lack of control the end result would be that the waterway would be closed. A process, slowly but surely is gaining momentum and it has been found that social networks assist in getting the message across.

It was remarked to Jan-Hendrik Oltmann that a concern in the lead up to and throughout the week is that when considering traffic routing / motorways of the sea what is to be done about those vessels that don't fall under the cover of SOLAS / mandatory carriage of ECDIS; it has been calculated that 74% of the UK fleet falls into this category. How are these other vessels to be

captured in the e-Navigation framework? Jan-Hendrik Oltmann responded that the scope of the question goes beyond the scope of his presentation. However, he indicated that e-Navigation solutions are to be scalable in the maritime domain. At present with no mandatory carriage requirement there may be voluntary applications to start with that would include the other vessels referred to, including leisure craft. He foresaw a discussion on how to engage with these vessels in the future.

Javier Martin Santo Domingo was asked that with members of Puertos del Estado attending the level 1 AtoN management course, could he say what proportion of the €9.5M budget will be dedicated to the training of AtoN managers. The question was responded to by Juan-Francisco Rebollo, who said that Puertos del Estado is very involved in all aspects of training, including that of all personnel dedicated to lighthouses and AtoN. From time to time there is a need to bring in new technicians who come into the organisation from other fields of technology than lighthouses and should be well trained in the future. For Puertos del Estado it is very important to be dedicated to the training of these people, who are the future for the national AtoN system. It is difficult to quantify how much of the budget is for the training, because not only do funds come from Puertos del Estado but the port authorities also work hard to train their own technicians. However, it is clear that Puertos del Estado is very involved in the training and plans to develop the programme for developing training according with the IALA WWA guidance.

Sascha Heesch was asked, after introducing information management and exchange system between VTS centres, what type of redundant / back-up systems do you have? The response was that there are three data centres (DC) that store the data for the VTS and status of AtoN. These DCs are regionally distributed and replicate data between each. If one of the DC is breaks down then a VTS centre can connect to another one.

Noting the comments on the restoration of AtoN after the Great East Japan Earthquake, the Chairman asked Cdr. Hideki Noguchi was it necessary to conduct hydrographic surveys to establish whether there had been any changes to the seabed, perhaps sufficient to preclude AtoN restoration? Cdr Noguchi said that such surveys had been necessary but that he had limited his presentation to focus on AtoN. He further commented that recovery is a national work, involving not only hydrographic surveys but also co-ordination with affected ports. Before deploying emergency buoys it was necessary to verify that the channel was open or if there was any debris. Thus a hydrographic survey was carried out before buoys were replaced or sited.

## **18 Technical Session 4.2 – Management (2)**

Chair: Mr Roger Barker, Trinity House Lighthouse Service, UK.

Vice Chair Mr Kaisu Heikonen, Finnish Transport Agency, Finland.

### **18.1 Maintenance of Aids to Navigation based on Knowledge, Innovation and Integration of IALA Guidelines and Recommendations**

#### ***Author and presenter***



Mr Nick Goethals, Shipping Assistance Division, Belgium.

### **Abstract**

The Shipping Assistance division of the Flemish Government is responsible for the management and maintenance of the fixed AtoN in the ports of Nieuwpoort, Oostende and Blankenberge. Nieuwpoort is the biggest marina of Northern Europe and has more than 2.000 berths. The existing system of AtoN consisted of a variety of systems, often installed in earlier years by various organizations and end-users, which resulted in a complex inventory of equipment and rising maintenance costs with little benefit for the yachtsmen and shipping industry. Where the previous maintenance was carried out based on a basic preventive maintenance schedule and an on-demand corrective maintenance, there was a strong need for a more structural approach to meet the current IALA guidelines and recommendations. This approach should also give more attention to the need for innovation, integration of cost efficiency in design, development of a long-term vision and the interaction with the end-user.

### **The key points of the presentation were:**

1. AtoN.
2. Control and monitoring.
3. Maintenance.
4. Knowledge.
5. Innovation.

### **Questions**

There was a question whether all stakeholders had been consulted and what the considerations would be to achieve harmonisation. The presenter advised that they had conducted a market survey to see what products were available and which ones would be best suited to achieve standardisation across their three ports.

In response to a question about the non-inclusion of the Port of Antwerp, the presenter replied that they were only responsible for three Flemish ports. The Port of Antwerp was responsible for its own aids to navigation. However, his own view was that a single authority should be responsible.

A question was raised about the ease of access to IALA guidance documents from their website. The presenter replied that the site was well structured and that they were able to download what they wanted easily.

Germany asked if they had done more work on remote control and monitoring of their new Aids to Navigation. The presenter replied they were still in the investigative phase and were keen to learn from industry. Germany's offer to share information on this issue was gratefully accepted.

## **18.2 Risk Management in Waterways affected by Hurricanes**

### **Author and presenter**



Mr Julio Fidel Sierra Almaguer, Hydrographic and Geodetic Service, Republic of Cuba

### **Abstract**

To minimize the destructive effects of hurricanes on Aids to Navigation, the Hydrographic and Geodetic Service of Cuba has changed its approach to risk management. One of the most effective risk management options has been the lighting system deactivation and the removal of other accessories for its preservation and the subsequent activation of systems after the storm. This task is executed in a short period of time simultaneously in those waterways likely to be affected. Once the hurricane has left the area the damage is assessed and the aids to navigation reactivated in accordance with the priority required by the risk level of the affected waterways. Throughout the process the maritime community is properly informed in compliance with Regulation 13, Chapter V of SOLAS.

### **The key points of the presentation were:**

1. The Aids to Navigation in the Republic of Cuba.
2. Hurricanes.
3. Risk Control.
4. Hurricane season 2008 for Cuba.
5. Lessons learned.

### **Questions**

A question was asked whether meteorological advice had improved and if it could assist in preparing for the onset of stormy weather. The presenter replied that they had information on the trajectory of approaching hurricanes from several models; however, this information is used together with the company's own modelling to predict the path of a hurricane.

Following on from this a question was asked if local mariners ventured out to sea quickly after a hurricane had passed (i.e. before all aids had been redeployed). The presenter replied that their Coast Guard advised the authority if mariners were doing so and that there were no problems in this regard

## **18.3 Development, Maintenance and provision of Services for Aids to Navigation – Who pays them?**

### **Author and presenter**



Mr Alvaro Rodriguez Dapena, Puertos del Estado, Spain.

### **Abstract**

Aids to Navigation (AtoN) are currently financed through a great variety of sources and funds, public and private, all over the world. Economic and legal framework is crucial to determine financial conditions for supporting AtoN in each country. In some countries, like United Kingdom, Ireland and Spain, economic conditions for developing and/or maintaining AtoN elements are established in association with a self-funding scheme, based on specific tariffs, taxes, dues or levies applied to the users (following an user-pays system). In other countries there is a relevant economic support coming from the general fiscal system. The aim of this work is to compare

different systems for financing AtoN elements (facilities and services), and the way in which to apply them, in order to learn lessons coming from the experience and to also identify trends for the future.

***The key points of the presentation were:***

1. Finance.
2. Promotion.
3. Governance.
4. Development and maintenance.
5. Service provision.

***Questions***

The Dean of the WWA remarked that in the WWA's experience, the financing of Aids to Navigation services was a problem for many countries. The Spanish model was a pragmatic approach. The advent of e-Navigation and the change in the mix of Aids to Navigation would require new funding models.

The Spanish presenter added that in Spain, Aids to Navigation were financed by user fees, while the coastal VTS was funded by the government. However initial steps were being taken to merge the two systems. Roger Barker added that this was not an easy question and that 'who pays' was always important.

## **18.4 Quantitative Risk Assessment and the Complimentary use of IWRAP**

***Author and presenter***



Capt. Roger Barker, Trinity House Lighthouse Service, UK.

***Abstract***

Risk Assessment to ensure that the most appropriate mitigation measures are in place to ensure any new and existing dangers to the Mariner are provided for, is essential.

Use of the IWRAP tool to assess the probability of collision and grounding can incorporate the automatic download of vessel traffic information from the AIS network. This information is used to produce a density plot onto which specific leg information is defined and then analysed.

This, initial assessment of existing vessel traffic patterns can then be compared with a change in patterns after a specific risk mitigation/control measure has been considered to assess before and after results.

Control measure may incorporate all, or a combination of many options including changed or improved Aids to Navigation, Vessel Traffic Services, Pilotage assistance or improved electronic Aids on board the vessel.

The decision on the most appropriate control measure can then be informed by quantitative data supporting expertise provided by a qualitative risk assessment approach.

Although decisions regarding appropriate control measures must not be driven by cost alone, with Safety of the Mariner and Protection of the Environment being paramount, the truth is that there are ever increasing financial constraints placed on authorities. IWRAP provides additional evidence underpinning decisions on Aid to Navigation requirements.

***The key points of the presentation were:***

1. The IALA Risk Assessment toolbox.
2. The IWRAP model and density plot.
3. Practical application of the quantitative risk assessment.
4. Developing a model for a specific location.
5. Other considerations in practical Risk assessment.

## **19 Technical Session 4.3 – Management (3)**

Chair: Mr Seung-gi Gug, Korea Maritime University, Republic of Korea.

Vice Chair Ms Monica Sundklev, Swedish Transport Agency, Sweden.

### **19.1 Atlantic Coast Port Access Route Study and Coastal and Marine Spatial Planning**

***Author and presenter***



Mr George H. Detweiler Jr., United States Coast Guard, USA.

***Abstract***

One mission of the U.S. Coast Guard is to preserve navigational safety, even as new ocean uses emerge along the coastal regions of our waters, such as offshore renewable energy installations. The U.S. Coast Guard is conducting an Atlantic Coast Port Access Route Study (PARS) to study the navigational uses off the Atlantic Coast in support of the rapidly developing renewable energy industry, especially wind farms and to provide data to support future Coastal and Marine Spatial Planning efforts. The entire Atlantic Coast from Maine to Florida, including those waters located seaward of the existing port approach systems within the Exclusive Economic Zone, is being studied. The presentation gave an overview of the PARS process and then focussed on the Atlantic PARS. It then turned to GIS modelling and analysis and identified the various impacts that require a thorough understanding of the interrelationships of shipping and other commercial uses, recreational uses and port operations. The presentation concluded with a summary of the current process..

***The key points of the presentation were:***

1. Navigation safety must be preserved with the proliferation of wind farms.
2. The placement of wind farms will increase the risk of collisions and may increase the risk of collisions and groundings.
3. Data Gathering on existing and future waterway usage is an important initial first step.

4. Public outreach with the maritime community is essential.
5. A proper Modelling and Analysis tool is necessary to ensure all known risks are identified and to evaluate potential mitigations.

## 19.2 Light Measurement of Tower of Hercules Lighthouse

### *Author and presenter*



Author: Mr Malcolm Nicholson, General Lighthouse Authorities, UK & Ireland.

Presenter: Mr Link Powell, General Lighthouse Authorities, UK & Ireland.

### **Abstract**

The Research and Radionavigation Directorate of the General Lighthouse Authorities of the UK and Ireland (R&RNAV) has, for many years, carried out 'in-situ' light measurements of lighthouses in order to ascertain the light intensity performance upon re-engineering or a change in navigational requirement. A 'live' demonstration of the techniques used by R&RNAV was given on the Thursday evening during the conference with the present and potential replacement light sources measured at the Tower of Hercules Lighthouse. Following the measurement, during the conference, the results were presented along with a description of the techniques used and the common problems associated with conducting measurements of this nature.

### ***The key points of the presentation were:***

1. Quality assurance.
2. Light measurement techniques.
3. In-Situ light measurements.
4. LED light sources.

### **Questions**

Thanks were conveyed from the floor to GLA R&RNAV for providing an interesting and educative demonstration of measurement in the field at the Tower of Hercules, at both the Tower and the measurement site.

Link Powell was asked what the lifetime of the LED light source was, with some supplementary questions following. The response showed that the lifetime of the LED light source is assessed at 5000 hours or approximately 5 years, although LED have not been in use for sufficiently long for this to be confirmed. It was noted that this could be affected by how the light source is used. However, the estimate is considered realistic.

It was also stated that there is no need for a secondary light source, given how flexibly the LED source can be configured. The light source comprises six individual LEDs that can be driven individually and if driven individually one could lose one of the LEDs in the cluster and would only experience a minor reduction in range. However, it is really up to the Authority's policy and what level of backup is required. In addition to the 45 watts source used for the demonstration there are also 75 watt and 100 watts sources available but these do not need to be driven at the maximum level.

### 19.3 Outsourcing of AtoN Maintenance Services – Innovation in Tendering, Contracting and Managing these services in Australia

#### *Author and presenter*



Author and presenter: Mr Gerry Brine, Australian Maritime Safety Authority, Australia.

Co-author: Mr David Jeffkins, Australian Maritime Safety Authority, Australia.

#### **Abstract**

The Australian Maritime Safety Authority (AMSA) has outsourced its AtoN maintenance service since 2001. AMSA has since tendered this service on two occasions. With each tender, AMSA has sought to enhance the cost effectiveness of its AtoN network. The presentation highlighted the key lessons from these tender processes.

The presentation also examined how AMSA has evolved its contract management model and processes to achieve an optimal balance between allowing the contractor the flexibility necessary for them to be made fully accountable for the maintenance task, while fostering an in-house technical capability necessary to enable robust scrutiny of the contractor's performance and therefore to maximise the economic life of AMSA's AtoN assets. A comparison of AMSA's AtoN maintenance outsourcing model with a different model adopted by the Western Australian Department of Transport was also shown..

