



## IALA ENG COMMITTEE

# REPORT OF THE 16TH SESSION OF THE IALA ATON ENGINEERING AND SUSTAINABILITY (ENG) COMMITTEE

17 to 28 October 2022

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Committee Secretary

28 October 2022

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International Association of Marine Aids to Navigation and Lighthouse Authorities  
Association Internationale de Signalisation Maritime

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**Report of the 16<sup>th</sup> Virtual Session of the IALA  
AtoN Engineering and Sustainability (ENG) Committee  
17 to 28 October 2023  
Executive Summary**

The 16<sup>th</sup> meeting of the ENG Committee (ENG16) was held from 17 to 28 October 2023.

The session was attended by 103 registered participants from 27 countries. 30 participants attended for the first time.

Working in four working groups, the Committee considered 56 inputs and produced 14 output documents.

The Committee reviewed the following recommendation:

- Draft Recommendation R0203 Ed.2

The Committee reviewed and produced the following guidelines:

- Draft Guideline on Radar Reflectors
- Draft Guideline AtoN Equipment and Structures Exposed to Extreme Environmental Conditions
- S-245 eLoran ASF data Product Specification\_ed.1.0

The Committee produced the following liaison notes:

- Liaison note to ARM on Navigational Requirements and Considerations for Establishment of Buoyage
- Cover note on development of the draft IMO position on world radiocommunication conference 2023 (WRC-23) agenda item 10
- Development of the draft IMO position on World Radiocommunication Conference 2023 (WRC-23) Agenda item 10
- Liaison note to RTCM SC104
- SBAS-ARAIM IMO Minimum Performance Standard\_v0.1
- Liaison note to ENAV on VDES R-Mode Implementation
- Liaison note to ENAV on New Technology Review
- Liaison note to ARM on Maritime Services
- Draft Maritime Service 17 AtoN v.0.2
- Liaison note to ARM on cyber security (documents embedded)

Planned intersessional work:

- Progress by steering committee meetings on the Workshop on Sustainability
- Progress by steering committee meetings on the Workshop on AtoN Engineering
- Progress by steering committee meetings on the Heritage Seminar
- Progress the Guideline on quantifying characteristics to meet nautical and operational requirements and ways to verify them, participants interested are invited to contact the task leader Gillian Burns (gillianb@nlb.org.uk)
- Progress the Guideline on Resilient PNT, participants interested are invited to contact the task leader Kaisu Heikonen (Kaisu.Heikonen@vayla.fi)

- Progress the Guideline on R-Mode MF, participants interested are invited to contact the task leader Stefan Gewies (Stefan.Gewies@DLR.de)

The following table shows a summary of the ENG Committee task plan for the work period 2018-2023 and the progress made to date.

### Overall status of the ENG Committee 2018-2023 Work Programme after ENG15:

Task		WG	Start Session	Planned End Session	Revised End Session	Progress Indicator			Status Overview
						Green	Yellow	Red	
<b>Standard 1010 – AtoN planning and service requirements</b>									
1.1.1	Revised guidance on Simulation Technology to revise G1097 in cooperation with ARM task 1.2.4	2	8	14					This task is continued by ARM
1.2.1	Develop Guidance on checking that 3rd party AtoN providers are providing what they are obliged to provide– 3rd party AtoN provider quality control. (Joint ARM cooperation)	2	9	14	15				Completed
<b>Standard 1020 – AtoN Design and delivery</b>									
2.1.1	Review and update V-119 on the Implementation of Vessel Traffic Services (R0119) (Output to be a revised Recommendation and associated Guideline),( includes task 1.1.3)	1	8	12					Both for approval to Council
2.1.2	Develop Guideline on Port Traffic Signals	1	11	14					Likely to be next work plan
2.1.3	Develop E-112 Leading Lights and 1023 Leading Lines into a Guideline	1	9	14					Likely to be next work plan
2.1.4	Complete Guideline 1061 Illumination of structures	1	10	14					Likely to be next work plan
2.1.5	Update Guideline 1048 LED technologies and their use in signal lights	1	10	14					Next work plan
2.1.6	Review & update guideline 1043 on Light sources <b>Note: The old task in the 2014-2018 work period was Merge and update Guideline 1043 On Light Sources and Guideline 1048 on LED Technologies and Guideline 1049 on the Use of Modern Light Sources in Traditional Lighthouses (Task 5.1.9). Should this old task replace 2.1.5 and 2.1.6 as Task 2.1.5?</b>	1	10	14					
2.1.7	Develop a guideline for E-106 Retroreflective materials	1	8	9					Completed
2.2.1	Develop E200-3 on light measurement into a Guideline	1	11	14					Likely to be next work plan
2.2.2	Develop new recommendation on marine light Terms of Measurement	1	12	14					Completed
2.2.3	Develop E200-5 on Optical Performance into a Guideline	1	12	14					
2.2.4	Revise Guideline on effective intensity	1	9	11					Completed