#### ***The key points of the presentation were:***

1. The provision of Aids to Navigation (AtoN) maintenance is generally outsourced by aids to navigation authorities within Australia.
2. AtoN authorities outsourcing their maintenance service need to retain a core technical capability for effective contract and asset management.
3. A clearly defined but flexible performance management regime including contractor incentives are an essential tool for effective contract management.
4. An on-going risk for AtoN authorities when outsourcing is the potential for a reduction in the number and/or skills base of contractor resources.
5. There is a narrow market for AtoN maintenance services. Outsourcing these services carries a high risk of an incumbent contractor gaining a significant competitive advantage over time. Tendering strategies can help to counter this impact and ensure competitive pricing.

## 19.4 e-Navigation Starts with e-Voyage Planning

### *Author and presenter*



Mr Geir L. Olsen, Jeppesen, Norway

### **Abstract**

The world of navigation is getting more and more complex and the need for intelligent solutions to handle the workflow processes both on-board, for ship-ship and shore-ship collaboration, are in high demand. This includes all tasks, from the information collection in the voyage planning and optimization process, to reporting regimes and berth-to-berth safe navigation based on up to date and real time situation awareness.

It was emphasised that the need not only to provide more data to mariners, who are making navigational and other operational decisions, but also to enhance co-operation or 'co-navigation' happening between other ships and shore side support, from VTS and SAR to dedicated routing service, are presented as Intelligent Integrated Information. One of the main hazard to (e)-Navigation is the availability of good data that is presented and compiled in an 'unintelligent' way. The same goes for the workflow of the operators. The process from Planning, Optimising and Reporting, to berth to berth navigation is only as good as the weakest link of all the marine operators; be it the VTS or SAR operator, pilot, master or lookout. Without integrated tools to handle this workflow, the risk of misunderstanding, fatigue and human error is very apparent.

The presentation highlighted three central challenges in the voyage towards e-Navigation:

- more optimized and safer navigation based upon closer ship-ship and ship-shore collaboration;
- a concept for voyage planning, optimization, collaboration and reporting processes;
- the impact of e-Navigation on Polar Navigation.

The presentation indicated the current status from different test beds, as well as IMO and industry alignment, to ensure that the harmonization and enhancement set forward in the e-Navigation visions are being realised. Mr Geir Olsen author stressed the need for good solutions that take into account intelligent information exchange between all marine stakeholders, from the on-board navigators, shore side VTS and SAR operators and the ship operators.

### ***The key points of the presentation were:***

1. Voyage Planning and exchange.
2. VTS – Ship collaboration.
3. e-Navigation and test beds.
4. S100 sea trials.
5. Polar Navigation.

## 19.5 Real-time risk assessment for aids to navigation using fuzzy-FSA

### *Author and presenter*



Author: Ms Tingting Chen, Shanghai Maritime University, China.

Co-authors: Prof Chen Jinbiao, Shanghai Maritime University, China, Dr Guojun Peng, Marine Navigation & Pilot Technology Research Centre of Jimei University, China.

Presenter: Ke Ranxuan, Jimei University, China.

### **Abstract**

In order to appreciate the risk level to the Aids to Navigation (AtoN) in a navigation channel and to provide some decision-making suggestions for the AtoN Maintenance and Management Department, a risk assessment index system of the AtoN was built, taking into consideration the advanced experience of IALA. The quantitative standard of each factor was presented and the weight of each factor determined by means of combining experts' consultation with an analytic hierarchy process (AHP) method. Under the Formal Safety Assessment (FSA) framework, taking advantage of the fuzzy comprehensive evaluation method, the fuzzy-FSA model of risk assessment for aids to navigation was established. The data needed for the model was classified into three types, which are basic facts, real-time and external. The data source of each type of data was determined. The model was implemented for the assessment of AtoN in the Shanghai area. The real-time data were extracted from the existing information system of AtoN in the chosen channel and their real-time risk assessment was performed on a platform of a three-dimensional simulation system of AtoN, with the risk assessment software. Specifically, taking the deep-water channel of the Yangtze River estuary as an example to illustrate the general assessment procedure, related risk assessment results and risk control suggestions were given. The method proposed presents practical significance and application prospect on the maintenance and management of the AtoN.

### ***The key points of the presentation were:***

1. Introduction.
2. Index system for AtoN risk assessment.
3. Fuzzy-FSA model.
4. Real-time risk assessment for aids to navigation using fuzzy-FSA on the platform of Aids to Navigation Three-dimensional Simulation System.
5. Example of real-time risk assessment for aids to navigation in Yangtze estuary deep-water channel.

### **Questions**

The Chairman advised that questions could not be answered by the presenter but that any questions could be addressed to the author, Ms Chen Tingting via [luckytting@163.com](mailto:luckytting@163.com)

## 19.6 Risk assessment of new danger wreck marking

### *Author and presenter*



Mr Yongqiang Lu. Donghai Navigation Safety Administration, China.

### **Abstract**

A new dangerous wreck, which often has critical characteristics, poses a great threat to ships. IMO approved IALA Recommendation O-133 in November, 2006, which introduces a new emergency wreck marking buoy (EWMB). The latest revised IALA Maritime Buoyage System (MBS) includes the EWMB and stipulates that marking a new danger using appropriate marks such as Lateral, Cardinal, Isolated Danger marks or use of the EWMB. The presentation introduced the actual situation on new dangerous wreck marking worldwide since 2006, including the use of virtual AIS AtoN. It indicated the use of risk assessment for marking new dangerous wrecks including typical cases. Finally, in order to ensure safety of navigation and the prevention of pollution of sea, the presentation suggested how to better mark new dangerous wrecks in future.

### ***The key points of the presentation were:***

1. IMO and IALA's regulations on New Dangerous Wreck Marking.
2. Application of EWMB around the world.
3. Analyses of typical cases.
4. Risk Assessment and Risk Management on the new dangerous wreck marking.
5. Summary and Recommendations.

### ***Questions***

It was reported that Trinity House has been very successful when using the EWMB. However, there is a concern about the integrity of the position of the wreck when use of a Virtual AtoN (VAtoN) is being considered, as the position of the wreck may need to be surveyed before a VAtoN can be transmitted. Mr Yongqiang Lu agreed with the concern, saying that the precise position of a wreck is normally established but that, if necessary a VAtoN would be deployed and the wreck position surveyed.

It was observed from the floor that redundancy of transmission of VAtoN is also an important consideration when using VAtoN..

## 20 Technical Session 4.4 – Best Practice

Chair: Mr Eric Vassor, CEREMA, France.

In order to increase the participation of technicians in the IALA 2014 Conference, a best practice initiative was included as a way of sharing with the IALA family, organisations' experiences that solve a specific technical problem and in some cases can save significant resources (economic, human, time, service). While the intention is to publish all submitted experiences as a Knowledge Database, 10 selected experiences were presented in this session of the Conference.

## 20.1 Improving daytime conspicuity of buoys in Santander Port.

### **Author and presenter**

Author: Mr. Luis ALVAREZ Alvarez, Santander Port Authority, Spain.

Co-author and presenter: Mr. Carlos Calvo Gomez: Santander Port Authority, Spain

**Objective:** Improve daymark conspicuity.

**Problem to be solved:** The day mark conspicuity of some buoys was inadequate because their central body was narrow.

**Action taken:** Standard polyethylene plates 2x1 metres square and 10 mm thick, available in local shops, were cut to fit buoy. The green colour RAL factor was 3020, while the red colour RAL factor was 6024. The prototype was tested in the workshop, but production plates were outsourced. The plates were attached to the central body of the buoy using small rectangular steel plates, placing them on four sides.

**Results:** The result was a marked increase and improved daytime conspicuity of those maritime signals modified, as a consequence of having increased the size of the day mark and given it a triangle shape.

**Equipment or services involved** technicians in the Aids to Navigation mechanical workshop were involved.

**Knowledge acquired:** The solution showed that some times it is convenient to use small low-cost interventions in order to improve the performance of our maritime signals

**Resource implications:** The solution was really low cost due to the use of standard, readily available steel plating.

## 20.2 Inter VTS Exchange Format (IVEF) implementation in a National Maritime Safety System

### **Author and presenter**



Author: and presenter Mr. Artur Baranowski, Sprint S.A., Poland.

Co-authors: Michal Burka, Sprint S.A., Mr Jan Mlotkowski, Maritime Office, Gdynia, Poland.

**Objective:** Interconnection between VTS's in Poland (Gulf of Gdansk VTS, Szczecin-Swinoujscie VTMS, Stupska Bank VTS) and MarSSIES as a National Maritime Safety System master application.

**Problem to be solved:** Interfacing various manufacturer maritime related application; interoperability between existing master application and new systems.

**Equipment or services involved:** VTS, VTMS, MarSSIES (Maritime Safety and Security Information Exchange System).

**Action taken:** Design and test implementation of the IVEF 0.8.3 to establish communication between MarSSIES (Sprint S.A.) and VTS (Indra Sistemas S.A.)

**Results:** Positive test results, proper interconnection established between VTS and MarSSIES.

**Knowledge acquired:** Practice in IVEF implementation and IVEF SDK (Software Development Kit) use

### 20.3 Use of LED light sources in old lenses

**Author and presenter**



Author: Mr. Yves-Marie Blanchard, CEREMA, France.

Presenter: Mr Michel Cousquer, CEREMA, France.

**Objective:** Replace filament lamps used in traditional Fresnel lenses by LED light sources.

**Problem to be solved:** Develop, industrialise and deploy an innovative product that meets an identified need.

**Equipment or services involved:** Light sources / traditional glass lenses, preservation and economy.

**Action taken:** The procedure employed the following steps:

- write the need, feasibility, economy of the project;
- write specifications;
- conception/prototypes;
- qualification, measurements;
- estimations of performances in various optical apparatus;
- planning of deployment;
- industrialisation;
- deployment.

**Results:** Definition of a range of 3 LED light sources, with initial deployment of 2 completed and the final deployment planned for 2014.

**Knowledge acquired:** Development in the use of LED light sources.

#### Questions

It was asked if there is a requirement for overvoltage and lighting protection. Speaker responded that it was a requirement for the supplier of the LEDs to cater for overvoltage situation.

It was asked whether his organisation had any experience in the degradation of intensity of LEDs over time. The trial started 4 years ago and is still running 24/7 in the laboratory and the speaker was quite confident that 10 year life will be reached. The problem may be more the driver of the LED rather than the light source itself.

## 20.4 Handbook for nautical studies

### **Author and presenter**

Author and presenter: Mr. Ernst Bolt, The Netherlands Ministry of Infrastructure and the Environment, Netherlands.

**Objective:** To develop a standardized model or methodology to assess the effects on ship traffic safety and efficiency of policy measures and infrastructure changes

**Problem to be solved:** For Waterway authorities to decide whether an intended change to infrastructure or vessel traffic is acceptable and what mitigating measures should be installed. Also to create a standardised 'state of practice' with respect to the assessment of infrastructure investments that makes the decision making process more transparent and legally robust.

**Equipment or services involved:** Typically, a consulting firm will undertake the research. A number of checklists and a functional description of available assessment tools support the process.

**Action taken:** A top-down approach is used to make clear what questions have to be answered and what type of answers would suffice. Descending from the highest level, details added in several loops involving communication with the problem owner.

**Results:** The problem solving process is standardized and transparent. Importantly, it may be avoided that a laborious assessment tool is applied which, although available, will not be able to produce the type of answers that is needed. The handbook will be regularly updated, gathering experience from each application of the Handbook.

The Handbook provides guidance for approaching questions on the design and use of nautical infrastructure. The check lists help to assure that nothing will be overlooked, and the description of tools helps in appropriate application of those tools.

**Knowledge acquired:** Avoiding research which would lead to a useless answer may yield major savings. Moreover, the Handbook assists in a clear and efficient breakdown of the questions to be answered; the selection of capable tools and possibly adjusting expected answers. By providing a transparent decision making process, political procedures become more efficient. Differences in insight are avoided by using the Handbook agreed upon by the main stakeholders.

## 20.5 How to prevent Vessel Traffic Services (VTS) operators' bad habits

### **Author and presenter**



Author and presenter: Mr Carlos Fernández Salinas, Spanish National Agency for Maritime Safety and Rescue, Spain.

**Objective:** As applicable, all operators are trained in accordance with IALA Recommendation V-103.

**Problem to be solved:** To show the need of applying the required criteria established in IALA recommendation V-103. The daily routine carried out by a VTS operator can lead him/her to acquire certain bad habits that may affect the service efficiency.

**Equipment or services involved:** Vessel Traffic Services, Radar/AIS observation and VHF Communication.

**Action taken:** By means of different designed exercises on the VTS simulator the future operators realize the need of preventing a number of bad habits that directly might influence on the service. All the exercises are based on real cases.

**Results:** Those future VTS operators who attend the course pay more attention to different aspects such as: VHF communication exchanges with vessels within the VTS area, proper use of message markers, early detection of troublesome situations and the role of VTS operator in collision avoidance.

Thanks to the proper training of the VTS operators in terms of their professional skills, the number of possible accidents and hence use of resources is likely to be reduced.

**Knowledge acquired:** the need of developing VTS operators' professional skills by means of simulation exercises and discussion of real cases.

### **Questions**

Bad habits can lead to grounding or collision. Experience of bad habits of VTS operators leads to near miss dangerous situations which can result in accidents. Is it possible for investigators to find the VTS operator guilty under Spanish legislation? The speaker affirmed saying that everything is recorded in the VTS Centre so tracking is possible. It would therefore not be difficult to investigate and individuals could be subject to legal sanction.

A question was then asked about pilots using PPU's. The speaker said that approaching speed is also very important. In the discussion it was acknowledged that PPU's are very valid and useful in close conditions. One of the unique features of the dynamic UKC management system is that it is also being monitored by the VTS centre providing the pilot with a backup. The chart overlays allow the pilot to see quickly where any errors are in his passage plan e.g. if he is falling behind or the tide is changing differently to the predicted state, the shore station can provide information to allow the pilot to update his passage plan. PPU's are not a replacement for core navigation by pilots.

A contribution from the floor agreeing with the presenter regarding bad habits of VTS operators suggested mariners are also guilty of this. Many mariners contribute to operator errors with statements such as "passing red to red" or "green to green" instead of "port to port".

## **20.6 AtoN remote monitoring and AtoN remote control with AIS messages with a dedicated low cost coastal Station**

### **Author and presenter**



Author: Pierre-Yves Martin, CEREMA, France.

Presenters: Mr Michel Cousquer, CEREMA & Mr Patrick Moelo, CEREMA, France.

**Experience objective:** Have a low cost device which performs the routing and the centralisation of AIS messages of a remote control and monitoring system.

**Problem to be solved:** Fill the radio coverage gaps of a AIS Base Station Network used to collect the messages transmitted by a remote and control monitoring system based on AIS.

**Equipment or services involved:** Aids to Navigation, AIS AtoN Station (transponders), and Supervisory Control and Data Acquisition (SCADA).

**Action taken:** The procedure employed the following steps:

- design and specify the device in compliance with recommendations of ITU, OMI, IALA, IEC;
- call for tender to prototype the device;
- trials for the validation of the concept and acceptance of the device.

**Results:** Improvement of the firmware of the AIS AtoN remote monitoring station to allow it to work as a Shore Station.

Reception of message 21 and message 6 dedicated for AtoN Monitoring (DAC=235, FI=10), and routing to the SCADA

Transmission of messages 6 dedicated for remote control of AtoN.

**Knowledge acquired:** AIS Standard communication.

### **Questions**

It was stated that the project is to replace a 20 year old system. The system specification requires access via web browser. Software is a Java application.

The AIS shore station is used as a device for receiving and sending remote monitoring messages. AIS shore station is a low cost device which can replace an AIS Base station.

## **20.7 Dynamic Chart Overlays to maximise the safety of navigation and assist in contingency planning.**

### **Author and presenter**



Author and presenter: Capt. Jonathon Pearce, OMC International, Australia.

**Objective:** To maximise the safety of navigation through a unique chart overlay system on the vessel during transit in real-time.

**Problem to be solved:** To deliver real-time information to the pilot on a vessel to ensure safety of navigation within a tidal channel and to improve contingency planning in the event of an unforeseen incident.

**Equipment or services involved:** OMC Dynamic Underkeel Clearance technology delivered to Navicom Dynamic PPU laptops via Qastor QPS Connect server.

**Action taken:** Creation of a real-time dynamic chart overlay showing the predicted under-keel clearances throughout the passage in a format that is easily understandable, and able to be adjusted, for the pilot.

The overlay to be updated at frequent intervals (1 minute) accounting for environmental changes. Had to allow for account channel changes (regular surveying). Can be used to assist in contingency planning to ensure multiple vessel/s safely transit. The system to allow for maximise water column efficiency through maximum drafts and longer tidal windows and also optimize sailing rotation to increase productivity.

Creation of a communications system to transit the overlays to the pilot through 3G networks, and for the PPU laptop to be able to display the overlays without excessive overheads or negative impact on the primary navigation software. Integrated and continuous mutual sharing/adaptation of transit plan between pilot and VTS/Port Control/HM.

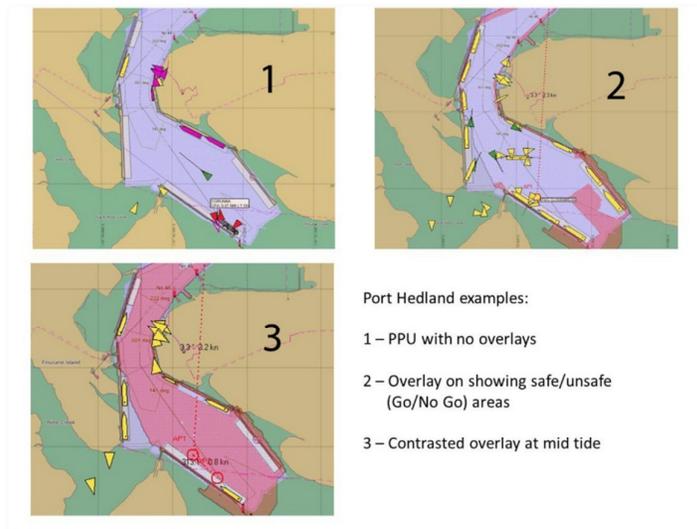
**Results:** System installed and operational at Port Hedland 2013.

Improved productivity/throughput of vessels/cargo through the optimization of vessels sailing on a tide.

VTS/Port Control/HM and Pilots able to see the predicted UKC for the whole transit (30 nautical miles) and plan/optimize the sailing plan.

Overlays made available to the pilot's PPU laptop, and updated continuously, and the transit can be altered if required by pilot or shore.

Enhanced contingency planning as the pilot can assess exactly how much time/ vessel speed profile is required before the conditions become critical and can effect contingency measures to avoid a vessel grounding.



There are significant savings in capital dredging costs through the optimisation of the existing tidal water column. Maintenance dredging optimised to ensure channel remains at sufficient depth to ensure maximum productivity.

**Knowledge acquired:** Dynamic Under-keel Clearance system updated to V5 with sophisticated environmental monitoring systems.

Qastor QPS Connect server systems and the transmission of mission critical chart overlays to remote PPU laptops.

Navicom Dynamic and the pilots' involvement of ensuring overlays were acceptable and did not impact on the navigation system and were easily adjusted when required. Improved understanding of the port channels, its limitations and control points.

### Questions

It was asked that, given technology for running this system is already available on-board in ECDIS, why are the overlays being run on a shore side server. The speaker was asked to elaborate on experience with shore side technology and advise what are the risks to running system on ECDIS.

Speaker responded that one needs to understand that dynamic vessel motion depends on dynamic data and to actually process data of the local conditions e.g. tidal data requires huge processing power. The Malacca Straits system is not dynamic. Further, the presenter said he understood that ECDIS is a very standalone system and doesn't communicate with other systems.

A chart overlay system does not require anything to be taken on board e.g. PPU but if ECDIS was capable of receiving this sort of data then on-board presentation would potentially be feasible.

## 20.8 Handling of echoes using VoIP technology in case of multiple shore reception of maritime communications

### **Author and presenter**

Author: Mr. Romain Gallen, CEREMA, France.

Co-authors: Mr. François Bajard-Jacobs; Mr. Patrick Doaré; Mr. Thierry Le Poder, CEREMA, France.

Presenter: Capt. Jean-Charles Cornillou, CEREMAR, France.

**Objective:** To connect all Very High Frequency (VHF) and Medium Frequency (MF) shore stations on a MPLS network and to use Voice on IP to transport maritime communications to the five MRCCs in France.

**Problem to be solved:** Reduce the echo perceived by operators in MRCCs when receiving a given maritime communication from multiple VHF or MF shore stations because the delay for voice transportation from these stations varies.

Suppress the voice feedback when a message is emitted from one shore station of the MRCC and is subsequently received by neighbouring shore stations.

**Equipment or services involved:** VHF and MF radio equipment, routers and VoIP gateways, central processing system.

CETMEF Technical services, in MRCCs, in the telecommunications services companies.

**Action taken:** The project employed the following steps:

- transfer all existing classical voice transportation links to MPLS network;
- elaborate the complete routing scheme of shore radio stations linked to a given MRCC;
- distribute IP addresses to all the elements interconnected in this network;
- use RTCP protocol in order to gather statistics for connections (transmitted octet and packet counts, lost packet counts, jitter and round-trip delay time);
- use this information to control and adjust quality of service (by limiting the flow or using a different codec);
- estimate in real time the latencies in the different parts of the network in order to align the voice communications on a same reference and limit troublesome echo effects.

**Results:** By connecting all routing and radio communication systems, the supervision of the working state of these elements and of the transportation links is greatly improved.

It is possible to gather all these information in a unique supervisor console for operators and technical services to be aware in real time of their capabilities to send or receive maritime radio communications.

By using the statistics extracted from RTCP frames used in VoIP technology, it is possible to nullify the echo generated when multiple radio shore stations receive a message.

It is also possible to suppress the echo generated when a message is emitted on simplex channels by a Maritime Rescue Co-ordination Centre (MRCC) using a given coastal radio station and that neighbouring stations receive this same message and carry it back to the MRCC.

Depending on the telecommunication operator, the renting of SDSL links with Quality of Service (QoS) for voice transportation can be very low as compared with old technologies such as RNIS, Transfix, LS.

In the best cases the renting of these links can be divided by three. Of course, in other cases an investment may be necessary to finance the initial cost for the telecommunication operator to link distant sites to its network.

**Knowledge acquired:** VoIP technologies and protocols.

In addition, it was learned that:

- that there are fine-tuning parameters that need to be requested from telecommunications services companies when ordering links dedicated to the transportation of maritime communications;
- how to extract and to use all statistics hidden in the different protocols of the world of VoIP and we adapted them to the specific issues linked to multiple receptions of a given message from different radio stations;
- how to discriminate failures from the voice transportation link from equipment failures and how to picture them to the operators;
- how the quality of voice transportation in degraded situations could be adapted.

## 20.9 The use of AIS in mixed areas (Coastal Waters, Ports and Inland Waters)

**Author and presenter**



Author & presenter: Mr Jeffrey van Gils, Ministry of Infrastructure and the Environment, The Netherlands.

**Objective:** Setting up an Automatic Identification System (AIS) environment within an area under responsibility of various competent authorities with diverging responsibilities.

**Problem to be solved:** The Netherlands is a small country with many waterway authorities and it is neighbouring with countries having their own interests, administrative systems of responsibilities and tasks.

The shipping density in these waters (coastal waters, harbour approaches, port areas and inland waterways) is very high and shows a combination of sea-going and inland vessels. The use of AIS therefore already at present is meeting a number of problems to be solved. One of these is the fact that the Netherlands has a rather flat surface, which has impact on the potential use of AIS due to propagation and interference reasons.

It is therefore of most importance that in order to ensure an optimal operation of AIS services by so many users, both ship-borne and ashore a coherent national policy framework will be developed and implemented on short term.

In the future the VHF Data Exchange System (VDES) may resolve some off the problems, enforced by the ITU decision (WRC 2012) to add extra frequency capacity to the VHF band. In order to secure the optimum benefits of this decision and to prevent that the primary functionalities of AIS will be jeopardised, the VHF Data Link (VDL) of AIS must be protected.

On an average day approximately 6000 AIS targets in the Netherlands are detected of which 1500 are sailing through or passing the Netherlands.

Every target is transmitting the standard AIS messages. An increasing number of AIS users, both ashore and ship borne, have identified - due to the capabilities of the AIS system – more potential applications in using AIS and even started to develop or use them already, mainly under the flag of *e-Navigation* or the European Inland Waters project *River Information Services (RIS)*.

As a result the transmission of a large variety of data using AIS is growing quite rapidly. In most cases this data is contained into so-called Application Specific Messages (ASM), although sometimes even safety messages are used for this purpose.

The further development of future applications, the implementation and operational use of AIS requires a coordinated central approach and a (legislative or policy) framework. Close collaboration with users, authorities (including those responsible for frequency management) is considered to be essential for the assignment of the provision of ASM and AIS-slots.

**Equipment or services involved:** Automatic Identification System (AIS) shore based infrastructure (networks) Vessel Traffic Services (VTS) systems and Search and Rescue (SAR) and on-board ship equipment.

**Action taken:** The following actions were taken:

- making national and international parties aware of the shared challenges and seek collaboration in order to come to common accepted solutions for the establishment of a transnational good operational AIS system;
- one has to start at the national level and extend the process at the proper moment with neighbouring countries;
- the process and all substantial results, such as agreements, assignments, criteria and conditions for operational use should be incorporated into a common accepted policy document.

**Results:** In recent years the knowledge of AIS and possible problems became clearer to waterway authorities and other users. This was emphasized by the publications of relevant IMO and IALA documents.

During the introduction of AIS for inland shipping (in short time an increase of approximately 12.000 mobile stations) and the realization of the shore based networks it was noticed that especially the shore based networks encountered problems such as 'jumping ships' (icon jumps) and a decrease of the coverage area.

In order to resolve these problems and to restore a further reliable coverage of the areas of responsibility and interest huge investments would be needed.

The Netherlands Ministry of Infrastructure and the Environment, responsible for the implementation and operation of the AIS, initiated the development of a policy on the use and operational exploitation of the networks, including the appointment of a central point of contact for advice and guidance. During this process all relevant stakeholders were involved.

IMO and ITU have developed a number of Application Specific Messages with the aim for global standardization, uniform in every country. This action resulted in the avoidance of creating new ASM (with almost the same information) and as such prevented an unnecessary overload of the VHF Datalink (VDL).

In parallel IALA has produced a Recommendation on the delivery of an Application Specific Message (ASM) and also realised a collection of globally used ASM, which is accessible via the worldwide web.

Waterway authorities and service providers, as well as any other party licenced by the appropriate administrative body (may differ from country to country) with the possibility to register their ASMs in this collection. This offers other countries the re-use of these ASMs.

An extra benefit of this approach is the minimization of investments in shore based and ship borne systems.

Optimal use of, scarce frequency spectrum, investments in infrastructure (shore) and equipment (ship), re-use of similar information without extra effort, standardization leading to reduction of development investment.

**Knowledge acquired:** Understanding AIS, expertise on radio propagation, management of frequency use and the development and use of ASM.

## 20.10 Rejuvenation of Navigation Aid Structures with Ultra-High Performance Fibre-Reinforced Concrete (UHPFRC)

### **Author and presenter**

Author: Mr. Nicholas Fady, CEREMA, France.

Co-author: Mr. Emanuel Denarié, Ecole Polytechnique Fédérale de Lausanne – ENAC/IIC/MCS, Switzerland.

Presenter: Mr Michel Cousquer, CEREMA, France.

**Objective:** Test implementation of cast-in place UHPFRC around an existing turret to stop concrete degradation and reinforce the structure.

**Problem to be solved:** Tailor the UHPFRC for cast-in place application on Navigation Aid turrets (minimization of autogenous shrinkage, self-compacting and strain hardening response under tension). Pour 4 m<sup>3</sup> UHPFRC by helicopter.

**Equipment or services involved:** Local Administration of Lighthouses Authorities, Lafarge R&D and MCS/EPFL.

**Action taken:** Preliminary tests on small-scale models to optimize the UHPFRC recipes. Manufacturing a formwork around the turret to cast a 60 mm thick UHPFRC shell. UHPFRC casting on the turret by helicopter.

**Results:** Validation of the 'cast in place' application of UHPFRC in maritime structures. Opening of the way to the 'cast in place' reinforcement of heritage lighthouses at sea.

Test the implementation of UHPFRC in vertical protective layers to stop the moisture and salts ingress into offshore structures.

**Knowledge acquired:** The implementation constraints of UHPFRC and the organization of a maritime work yard when involving the use of a helicopter.

### **Questions**

The speaker was asked if the reinforcing in the concrete is stainless steel? The Chair advised that a metallic fibre was used. The project was aimed at obtaining a waterproof sustainable repair of a masonry structure 70 years old using a UHP Fibre Reinforced Concrete layer application. The method has extremely low permeability (totally impervious to oil and gas) and has outstanding mechanical properties

## 21 Technical Session 5 – Heritage

Chair: Mr Bob McIntosh, Northern Lighthouse Board, UK.

Vice Chair: Ms Susana Roel, Port Authority of A Coruna, Spain.

### 21.1 Heritage Preservation, the Chilean Experience in its 175th Anniversary

#### *Author and presenter*



Cdr James Crawford, Directorate General of the Maritime Territory and Merchant Marine, Chile.

#### **Abstract**

The history of lighthouses in Chile has been linked with this nation from its beginnings. In fact, only 19 years after the establishment of Chile as a sovereign republic, the first lighthouse keepers appeared with the commissioning of the lighthouse Valparaiso, in the bay of the same name.

Considering that the spirit and direction of every organization are founded upon and reflected in its historic heritage, the Chilean Aids to Navigation Service carried out a number of activities for its 175th anniversary, celebrated two years ago, in order to preserve the history of Chilean lighthouse keepers for future generations.

#### ***The key points of the presentation were:***

1. In the context of the instant global communication and the displacements of people from one place to another, there is the risk of a standardized culture.
2. Each person needs to be witness to their daily lives, express their creativity and preserve the traces of its history, which can only be achieved through cultural heritage.
3. The preservation of history is important and it depends on each organization to develop initiatives or activities that tend to this end.
4. The history of lighthouses in Chile has been linked with this nation from its beginnings.
5. The Chilean Aids to Navigation Service has assigned a priority to this issue, generating a series of activities, which along with protect the historical heritage of lighthouse specialty, has favoured the diffusion towards social groups that have no connection to this activity.

## 21.2 Design and set up of a website about lighthouses of the Balearic Islands

### *Author and presenter*



Mr Jorge Martín Jiménez, Port Authority of Balearic Islands, Spain.

### **Abstract**

In 2011 the Port Authority of Balearic Islands opened a website on the lighthouses of the Balearic Islands, with the aim of publishing the current status of their lighthouses along the islands coasts, as well as showing to lighthouses lovers their relevance as part of the cultural heritage in the archipelago. In this website 360° photos can be found for every one of the 34 lighthouses currently operating, some video interviews on the life of the former lighthouses keepers (now retired) and their relatives, and fun teaching materials for scholars in relation with the world of lighthouses. In this website the opportunity is also offered to take a virtual tour through the Maritime Aids Museum located in Portopí lighthouse. Besides the technical data on all of these historical maritime signals, a large amount of information from the historic documentation generated by our lighthouses can be found.

Additionally, there are placed outside the restricted areas of lighthouses, information panels from which to access the web by QR codes using electronic devices.

### ***The key points of the presentation were:***

1. Exposure.
2. Museum.
3. Web page.
4. Social network.

## 21.3 “Lighthouse Integrated value” Indicator

### *Author and presenter*



Mr Juan Francisco Rebollo, Puertos del Estado, Spain.

**Abstract**

The aim of this project was to establish a model that would allow the assignment to each lighthouse of an indicator representing its INTEGRATED VALUE, taking into account four basic aspects or criteria: history, architecture, surroundings and nautical value.

Each one of these basic criteria has up to 22 sub-criteria, and each sub-criterion includes a series of up to 85 evaluation elements. Each element was assigned a score of between 1 and 10 and a weighting of between 1 and 5 was assigned to each criterion. These scores were obtained after conducting a Delphi process, which included people from different backgrounds.

**The key points of the presentation were:**

1. Tool to enable classification of lighthouses;
2. The indicator is not fully objective, but is the result of a working group with different sensibilities.
3. The roll of the leader of the Delphi consultation group is very important and can focus the results to some criteria.
4. This is a good tool for relative classification of lighthouses.
5. IALA could considerer this type of approach to lighthouse classification in the Heritage Group.

**21.4 The Use of Otter Shutters in the Northwest Coast of Spain and the National Plan and Study of the Characteristics and Inventory for Preservation of Historic Lighthouses**

**Author and presenter**



Ms Marisa Marco Brea, Vilagarcia Port Authority, Spain.

**Abstract**

Most actions in the preservation of historic lighthouses are aimed at the conservation of the buildings, towers, environment, civil works in general, while the optical rotation mechanisms and other technical elements of significant historical value, don't receive the same attention.

The Vilagarcia Port Authority commitment is to keep using all feasible optics and foundations, adapting to new sources of light and energy, so as to achieve the current service requirements, while retaining most of the existing historic equipment.

Three years ago, Puertos del Estado (State Ports) developed a project that has, as one of its main targets, checking the status of optical luminance of the lighthouses.

Another aspect of this project was the cataloguing of historical or unique equipment. As an example some uniqueness was found in several lighthouses in the North Coast of Spain. Within these equipment, the complexity and uniqueness of the lighthouses at Punta Insua, Corrubedo and Sálvora are remarkable.

***The key points of the presentation were:***

1. Heritage.
2. Preservation.
3. Otter Shutters.
4. Unique equipment;
5. Lighthouses in Galicia.

## **21.5 "Torre de Hercules" Management Plan**

***Author and presenter***



Mr Juan Mario Crecente Maseda, Crecente Asociados, Spain.

***Abstract***

The Management Plan of the Tower of Hercules and its environment has been promoted by the Council of A Coruña. The plan has been drawn up by a multidisciplinary team, including experts in the areas of: archaeology, architecture, history, engineering, tourism, lighthouses, etc. It takes into account the standards and regulations on the World Heritage Convention, with special attention to the five "C"s: Credibility, Conservation, Capacity, Communication, Community, and most recently with the addition of Creativity, and has been coordinated with state and regional policies. The plan presents the up-to-date situation, based on the best knowledge available and the latest research concerning the monument including; presenting important new aspects of it, such as its age, functioning as a lighthouse, uses as a fortification, and details of construction.

It is organized into three main areas:

1. Knowledge of the monument and the environment with the description of the methodology, analysis, and diagnosis.
2. Management of the Tower, in terms of Conservation, Intervention, Musealization, Distribution, Promotion, Management, and future aspirations.
3. Resources towards the phased plan, financial support to ensure the development and the implementation programme.

The plan also seeks to embrace the wider concept and vision of the impact of the lighthouses' territorial phenomenon that goes beyond the physical fact of the Tower and its platform, and that explains the Cultural Landscape Portum Artabrorum Magnus, this influence extends as far as the light reaches from the Tower.

***The key points of the presentation were:***

1. Lighthouse.
2. World Heritage Site.
3. Management.

4. Heritage.
5. Tourism.

## 21.6 Gap Identification to Implementation Methodology of Complementary Use in Lighthouses of the Ferrol Port Authority

*Author and presenter*



Mr Gervasio Dopico, Port Authority of Ferrol-San Cibrao.

### **Abstract**

Lighthouses are often found in environments of high natural and landscape value and are a strategic element that will enhance the image of the institutions responsible for their management, given their wide social acceptance.

A SWOT analysis is used to assess the initial situation, highlighting not only the strengths and weaknesses of all the AtoN, but also the threats and opportunities facing them. Subsequent analysis shows that whilst the service rate is high, conservation status is much lower and lighthouses incur heavy losses, since costs are much higher than the revenues they generate.

Establishing a plan that enables complementary uses, without neglecting their basic function, can alleviate the budget deficit, so it will be necessary to establish a catalogue of possible uses that will be individualised for each lighthouse, since it will not generate the same value for the managing authority as for society.

### ***The key points of the presentation were:***

1. Analysis (SWOT) Opportunities.
2. Plan for additional lighthouse uses and catalogue for possible alternative uses.
3. Value of use.
4. Assessment (criteria and rank).
5. Coherence and profile actions.

## 21.7 Lighthouses and their link to their Immediate Environment

### *Author and presenter*



Mr Eduardo Blanco Gallego, Port Authority of A Coruña, Spain.

### **Abstract**

Marine signals have fulfilled a key safety function in maritime navigation ever since the old days. The technology and the equipment installed in lighthouses has greatly improved during the last few years, becoming ever more efficient.

On the other hand, the buildings housing these signals have rarely changed since the day they were built. Consequently, such buildings have become real symbols for their neighbouring communities, which have incorporated them as a part of their culture, since they attract activities linked to the tourist and catering sectors, thus becoming a key element for the development of the area.

Among the marine signals managed by the Port Authority of A Coruña there are two premises that are perfect examples of this situation: the Vilan Lighthouse located in the Council of Camariñas and the Finisterre Lighthouse located in the Council area sharing its name with the lighthouse.

This presentation dealt with this particular feature of marine signals, which have become increasingly relevant in the course of their historical evolution, with a growing demand from their neighbouring communities to use these buildings for purposes other than aids to navigation.

### ***The key points of the presentation were:***

1. In some cases, lighthouses go beyond their proper role as marine signals.
2. Lighthouses have become distinctive symbols of their nearby community.
3. Lighthouses arise a sense of property in their neighbouring villages.
4. Lighthouses must adapt to new technologies and new demands for their use that arise from their surrounding environment.

## 21.8 Issues and Innovation in Remediation of Concrete AtoN structures - including Case Studies for Hydrographers Passage AtoN structures and historic Cape Don Lighthouse

### *Author and presenter*



Author: Mr Greg Hansen, Australian Maritime Safety Authority, Australia.

Presenter: Mr David Jeffkins, Australian Maritime Safety Authority, Australia.

### **Abstract**

AMSA utilises concrete structures in a variety of ways and locations within its aids to navigation (AtoN) network with some structures dating back to the late 19<sup>th</sup> century.

Examples include concrete lighthouses, beacons, platforms and supporting columns, foundations, helipads and blockhouses surmounted by lanterns.

The paper provided a detailed discussion of concrete issues within AMSA's AtoN network and innovation in repair methods. Aspects covered will include the evaluation of observed mechanisms of decay and the impact of patch repairs over time. There were two case studies on larger remediation projects: Hydrographers Passage AtoN structures and historic Cape Don Lighthouse. Both projects were significant in terms of size, innovation achieved, complexity and cost. The paper discussed the failure mechanism and testing process, repairs undertaken and outcome achieved. Numerous images were included to clearly demonstrate the issues and solutions achieved.

### ***The key points of the presentation were:***

1. Concrete is widely used in the Australian AtoN network.
2. The concrete deterioration is now becoming apparent as the infrastructure is ageing.
3. Maintenance considerations and remoteness of sites has an effect on the suitable repair solutions.
4. Concrete remediation options are becoming more advanced with new technologies being utilized.
5. Expectations are now that concrete structures with serious defects can be successfully repaired to prolong the life of the asset. 'Mapping our Maritime heritage' - A method for the Documentation and Presentation of Maritime Heritage, reaching it's audience through Phones, Pads and PC/Mac's.

## 21.9 Mapping our maritime heritage - A method for the documentation and presentation of maritime heritage, reaching it's audience through phones, pads and PC/Mac's

### *Author and presenter*



Author: Mr Jo van der Eynden, Lindesnes lighthouse museum, Norway.

Presenter: Mrs Kirsti Slotsvik, Norwegian Coastal Administration, Norway.

### **Abstract**

The project 'Coastlight.net' has been developed for the documentation and presentation of maritime heritage in general, and the maritime cultural landscape and lighthouse history in particular. By using a digital map, information in the form of text, photo and film is "tagged" to specific geographical positions, thereby making it possible for tourists, students and the general audience to take part in the history and the many stories embedded in the landscape.

The pilot-project is focusing on the nearby landscape around Lindesnes lighthouse, but the project is now being developed within a national perspective, through the cooperation between the coastal administration and several maritime museums around the coast. Through the IALA-network, we have now also started to expand the project internationally, starting with two lighthouses in France. But we hope for a much wider engagement, so that 'Coastlight.net' can become a worldwide service, showing the global network of lighthouses, and presenting the lighthouse heritage as a common world heritage for the benefit of the general public.

### ***The key points of the presentation were:***

1. Documentation and presentation of maritime heritage / historic lighthouses.
2. Geo-tagging information on digital maps.
3. Presentation of the maritime cultural landscape (seascape).
4. Global access to information on lighthouse heritage.
5. An invitation to international cooperation, and cooperation between coastal administrations and museums.

## 21.10 Analysis on Protection of Historical Lighthouses in China

### *Author and presenter*



Author; Mr Shan-lei Xu, Shanghai Maritime Safety Administration, China.

Co-author: Mr Ming Xu, Donghai Navigation Safety Administration, China.

Co-author: Mr Fangshun Zhang, Donghai Navigation Safety Administration, China.

Presenter: Mr Yongqiang Lu, Donghai Navigation Safety Administration, China.

### **Abstract**

Some protective measures on historical lighthouses were summarized by the description on the evolution and value of China's historical lighthouses. Some suggestions on a number of practical problems and how to improve the protective regulation were proposed.

### ***The key points of the presentation were:***

1. The Overview of China's historic lighthouse.
2. The value of the historic lighthouses.
3. Experience on China's historic lighthouse.
4. Encountered problem on China's historic lighthouse preservation.
5. Recommendations on the historic lighthouse preservation.

## 21.11 Discussion

A general question was asked about the subject of real and physical visit – how access to the technical rooms is managed.

The access to working lighthouses is very difficult problem due to the hazards associated with general public access. It was noted that IALA has provided guidance in the past to assist with improving public access. In some cases access may not be possible due to space and safety aspects. Some suggestions included the use of web cams in areas where the public cannot access.

In Australia a number of lighthouses are open to the public for tour access. Tours are arranged with local authorities who run the tours and generally only allow 10 people in the lighthouse at a time with a guide. Only allow certain access in the lantern rooms is allowed with no access to the upper catwalks. Visitors generally can get on the balcony.

Relating to the tour of the Torre de Hercules, some people look for a lift, but there is no place to install a lift. The need is to preserve first with limited number of people gaining access at any time. Other options include a camera for those who cannot climb while another part of the master plan is to have the 'tower' in all parts of the city through old equipment, images, part of the original stone aspects and maps in the library.

There was an announcement of the IALA WWA. They will develop a draft model course on the preservation of historic lighthouses, which will be presented to ENG 1. Anyone who would like to provide input was requested to do so through Stephen Bennett, IALA WWA.

The personal contribution of the Session Chair, Mr Bob McIntosh, in the preservation of lighthouses was noted.

It was noted that there are many parts of the world with museums and open lighthouses while there are other parts of the world that do not. There is a world maritime day, a seafarer day, is there a national lighthouse day? The proposal was appreciated; some attendees will know that for the last number of years an international day for aids to navigation, not only lighthouses, was promoted. It has been said in the IALA Council time and time again. Following this people should work towards this international day for aids to navigation / lighthouses. Lighthouses are part of society and should be honoured at least once a year in the newspapers and on television.

Balearic Island is the third oldest lighthouse in the world and a limited number of people visit on Thursdays. It is good have one emblematic lighthouse. Similarly there are many events related to the Torre de Hercules.

There was a proposal that the next 27<sup>th</sup> June will celebrate the Torre of Hercules as a world heritage site. It was suggested that the 27<sup>th</sup> June could be the day for world lighthouse day.

The Chair said that, as far as he is aware, there is a world lighthouse day. He was sure the he had seen some indications of lighthouse day from various organisations around the world. He suggested that attendees could come together and as a forum try to encourage members to identify and celebrate a lighthouse day.

In a further comment it was suggested that in Malaysia a week could be used and there could be co-operation with the radio amateurs every third week of August.

India stated that there is a lighthouse day in India, the day the lighthouse act was passed 21<sup>st</sup> September. There are two lighthouse museums in India with more than 4,000 visitors each day. But they would like to have a central lighthouse museum in India.

## ANNEX C Industrial Members' Exhibition

### 23 Industrial Members

The Industrial Members' Exhibition was opened at 1630 on Monday 26<sup>th</sup> May by Mr Koji Sekimizu, Secretary General of IMO and Mr Jose Llorca, President of Puertos del Estado. Fifty (50) Industrial Members exhibited their products and services.



Names of the exhibitors and their products are given below:

Booth Number	Name of exhibitor	Products
52/53	Almarin	Specialist in the design, supply and installation of AtoNs.
28/29	Australian Maritime Systems Ltd	Management and integration of maritime projects including VTS and the supply, installation and commissioning of aids to navigation.
18	Beijing Catonglobal Technology Co Ltd	Provider of AtoN solutions and services, preventative maintenance on VTS systems
80	Chaohu Yinhan Navigation Aids Ltd	Manufacturer of grade 1 to 3 marine accessories, anchor chain, buoy chain, marine outfitting products, beacons, mooring floating, LED beacon light production.
25	Denbridge Marine Ltd	Provider of innovative maritime surveillance and port management solutions
73	Elman	AIS for monitoring and identifying maritime traffic. Products include GMDSS, VHF and UHF radio; GPS receivers and NAVTEX.
36	exactEarth Ltd	A subsidiary of COM DEV of Canada. Deals with capture of large amounts of AIS data of value to coastal surveillance and SAR authorities.
5	Floatex	Buoys for dredging, for surface and deep-water applications. Pioneers of the application of plastic rotomoulding technology for aids to navigation manufacture.

<b>Booth Number</b>	<b>Name of exhibitor</b>	<b>Products</b>
21	GateHouse	Provider of products and solutions for maritime surveillance and monitoring systems.
67/68	GISMAN	Design and manufacture of aids to navigation equipment; racons, mooring systems, project management, maintenance and training.
40	Grupo Mecanica Del Vuelo Sistemas Sau	Provider of solutions in aeronautics, banking and finance, space, defence, health, security, transportation, telecommunications and information technology.
37	iDeal Teknoloji Bilisim Cozumleri A.S.	Providers of technological solutions in the sectors of electronics, information technologies, telecommunications, energy and control automation
19	Indra	Provider of solutions for the implementation of Vessel Traffic Services for maritime
10/11	Japan Radio Co Ltd	Radar manufacturer and supplier of Vessel Traffic Systems
81	JFC Manufacturing Co Ltd	Designer and manufacturer of products in the rotational moulding industry.
2	Jotron AS	Manufacturer of critical civil and military communication equipment for air traffic control and maritime applications.
66	Kelvin Hughes Ltd	Marine navigation and surveillance systems including radar sensors; VDRs; ENC's and integrated bridge systems.
6/7	Kongsberg Norcontrol IT AS	Developer, designer, and installer of maritime domain awareness solutions.
27/34	La Maquinista Valenciana SA	Supplier of AtoN and equipment.
43/44/5 6/57	Mediterraneo Senales Maritimas SLL	Provides a complete service for design, installation and commissioning of marine aids to navigation. Undertakes R & D and use of renewable energy.
1	Meritaito Ltd	
4748/49	Mobilis SA	Mooring devices and buoys; dredging pipe floats; design of lights and electronic equipment.
20	Navielektro	Developer and maintainer of situational awareness, surveillance and communication systems for civilian and military purposes.
9	OMC International	Specialist in ship motion analysis, Under Keel Clearance systems and channel design.
38	Orolia SAS	
12/13	Pharos Marine Automatic Power	Provider of AtoN solutions, AtoN monitoring software.

<b>Booth Number</b>	<b>Name of exhibitor</b>	<b>Products</b>
14	Pintsch Aben BV	Developer of traffic engineering products, AtoN equipment, safety equipment for air traffic, including buoys, LED lanterns, rotating beacons
82/83	Saab TransponderTech AB	Product portfolio includes AIS, VTS, VTMS and coastal surveillance systems. Display includes the Trimble marine DGPS.
45/46/54/55	Sabik Oy	Solar and LED technology; advanced optics; low maintenance marine lanterns.
62/63/64/65	Schnoor Industrieelektronik GmbH & Co KG	Developer of tailored communication system solutions with a focus on maritime, transport, public safety and industrial applications.
60/61/69/70	Sealite Pty Ltd	Latest advances in LED technology; a new 10nm LED lantern; a 2.2m buoy commissioned in 2009.
17	Selex ES	Integrated Vessel Traffic Services
26	Shandong Buoy & Pipe Industry Co Ltd	Manufacturer of ultra high molecular weight polyethylene navigational aids.
3/4	Shanghai Rokem Industrial Co Ltd	Supplier of AtoN products including: buoys, lanterns, light towers, solar panels, racon and remote monitoring systems. Producer of rotationally-moulded PE buoys.
22/23/24	Signalis	Specialist in marine traffic control and coordination, harbour security, port management, maritime and land border surveillance system.
8	SRT System Solutions	Development of advanced technologies, products and systems in the maritime domain awareness arena.
31	Terma AS	Sea surveillance radar systems; radar for VTS Sensor technology for VTS and coastal surveillance radars.
58/59/71/72	Tideland Signal	Full range of marine aids to navigation; racons; LEDs; remote monitoring systems.
39	Tokyo Keiki Inc	Providers of systems for advanced avionics, navigational equipment, maritime traffic systems, offshore transportation management.
15/16	Transas Marine International	Developer and supplier of high technology solutions for transport, oil and gas industry, security, and defence industry.
41	Trimble	Providers of design, installation, and maintenance of large geodetic networks.
32/33	Vega Industries Ltd	Lighted aids to navigation; optical, electronic and electro-mechanical instruments; photometric testing.
30	Wealth Marine Pte Ltd	Marine aids to navigation products; barriers. Also operates a testing and research centre. Radar

<b>Booth Number</b>	<b>Name of exhibitor</b>	<b>Products</b>
		beacons.
50/51	Woori Marine Co Ltd	Manufacturer and supplier of marine AtoN equipment and products.
35/42	Zenilite Buoy Co Ltd	A wide range of fixed and floating aids; AIS products for providing navigation, meteorological and hydrological data; LED technology.

## **ANNEX D Other meetings**

### **24 General Assembly Session**

#### **24.1 IALA General Assembly**

During the Conference, IALA held a General Assembly over two sessions. The first General Assembly was to provide an update on the work of the IALA Council, including a Financial Report, a report from the IALA Strategy Group and a report from the LAP re the change of status of IALA.

The goal of the second part of the General Assembly was the election of 21 members of the new IALA Council for the period 2014 - 2018. The remaining three members of the Council are automatically elected. A copy of the report from the General Assembly is available on the IALA web site.

#### **24.2 Invitation to the 19<sup>th</sup> IALA Conference, 2018**

Dr. Hyundong Kong, Director, Ministry of Oceans and Fisheries, Republic of Korea invited delegates to the 19<sup>th</sup> IALA Conference, to be held in the Republic of Korea. All IALA members were invited to participate in the Conference, the IALA General Assembly and the Industrial Members' Exhibition in 2018.

The text of Dr Kong's address is at ANNEX M.

#### **24.3 Invitation to VTS2016**

Captain Ahmad Bin Othman, Light Dues Board Peninsular Malaysia, introduced Kuala Lumpur as the venue for the 13<sup>th</sup> international VTS Symposium - VTS2016, between 8 – 12 August 2016. The theme will be "Sustainable Safe Navigation". Noting that Malaysia has been a member of IALA since 1962 and has been involved with and hosted many IALA events, he provided a description of maritime activities in Malaysia using videos and the facilities available to support the Symposium.

On behalf of the organising committee, he cordially invited all IALA Members to the 2016 VTS Symposium which will be held from 8 to 12 August 2016 at the Kuala Lumpur International Convention Centre (KLCC), Kuala Lumpur, Malaysia. He looked forward to welcoming everyone to Malaysia in 2016.

### **25 Ancillary meetings**

A number of additional meetings were held during the Conference including the IALA Council, the Iberio group of Spanish speaking countries, , the group of French speaking countries, VTS2016 Steering Committee and the IALA Industrial Members Committee (IMC).

### **26 Pre-Conference Seminar**

A one day pre-Conference seminar on the Training and Certification of Aids to Navigation (AtoN) and Vessel Traffic Services (VTS) Personnel was held in the Arao Auditorium of the PALEXO Conference Centre A Coruña on Saturday 24 May 2014.



The superb organization provided by Puertos del Estado ensured that this seminar was conducted faultlessly. It was delivered by the IALA World-Wide Academy and hosted by Puertos del Estado and was attended by 61 participants from 26 countries. The objective of the seminar was to provide participants with an overview and update on the latest developments relating to training and certification of AtoN and VTS personnel. Academy staff and IALA-endorsed experts delivered presentations during the first five Sessions. Practical examples of both Aids to Navigation (AtoN) and Vessel Traffic Service (VTS) training and accreditation processes were presented by seven of these countries during Session 6. The seminar was considered to have met its objectives in full. Two recommendations were adopted by participants. These were:

- The establishment of accredited national and regional training organizations should be considered and Competent Authorities are encouraged to implement training consistent with IALA Recommendations E-141; V-103 and associated Model Courses;
- A framework for the mandatory training of VTS personnel in a manner similar to the provisions for navigating officers provided in STCW Convention should be considered.

## **27 Social Events**

### **27.1 Welcome Reception**

On May 25<sup>th</sup> delegates were welcomed with a reception in the PALEXCO.

### **27.2 Official Conference Dinner**

On May 26<sup>th</sup> an official Conference dinner was held in the Pazo de Santa Cruz de Mondoï, a typical Galician palace from the 16<sup>th</sup> century which was originally a home of the rural aristocracy. Following the dinner delegates were entertained by two Galician witches concocting a flaming brew.

### **27.3 Industrial Members' Evening**

The Industrial Members hosted a regional cultural diversity dinner on 28<sup>th</sup> May in the Marina Coruna. Typical Spanish fiesta with cuisine from the four regions of Spain, Galicia, Castille, Mediterranean and Andalusia was presented in a bright and relaxed environment. Attendees were entertained by music from each region – Celtic bagpipes from Galicia, Gregorian chant from Castille, mixed themes from Mediterranean and pasodoble from Andalusia. The evening concluded with a spectacular fireworks display. The event was a huge success.

### **27.4 Formal Closing Dinner**

The Farewell Dinner was held in the Hesperia Finisterre Hotel in A Coruña on the night of 31<sup>st</sup> May. The Gala Dinner commemorated the 500<sup>th</sup> anniversary of the foundation of the charter of the Corporation of Trinity House.

Delegates and accompanying persons, staff of Puertos del Estado, the IALA Secretariat and guests were treated to an excellent dinner representing the best of Spanish cuisine.

The Secretary General of IALA, Mr Gary Prosser, announced the newly-elected IALA President, Mr Juan-Francisco Rebollo (Spain), and Vice-President, Dr Hyundong Kong (Korea). He thanked all Spanish authorities for a fantastic week. He thanked the outgoing President and Council for a four year period of big achievements and welcomed the new Council, he invited all to set sail for Korea in 2018.

Thanking him for his leadership over the past four years, Councillors from Finland and Norway made a presentation to Mr David Gordon, outgoing President of IALA.

The incoming IALA President, Mr Juan-Francisco Rebollo, thanked all involved for their support and cooperation before and during the Conference and expressed a wish that attendees should return again to A Coruna in the future.

The President of the Port Authority of A Coruna, Mr Enrique Losada Rodríguez was pleased to host the IALA 18<sup>th</sup> Conference at A Coruna, saying that the event was a most important milestone in the history of the town. He thanked the members of the Port Authority of A Coruna and Juan-Francisco Rebollo for a job well done. He concluded wishing that the light of IALA will continue to shine for many years for the safety of all.

The Deputy Mayor of A Coruna, Mr Martín Fernández Prado, expressed that wish that all attendees had felt as though they were with friends in A Coruna, as no one is a stranger in the region. Noting the great week with a perfect Conference and the football team of A Coruna moving into first division, he invited attendees to come again to A Coruna.

The floating trophy was handed by the President of Puertos del Estado Mr José Llorca to Mr Hyundong Kong from the Republic of Korea, whose authority, the Ministry of Oceans and Fisheries, will host the 19<sup>th</sup> IALA Conference. Mr Kong responding hoping that he would see all attendees in Seoul in 2018.



Noting that the 18<sup>th</sup> IALA Conference was an unqualified success, the President of Puertos del Estado, Mr José Llorca, recalled the attendance statistics for the 18<sup>th</sup> Conference with the expectation that the 19<sup>th</sup> Conference will be even better. He thanked IALA for holding the 18<sup>th</sup> Conference in Spain and Trinity House for sharing its celebration of its 500<sup>th</sup> anniversary. He thanked the IMC, the Sponsors, the Organising Team, Mr Juan-Francisco Rebollo and all the staff of Puertos del Estado for an excellent Conference. He concluded wishing that IALA continue to lead in safe navigation.

## **ANNEX E      Acknowledgments**

The Conference expressed its appreciation to Puertos del Estado and their sponsors for their invaluable support for the 18<sup>th</sup> IALA Conference. It wished particularly to acknowledge:

Puertos del Estado, Spain;  
Xunta de Galicia;  
Ayuntamiento de A Coruna;  
Autoridad Portuaria A Coruna;  
Salvamento Maritimo;  
Instituto Hidrografico de la Marina;  
Zeni Lite Buoy Company (Gold Sponsor);  
Indra (Silver Sponsor);  
Cabreiroa (Bronze Sponsor);

The Industrial Members Committee donated to provision of electronic tablets for all Conference delegates to enable the Conference to be run as a paperless meeting instead of using paper documents.

Appreciation was also expressed to the Industrial Members Committee who generously sponsored the full cost of participation at the 18th IALA Conference by delegates from Angola, The Republic of Cuba, Gabon, Sri Lanka and Trinidad and Tobago.

IALA acknowledges the following organisations without which the Conference would not have been possible:

Orzan Congres, S.L., Serglo, Chelo Belmonte, Viajes Orzan, Palexco, Josmaga, Tesec, Azaga, Carpas CK, Verdemar, Grupo 76.

The reporting of the technical sessions and the compilation of the report was undertaken by:

Seamus Doyle  
Dr Mike Hadley  
Wim van der Heijden  
Jillian Carson-Jackson  
Mahesh Alimchandani  
Gerry Brine  
David Jeffkins

Thanks are also extended to those who contributed to the drafting of the Conclusions.

Photographs of the Conference were taken by Interbanco Fotografico

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## **ANNEX G      Key Note Address by Mr. Koji Sekimizu, IMO Secretary General**

IALA is a non-profit international technical association among marine aids to navigation authorities, manufacturers, consultants and scientific and training institutions to make exchange of experience and achievements to harmonize Aids to Navigation (AtoN) Services worldwide. Their activities and contributions to the work of IMO has always been appreciated and IMO has been enjoying an excellent record of cooperation with IALA in the field of Aids to Navigation.

This week, I attended the opening session of the 18th IALA Conference held in A Coruña, Spain, with Minister of Public Works of Spain, Ana Pastor, and President of Puertos del Estado, José Llorca, the host of this Conference.

At the opening Keynote speech, I spoke about my initiative for the Review and Reform process which produced the Study Report on long-term financial sustainability of IMO, a transparent budget formation process, revised structure of sub-committees, new human resources management policies, new technical cooperation based on the country profiles and national maritime policy formation and strengthened outreach activities through social media. Review and Reform is my main avenue of management aiming at an efficient, creative, forward-looking UN Agency in the 21<sup>st</sup> century.

I also stated that I am speaking about the objectives of activities of IMO at various public speaking opportunities and conferences. I touched upon my vision for the Accident Zero Campaign, reduction of maritime casualties by half, eradication of marine piracy, implementation of the Ballast Water Management Convention, the concept of the Sustainable Maritime Transportation System, IMO as the global organization for policy coordination among various sectors acting as the Institutional Framework for the Sustainable Maritime Transportation System.

I also touched upon the worrying state of safety of domestic passenger ships which counted 2,932 casualties over just two and a half years and repeated my statement at MSC 93 that the time has come to make a further step forward to improve safety of passenger ships regardless of the nature of navigation, either international or domestic. The general public should enjoy the same level of minimum safety standards of passenger ships.

Then I remarked on the status of development on e-Navigation at IMO.

I stated that, after eight years of serious discussion at the NAV and COMSAR Sub-Committees, I could not see a clear output coming from the long debate at IMO at the practical level.

IMO is a technical body and we need outputs in the format of technical guidelines, standards, recommendations for the industry and manufactures. For example, the decade of discussion produced the Goal Based Standard for new ship construction; MARPOL's new Annex on air pollution prevention, GMDSS, passenger ship revised safety standards and so on.

On e-Navigation, yes, the strategy towards e-Navigation was established and the draft Strategy Implementation Plan is under development but we have not yet produced tangible technical guidelines, standards or recommendations for the industry and manufacturers. I raised a question to the audience of the IALA Conference as to whether IMO has provided a beacon for the AtoN community and manufacturers and whether they are satisfied with the output from eight years of discussions over e-Navigation at IMO.

As my concluding remarks, I stated that the discussion on e-Navigation should not become a continuous task at IMO without producing technical outputs and I encouraged IALA and their associated members to take a leadership role in the discussion at the newly formed Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) towards producing tangible practical and technical outputs.

This mission to the IALA Conference was a useful opportunity for me to meet members of IALA and discuss contemporary issues surrounding AtoN worldwide and I appreciate the invitation from President, José Llorca, and the Secretary General of IALA, Gary Prosser.

It was a good opportunity for the three Heads of Organizations, IMO, IHO and IALA, to reconfirm our strong cooperation in the fields of Aids to Navigation. I am pleased with the support voiced by members of the IALA Council to the Accident Zero Campaign in the field of VTS and enthusiastic comments on the future of our cooperation.

This conference was held in A Coruña where the Tower of Hercules Lighthouse, World Heritage Site of UNESCO, has been sending beacons for seafarers for nearly 2,000 years from the Roman ages. I was introduced to the Tower by the Deputy Mayor, Dna. Maria Luisa, after the meeting with the City Mayor, Snr. D. Carlos Negreira Souto, at the most beautiful City Hall. It is difficult to imagine a more appropriate setting for the IALA Conference and I expressed my heartfelt gratitude to the City Mayor for the support of the City inviting the IALA Conference this year.

## **ANNEX H Address by Mr Carlos Negreira Souto, Mayor of A Coruna**

Ladies and gentlemen .

From the first century of our era to today, the port of A Coruña has called millions of seafarers to its docks. All have been helped in their journey by the world's oldest operating lighthouse, the Torre de Hercules. So I cannot think of a better place than this city to host a major conference of IALA .

I welcome you to a city that was born, raised and always developed its sheltered harbour and lighthouse. From today until next Saturday, the harbour and the lighthouse convenes 450 participants from 54 countries. Our city, open to the world and cultivated since the first century, is once more apparent.

I thank IALA for choosing to host this plenary conference at A Coruña, the first European city to host it since 1998. I have no doubt that this general conference will serve to project the image of A Coruña internationally, and its association with a monument of our city that symbolizes values such as respect for our history, passion for sailing and maritime safety .

2014 is also a very special year for the whole city because very soon, on June 27<sup>th</sup>, will be the fifth anniversary of the declaration of the Torre de Hercules as a World Heritage Site. Civil society was the main driver of this distinction, but the support of international institutions such as IALA was decisive for our bid to come to fruition and the Torre de Hercules became the first lighthouse in the world declared as World Heritage Site by UNESCO.

According to recent research, our lighthouse was built in the first century, probably during the reign of the Roman Emperor Claudius, at a time when Rome was just embarking on the conquest of Britannia and creating a maritime route linking Sevilla ( Hispalis then) with what is now Britain. In this route, established primarily for the transportation of oil, A Coruña was the port of support before making the leap to the islands.

The conquest of Britannia is contained in the real origin of the lighthouse. And interestingly, another conquest, Ireland, is the basis of one of the most popular legends associated with the Torre, one that says that Ith, son of Breogán'son, saw Ireland from the top of our beacon and set out to conquer it.

The lighthouse brought wealth and growth, paved the way for thousands of sailors who brought prosperity, but also brought hostile visitors. In the V century the Normans invaded us and managed to leave the city empty, then called Brigantia, leaving only one inhabitant, the Torre de Hercules. So in later chronicles, Brigantia happens to be named as "The City of Faro".

After that forced migration, the whole city would return to the side of the tower, which over time was deteriorating. So in the seventeenth century, King Carlos III ordered its restoration. I encourage you to visit the lighthouse and climb the 234 steps to enjoy a magnificent restoration that was praised by UNESCO.

It was during this restoration the tower was coated externally with granite , as we know it today. This was also known by the great Picasso, who spent five years living in A Coruña and renamed it the 'Tower of Candy', because of the colour of granite. Of course, Picasso painted and drew the Tower. He is one of the hundreds of people from the world of culture that were inspired by the lighthouse, which also included the Nobel laureate, Camilo José Cela .

Our lighthouse symbolises our past and our future. Transportation experts argue that the XXI century will be an era of shipping. In fact, this is happening. Shipping is the backbone of international trade and the global economy: about 80 % of world trade by volume and 70% by value is transported by sea and passes through ports around the world, according the latest report from the United Nations Conference on Trade and Development. In this report, it is highlighted that international seaborne trade recorded an increase of 4.3% in volume in 2012, the last audited year.

A Coruña does not want to miss out on that transatlantic progress. Therefore, it has been added to the economic and commercial trend with a gorgeous outer harbour, and will be one of the main areas of future growth.

But we are well aware that the progress of navigation must be matched by growth in maritime safety. This much we know because we have suffered oil slicks even at the foot of the lighthouse. Hence it is important for us to host the general conference of IALA, which has been working since 1957 to coordinate shipping and maritime safety.

Today, two thousand years after the wood fire was lit up for the first time at the top of the Torre de Hercules, our beacon receives you with its electric eye winking from 59 metres high every 20 seconds, launching four flashes which are visible at 24 miles. It is our friendly business card to the world, because the sea has shaped the character of this city, and made it open and tolerant.

I hope you enjoy your stay and that this meeting is very helpful and show us all future horizons.

Welcome to the City of Faro.

Thank you very much.

[English translation]

**ANNEX I      Address by Mr Jose Llorca, President of Puertos del Estado (Opening Session)**

Distinguished Minister of Public Work and Transport, distinguished Mayor of the city of Coruña, distinguished delegate of the Spanish government in Galicia, distinguished Regional Minister for Agriculture, Rural Development and Maritime Affairs, distinguished General Secretary of the International Maritime Organization, Mr. President of the International Association of Lighthouse Authorities, Mr. President of the Port Authority of Coruña, Mr. General Secretary of IALA, distinguished authorities, ladies and gentlemen, madame et monsieurs, señoras y señores.

Dear colleagues, queridos amigos

It's a privilege and a great honour to participate in this opening ceremony of the 18<sup>th</sup> conference of the International Association of Lighthouse Authorities as President of Ports Of Spain, a public body depending on the Ministry of Public Works and Transport, responsible for the regulation and control of the aids to navigation service in Spain.

And I do it as president of the organizing committee of this conference as well.

First of all, let me thank you for the confidence of your association in Spain, and particularly in the body ports of Spain, for the organization of this conference, whose application was submitted in the distant 2003 to the former Secretary General of IALA, Mr Torsten Kruise, during the opening ceremony of the important exhibition on lighthouses and other aids to navigation which took place at the maritime museum of the city of Barcelona. This exhibition, for the first time in Spain, allowed the collection and cataloguing of an important part of our historical and technological heritage in the field of aids to navigation and made it known to society. A society that considers aids to navigation and particularly lighthouses, part of their environment and their emotional landscape.

I also want to acknowledge the presence of the distinguished authorities who have joined us for their support to the holding of this conference, which demonstrates its commitment as critical to the safety of sea transport element as are the navigation aids.

And of course I thank all of you, the participants in the conference, delegates and accompanying persons, their presence here in Spain and in the city of A Coruña has made its lighthouse, Torre de Hercules, the symbol of the city as part of his coat of arms. We could not have found a better venue in Spain to celebrate this 18<sup>th</sup> conference for his close relationship with the sea and lighthouses.

And I can not finish without congratulating and thanking the team over these last two years that has worked hard to make all this ready for the reunion of what you call IALA family. And I especially want to thank the great collaboration within the organizing committee of the representatives of the Port Authority and the municipality of La Coruña, with the Mayor in front, without whose enthusiasm and collaboration would have been very difficult to organize this conference. Thank you very much to all.

As you all know, this picture of the conference is an interpretation of the Torre de Hercules, Roman lighthouse base, unique in the world heritage site declared by UNESCO. And this gives us insight into the theme of the conference linking the past with the future of aid navigation in continuous technological evolution, without breaking with elements that continue in service and remain essential for marine navigation as headlights. The slogan adopted: from the Torre de Hercules to the Electronic Navigation and Beyond perfectly reflects the spirit and content of the conference in which the exchange of innovative experiences is its essential part .

I'm sure the 90 papers submitted by 152 authors, which will be presented by representatives from 24 countries, will respond to this innovative vision of navigation aids, and will represent new technological developments in this field which have been industrially developed and placed on the market and presented in the industrial exhibition which takes place in the framework of the conference. I am convinced that the presence of 46 companies around the world presenting their technological advances will be an item of great interest to you all.

I thank them all. Despite the difficult international economic situation, we can congratulate ourselves at this conference having reached record numbers of delegates, exhibitors, companies and stands. Undoubtedly, A Coruña this week will be the centre of the world in this field.

I am convinced that the exchanged experiences, new industrial developments presented and the conclusions of the conference which we will see next Saturday, are going to mark the lines of work for the future of the authorities responsible for the administration of the navigation aids at all the world, like the one I have the honour to preside over, helping us to become centres of excellence in this area, based on a solid technical authority and a strong innovative capacity to meet the challenges and developments in international maritime transport.

To be a centre of excellence we can not forget the formative aspects of latest equipment. In Spain we are making progress in developing a model consistent with the educational structure of the global academy IALA and model courses, hoping to become one of the most active collaborative partners with IALA in this general area and especially for the promoting the use of the Spanish language within the association.

In this regard, we inform you that, thanks to the presence of delegations from countries of the Spanish language, we intend to formalize the constitution of the Ibero-American forum on Aids to Marine Navigation, one of whose objectives is the exchange of experiences and the promotion of the use Spanish in IALA, with concrete actions such as Spanish translations of the most relevant technical recommendations and making available of these through the website of IALA and port status.

For our part, from the organizing committee of the conference, we wanted to contribute to this innovative spirit with two performances.

On the one hand to organize a paperless conference for the first time, which combines the application of new technologies with a drive towards sustainability and environmental conservation. I hope the outcome is positive and can perfectly follow the development of the Conference and especially the technical sessions with the mobile tablet device, which is included in "the delegate bag."

Furthermore we have devoted a technical session to the concept of 'best practices' to integrate into the conference the more practical aspects, often developed in the technical field, which usually do not have much space to present their experiences in a conference and certainly are contributing significantly to the improvement of marine marking services.

I do not want to end my speech without inviting you to visit the exhibition this afternoon which will be inaugurated in the exhibition hall of the Caixa Galicia Foundation under the theme 'headlights - the light should never be turned off'. I'm sure it will be of interest. We wanted to engage all Coruñesa society in our conference and we felt that nothing better than open to society the knowledge of what aids to navigation represents from the past into the future and meet some of our important historical heritage in this field. Do not hesitate to visit the Torre de Hercules, since largely it is why we are here today.

These are times of austerity and this has guided the organising committee throughout. But we are sure that all will go as we hope and as planned by the organizing committee who have worked, and continue to work, to ensure everything will work properly, providing happy memories of this conference in the future. And we hope, of course, that you take to your countries of origin the memory of this old European nation that is Spain and this Galician land located in European Finisterre, which receives you with open arms, as it has always done since the Middle Ages with pilgrims traveling to Santiago.

I do not want to say anything more.

I want to thank the AISM for trusting us with the organization of this conference and all of you for coming here to the city of Coruña. And of course has the authorities that are with us today in this inauguration ceremony for their presence and support.

Nothing more.

Thanks again to the International Association of Lighthouses for their trust for organising this conference and all of you for being here, and also our distinguished authorities who have sustained us in this ceremony by their presence and support.

And thanks especially to you, Minister, for your presence here today and also for your commitment and support to the celebration of the IALA Conference in Spain and generally everything related with marine navigation aids . Our commitment to you as a public service responsible marine marker of our country is to continue working for the Spanish excellence in this field .

Thanks of your attention, merci pour votre attention, thank you very much to all.

[English translation]

## **ANNEX K      Address by Dna Rosa Quintana, Regional Minister for Agriculture, Rural Development and Maritime Affairs**

Ms. Minister of Development, • Mayor of A Coruña, Government Delegate, • President of IALA, President of the State Ports, President of the AP of A Coruña, Mr. Secretary of IALA, Mr. Secretary General of the Committee of Industrial Members, Authorities and institutional and business representatives, Speakers and attendees at the IALA Conference XVIII.

I want to convey the apologies of the President of the Xunta de Galicia, Alberto Núñez Feijoo who, for reasons of inescapable agenda cannot share with you all this Opening Day, as had been his desire.

On his behalf and on my own behalf I give our warmest welcome to all participants Galicia in the 18<sup>th</sup> Conference of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA ) and express our most sincere congratulations to the representatives of the State Ports Authority and Port our hosts, promoters and organizers of this conference and thank the IALA assessment of the proposal made in 2003 for a Coruña, Galicia, Spain as this international meeting now begins.

We welcome you to a land with great awareness of the importance of marine safety, as sailors and navigators who sailed seas and oceans from 5 continents since time immemorial, and suffered in their own flesh the pain of shipwrecks, to the extent of its coastline baptized with the name of the Coast of Death.

Perhaps that conscience, stirred by the bravery of its waters, the autonomous Galicia is now the community of Spain with the highest number of navigation signals: 30 and 456 fog light signals, day beacons and sound, located on land and sea over 1,700 kilometres of coastline.

They are the ideal setting for this Conference. This week we turn to the city of A Coruña as the world capital of maritime safety. Not surprisingly, official representatives of 50 countries and navigation experts have gathered at this meeting.

The unbreakable bond between Galicia and sea throughout history has left its mark in the form of maritime signals , which for centuries guided navigation along the Atlantic coast.

The Torre de Hercules, built by the Roman Empire 2,000 years ago, is the epitome of this statement, being the oldest operating lighthouse that exists and the only one in the world that has been declared a UNESCO World Heritage Site.

A Symbol of the city of A Coruña, this lighthouse has for centuries guided sailors who sailed the dangerous route between the Mediterranean and the North Atlantic lighthouse. Today, it illuminates a city and a port that maintain the essence of their seafaring tradition, incorporating the latest technological and social advances to remain a leader in the safe navigation.

And in this goal to improve maritime safety every day, there are signals along the coasts of Galicia operated by administrations through five port state authorities , such as A Coruña, Ferrol -San Cibrao, Vilagarcía Marín, Pontevedra and Vigo, and 122 ports of regional ownership.

The nearly 500 beacon signals for navigation make Galicia the great Atlantic lighthouse, which oversees the safety of more than 40,000 vessels per year transit the corridor Finisterre.

To ensure safety such as this has constantly motivated the interest of the regional government to introduce the latest in navigation signals, to the point that today Galicia is a pioneer in the installation of light emitting diodes, LED, as a light source. An autonomous AtoN system is driven by solar energy and is equipped with the latest technology backed by IALA. A total of 222 autonomous lanterns punctuate our shores.

Navigation safety has always been a priority for the regional government in maritime matters. And the efforts in this direction will allow an increase in the chances of Galicia as a strategic base for international maritime traffic, from the new scenario that opens with the future commissioning of the works of the Panama Canal.

The megastructure will draw a new map of world trade in this autonomous community which has European centrality. In this framework, to ensure the highest levels of safety in navigation will be key to placing Galicia in the first line of the continental maritime field stations.

Our goal is to provide a safe area, so that the new traffic found in the peninsular northwest is a powerhouse of navigation. Considering that 90 % of freight traffic to world trade is carried by sea, it is clear that our coast can become an economic generator of the first magnitude, with a new opportunity for the creation of wealth and employment, which will join the existing one, from fishing, shell fishing, aquaculture and the current trade.

I'm convinced that the results of this IALA Conference, the first to be held in Spain and Galicia, will contribute decisively to improving the safety of navigation.

I reiterate my welcome and I would urge you, to the extent that your work at this meeting allows, enjoy the beauty, heritage, gastronomy and reception of A Coruña and Galicia.

Thank you.

[English translation]

## **ANNEX L      Address by Dna Ana Pastor, Minister of Public Works and Transport**

Mr Carlos Negreira, Mayor of A Coruña, Mrs. Rosa Quintana, Regional Minister for Agriculture, Rural Development and Maritime Affairs, Mr José Llorca, President of Puertos del Estado, Mr. Koji Sekimizu, Secretary General of the International Maritime Organisation, Mr. David Gordon, Chairman of IALA, Mr. Enrique Losada, President of the Port Authority of A Coruña, Authorities, Ladies and gentlemen.

Good Afternoon to you all.

It's a great pleasure to see you here today, in the marvellous city of A Coruña, a special place surrounded by the sea. Its ports and the people way of live denote the maritime tradition of this historic city. Welcome to all of you.

We are now ten years beyond Puertos del Estado submitted its candidacy to host the 18<sup>th</sup> IALA Conference.

The declaration of the magnificent 'Tower of Hercules', as a World Heritage Site, marked an important milestone in the decision to hold this Conference in A Coruña. Today the Tower of Hercules is the only lighthouse in the World Heritage List.

I would like to thank the IALA Council to support Puertos del Estado for the organization of this important event, and also extend my thanks to all those people and organizations that have made possible this Conference today.

I am well aware that most of you know first-hand the history of the International Association of Marine Aids to Navigation and Lighthouse Authorities, but never hurts to spend a few seconds to remember the origin and evolution of it.

Initially formed in 1957 by 20 members, now has 270 members from Europe, Asia, Africa, America and Oceania.

IALA is an integrated national International Association members, who are the responsible official bodies in the field of marine aids to navigation; associate members, who are the technical entities linked to the field of maritime navigation aids, industrial members, who are the manufacturers of the equipment or service providers and honorary members, defined as those who have excelled in a relevant way by their work in the Association. In short, it is a global association with members from 57 countries.

As you know, every four years, coinciding with the celebration of the General Assembly IALA is holding a conference where the results of the research, development and innovation all about this subject are presented in order, thanks to the participation of leading specialists worldwide, to contribute to the progress and development of maritime transport.

Held also and simultaneously is an industrial exhibition by the Industrial Committee Members, to that we can say that for a week this event becomes the world showcase the latest advances in navigational aids.

Spain is a member of IALA since 1977, with the State Ports agency holds such representation and being SASEMAR (State Company for Maritime Safety ) is an associate member.

I will not deny them that it gives me special pleasure it is under my leadership this conference is being held in Spain for the first time since South Africa with the next in South Korea.

And not only in Spain but in Galicia, my land, and with so many ties binding me for so long. That is why I hope you enjoy it, you live it, and feel the event as yours. With the risk that entails, because once 'felt' it will cost you to discard it. Be warned!

To continue, I provide the latest figures available to me from the successful registration of participants this year until a few hours ago:

1. 56 participants at the Pre-conference Seminar from 26 countries.

2. 358 delegates.
3. 139 Exhibitors.
4. 47 companies represented.
5. 51 attendees from far away.

548 attendees in total from 57 countries with the following nations having the largest number of representatives:

Spain (90 ), United Kingdom (40 ), France (31) Germany (28), Japan (27), China (26), Australia (25), Korea (25) USA (23) and Italy (20) .

Also, in order to promote awareness of the aids to navigation and its importance, State Ports has organized an exhibition that traces the history of maritime signals in Spain, from the Torre de Hercules to today to coincide with the conference, a sample that contains a careful selection of historical and technical Spanish maritime heritage signage and markings.

An exhibition with the title ‘Headlights: the light that should never go out’, will remain in the coming months at Novacaixagalicia Foundation and I strongly encourage you to visit it this afternoon.

Before proceeding with the more remarkable work carried out Spain, along with many other countries, in respect of lighthouses, beacons and aids to marine navigation in general, I very sincerely express my satisfaction about the visit that HRH Princess Anne of England will perform next Friday to this city and this conference coinciding with the 500<sup>th</sup> anniversary of Trinity House, the authority of aids to navigation in England.

The aids to marine navigation, facilitating knowledge and confirming the position of ships in navigation, have evolved throughout history, innovating and adapting to changing times.

Clearly, nothing shows this more than the Torre de Hercules, built by the Romans in the first century to guide their vessels which has been updated with modern systems today for use by commercial vessels and recreational and sports boats.

Today, the boats are getting bigger, faster and more substantial, and therefore, in addition to traditional aids, other tools require more related fields such as communications or information technology.

I speak, for example, of automatic identification systems of vessels, known as AIS.

The innovation in this area and the introduction of new technologies that allow us to provide aids to maritime navigation are now more than the signal lights.

In Spain the exclusive competence of the State since 1847 is enshrined in our Constitution.

The IALA International Conferences have a big impact on shipping, as the proposals and recommendations that arise from them directly affect aids to navigation, and makes shipping most efficient and environmentally friendly.

In Spain, for our geographical location, and the more than 8,000 km of coastline that we have, these contributions are very considered. Remember that more than 130,000 Spanish vessels calling at the commercial ports annually.

In addition, traffic separation systems are the responsibility Spanish maritime traffic, as Finisterre and the Strait of Gibraltar controlled about 35,000 and 85,000 vessels per year, respectively, without forgetting that Spain is one of the main tourist destinations in nautical sports and the recreational world.

At first, before 1842, there were no more than 20 lighthouses in Spain. They came from the Roman times, such as the Torre de Hercules, or the Middle Ages, as Portopí Lighthouse in Mallorca, where lighthouses were under the control of individuals or sailors associations. On that date the Lighthouse Commission was created, becoming a state service. And it remains so today. The Lighthouse Commission is an advisory body of the State Ports, given the importance of their role and implications of international maritime traffic.

In addition to helping more reliable navigation, new marine signal lights projects began in the mid-nineteenth century and also improved attention to boats in trouble, as the lighthouse keepers, in a way, maintained a watch.

It should be remembered that modern maritime rescue services have their origin in the lighthouses and in fact the Lighthouse Commission developed standards based on this.

This historical background is the origin of the 187 lighthouses that are currently in Spain. A concern for the lighthouses started in places like the Galician coast, the North Sea or the English Channel and later spread worldwide.

Initially, as the traffic was mainly coastal, each country begun to develop their own system of maritime signalling. But when vessel traffic became globalised, it became necessary to have a unified signalling system worldwide.

This was achieved not long ago, in 1980. It has been a success and it is fair to recognize and applaud achievements of this Association.

Shipping cannot and must not be operated without harmonised systems of aids to navigation, regulated worldwide and with equivalent benefits in different countries.

In the future, the work of this conference will ensure that aids to maritime navigation will evolve according to the requirements of international shipping. They will evolve with the changing times, technological innovations, and always try to improve the service provided to the navigation.

This is for all mariners, both those who are only able to see the lights and those carrying sophisticated navigation equipment.

The combination of old and new technology systems will enable all kinds of signals, including virtual and digital, including those that work on demand from ships, so that upon detecting the presence of a vessel through its AIS device specific support for that ship is activated.

And I should not proceed without highlighting the enormous effort and exceptional quality of the Spanish industry in this regard. Many Spanish industrialists contribute their work, design and good work in this area and it would do justice in this scenario to give them the recognition they deserve.

In any case, only from coordination between countries from harmonization and from joint technology development can we go forward and play a crucial role in IALA's technical committees.

The aids to navigation must respond to the improvement of shipping traffic which supports new and existing ships.

I do wish to show the deepest of respect for the work that you carry out. People who strive to ensure that maritime transport, a driver of the economy and the development of peoples, will perform be reliably coordinated in an increasingly globalized world , through the Recommendations and other technical documents that are evidence of their ability and professionalism.

You will understand, therefore, that Spain has much relevance to this conference. We have become the main port hub in southern Europe, moving more than 460 MT and 29 M passenger; four Spanish ports are among the top 100 in the world in container handling. The port of Algeciras Bay leads the Mediterranean in this section and is 5<sup>th</sup> in European total port traffic, and Barcelona is the fourth port in the world in motion cruisers.

All of you already know the importance and weight of the Galician ports in the Spanish economy. Of the 28 Port Authorities, 5 are Galician. Galicia has many ports, directly related to the productive economy, particularly in the fisheries sector. Vigo and A Coruña are the two ports with more volume in Spain and Europe, in both fresh and frozen fish, moving just over 128,000 tonnes of fresh fish .

Thus, the Galician port authorities annually move more than 31 million tonnes, with the ports of Vigo and A Coruña also very relevant in the cruising industry.

In addition, I am pleased to share with you some great news a few hours ago and I is that we already have the approval of the European Commission on the Autopista del Mar Vigo- Nantes in the Marco Polo Programme. Great news, no doubt, to Galicia and Spain, which will improve the logistics capacity and therefore the competitiveness of the Galician economy.

Let us, then, deal with issues more directly linked to the conference.

Besides dealing with technical issues and discussing the future of aids to navigation through knowledge and innovation, as given in the theme of the conference, there will also be a session on the historical and technical heritage represented, especially the lighthouses. A session that will value as heritage lighthouses open to tourism and culture, and therefore to society. A line of action which, no doubt, is shared through the project 'Beacons of Spain'.

Therefore, the Ministry of Development, through State Ports and the whole of Port Authorities, has launched this project which we have called 'Beacons of Spain'. We intend to put them to use for tourism. Specifically, for hotel use, without losing their status as maritime signals (following the experience of similar projects carried out in the UK, Croatia, Denmark and Germany, among other countries). 23 of the 187 existing lighthouses in Spain are located on the coast of Galicia, and just seven of them in La Coruna.

In addition to the technical sessions to be held during the Conference, there will be the twelfth General Assembly of the Association, which will deal with an issue that can be critical to the future of IALA. This is the start of a possible change of status, becoming an international organization such as the International Maritime Organization, the Secretary General joins us today and he has supported this initiative.

And if I may, I would not end this speech without referring to all professionals in the sea. Men and women working hard and with absolute professionalism dealing with everything that is related to the sea and with the difficulties involved, major users of navigation aids .

It is our duty, no doubt, it is a duty of all governments to work closely and indefatigably - as they do - in order to improve training and in order that working conditions are the most optimal possible not only for all that they bring to the society and the economic revitalization of the area where they work as usual, but also by the conditions of their business. It is well deserved and necessary that they devote the same effort.

[English translation]

**ANNEX M      Address by Dr. Hyundong KONG, Director, Ministry of  
Oceans and Fisheries, Republic of Korea**

I thank you for your generosity in providing me time to speak at this Conference.

I would like to begin by expressing that we are deeply saddened by the tragic sinking of the RO-RO Ferry Sewol off the southern coast of Korea. Our collective hearts are heavy with sympathy.

On behalf of the Ministry of Oceans and Fisheries, Republic of Korea, I would like to express our deep appreciation to our host, Mr. Jose Llorca Otega, President of Puertos del Estado, the national authority on marine aids to navigation in Spain as well as to his able team members for their tireless efforts in organizing the Conference to be as successful as it is.

Also, I would like to extend my thanks to all speakers and participants for their contribution to this Conference. Over the course of this Conference, I am happy to note that significant progress on developing a new vision for IALA has been made as well as strategies formulated to work more effectively.

In particular, the in-depth discussions on matters promoting sustainable development in Aids to Navigation technologies and our responsibility for maritime safety and shipping efficiency of the world were very timely.

Based on the outcomes of this Conference, Republic of Korea as the Host of Next IALA conference will do its best to ensure that the 19<sup>th</sup> IALA Conference in 2018 achieves the greatest success.

Korea will continue to support IALA activities in a collective effort to narrow the technical gap that exists among IALA members in order to enhance international cooperation for the maritime safety.

Honourable Chairman and my dear IALA colleagues!

At present, Korea is actively engaged in technical development through international collaboration to open a new paradigm of Aids to Navigation Systems.

SMART-Navigation is Korean initiative for future e-Navigation to improve the safety of navigation and efficiency of sea logistics through harmonization of navigation systems and supporting shore services.

Honourable IALA delegates, colleagues, ladies and gentlemen!

I believe that Korea was selected to host the 19th IALA conference 2018 in order to have the opportunity to further strengthen cooperation between IALA members and Korea and to enhance Korea's role in IALA.

I would like to invite all of you, my IALA family, to the 19<sup>th</sup> IALA Conference in Korea. I look forward to seeing you in Korea in 2018.

Finally, I would like to conclude my remarks by showing you a presentation on SMART-Navigation and a Video by the Ministry of Oceans and Fisheries, Republic of Korea.

Thank you very much!

**ANNEX N      Address by Mr Jose Llorca, President of Puertos del Estado (Trinity House Anniversary Session)**

Your Royal Highness,

As President of Puertos del Estado, the Spanish State Port Authority responsible for the aids to navigation in this country, and on behalf of the Spanish Government, I express our profound gratitude for your highness's generous presence despite your commitments and responsibilities.

It's a true privilege for us to welcome the Master of Trinity House in the five hundredth (500th) anniversary of the establishment of the Corporation that constitutes an eminent example for our sector.

World prosperity depends to a very considerable degree on maritime transport. Over eighty per cent (80%) of international trade in goods is carried by sea, and in the case of developing countries, this percentage is even higher.

There would be no world economic growth without transportation by sea. Maritime transport and port activity are crucial drivers for growth and jobs for the global economy.

Proactive maritime safety measures and activities aimed at improving ship safety, safeguarding human life at sea and protecting the marine environment are vital in this context. The consequences of accidents at sea extend beyond the wrecked ships themselves and affect on all coastal activities.

Thus, the contribution of the institutions and organizations that are working today to ensure safety of navigation and to reduce risks and threats to the maritime world must be emphasised.

Spain and the United Kingdom have an exceptional maritime dimension; both are closely linked to the sea and their extensive coastal areas. Clearly, they are countries with a very long maritime tradition, and historically they have an intensive maritime commercial activity. As indicative data, in 2013 port traffic between British and Spanish ports reached more than 10,5 million tonnes.

The provision of the aids to navigation service in Spain is carried out by taking three scenarios into account: the Coastal Network, port signalling and the marking of other facilities.

Hence, within the scope of the Coastal Network, the General Administration of the State is the provider of the service through the 28 Spanish Port Authorities.

In Spain, aids to navigation are the responsibility of the State since 1847, when a Lighthouse Commission was created. It now has more than 150 years of public service for the benefit of safety and navigation by making the traffic in our waters safer every day.

Indeed, regarding the very broad implications of a safety maritime traffic at international level, and the important role it plays towards enhancing safety navigation, the Spanish Lighthouse Commission continues operating today as an advisory body of Puertos del Estado.

Co-ordination among countries is the best tool to achieve a safer maritime traffic system for people and goods, helping ships to reach our ports, and boosting world commerce and economies.

The International Association of Marine Aids to Navigation and Lighthouse Authorities serves as an excellent and unique forum to share knowledge and experiences to the benefit of the sector. About 400 delegates and exhibitors are participating in this Conference, a number that denotes the concerns and the involvement of the British people in this important sector.

Spain is very proud to host this event in the welcoming Galicia Region, in the City of A Coruña, site of the magnificent "Tower of Hercules", the only lighthouse in the UNESCO World Heritage List which Her Royal Highness will have the opportunity to visit tomorrow.

I would like to express once again our pride in your highness's kindness in supporting the Eighteenth Conference of the International Association of Marine Aids to Navigation and Lighthouse Authorities.

The honourable presence of Your Highness reflects your recognition of the role of this International Association in the maritime world.

Thank you very much.

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