2.2.5	Develop Guidance on monitoring of function and degradation of AtoN light sources	1	9	14					
2.2.6	<del>Develop Guidance on service factor</del>	<del>1</del>							
2.2.7	Develop Guidance on Colour fading of AtoN (plastic and painted) – methods to measure and assess	1	10	14					Completed
2.2.8	Finish guideline G1148 Marine Signal Lights - Calculation of Luminous Intensity and Range  Develop Guidance on service factors	1	8	10					Completed
2.2.9	Update Guideline 1041 on Sector Lights	1	9	14					Next work plan
2.3.1	Develop guidance to identify appropriate standards for AtoN equipment with extreme environmental conditions. Humidity, temperature, enclosure ratings, UV etc) Also including peak intensity specification for LED AtoN, batteries, optic service factor, thermal cap, etc.	2/1	10	16					Approved in ENG16 and will be submitted to the Council
2.3.2	Complete guidance on Maintenance of AtoN structures	2	8	12					Completed
2.3.3	<del>Develop Guideline on meteorological and oceanographical data dissemination</del>	<del>2</del>	<del>8</del>	<del>14</del>	<del>16</del>				Cancelled
2.3.4	New Recommendation on the Responsible Design & Maintenance of AtoN (updated to include safety, sustainable design, and relevant building codes and standards)	2	8	10					Completed
2.3.5	Joint workshop with all 4 technical committees on Cyber Security in AtoN operations	2	8	12	14				Completed
2.3.6	Develop Guideline on the Sustainable Structural Design of Marine Aids to Navigation	2	14	14					Completed
2.4.1	Develop Guidance on what constitutes a good marine AtoN solar panel	2	10	14	16				Completed
2.4.2	Deliver a Workshop - IALA AtoN Engineering	1	11	13	14				Next work plan
2.4.3	Monitor Battery development for use in AtoN	2	8	14					
2.5.1	Develop guidance quantifying characteristics to meet nautical and operational requirements and ways to verify them	2	8	13	16				merged with 2.5.3, run over into the new work period
2.5.2	Develop new guideline on radar reflector (reflection) properties	2	8	13	16				Approved in ENG16 and will be submitted to the Council
<del>2.5.3</del>	<del>Creating an overview guidance on floating AtoN</del>	<del>2</del>	<del>8</del>	<del>13</del>	<del>14</del>				merged in 2.5.1
2.6.1	Develop Guidance on modern equipment in traditional lighthouses	2	10	14					Next work plan
2.6.2	Monitor Climate Change to inform IALA of impact and potential adaptation requirements for AtoN providers	2	8	14					

2.6.3	1.1.1. IALA Heritage website: - Establish a World Heritage Lighthouse Cyber Centre, accessible via the IALA website. - Establish a database on World Heritage Lighthouses.	4	8	14				
2.6.4	Establish a concept for nominating one lighthouse as World Heritage Lighthouse of the year for each 'World AtoN Day'.	4	8	14				
2.6.5	Deliver Heritage Workshop	4	8	11	14			
2.7.1	Revise Recommendation R1004 to reference the UN Sustainable Development Goals	2	8	10	14			Completed
<b>Standard 1030 – Radionavigation services</b>								
3.1.1	Resilient PNT (applicable to all technical domains) – (identification, potential impact and mitigations)	3	8	11	16			Next work plan
3.2.1	Terrestrial radionavigation systems	3	10	12				Completed
3.2.2	R-Mode (MF)	3	10	14	16			Next work plan
3.2.3	R-Mode (AIS/VDES)	3	10	14				Task closed – VDES GL moved to ENAV
3.2.4	Workshop on R-Mode in 2019	3	9	10				Completed
3.2.5	Develop and maintain relevant Product Specifications eg. S-245 eLoran ASF data, S-246 eLoran transmitting station alamanc, S-247 Differential Loran reference station etc.	3	10	14	16			Completed and following activities in next work plan
3.2.6	Guidance on timing and synchronisation	3	8	14	-			Run over into the new work period
3.2.7	eRacon (standard approach) ; Review recommendations ENAV146 & R-101 & Guideline 1010	3	11	14	16			New Guideline produced as output of ENG15. Review of documents to run over into the new work period
3.3.1	Consideration of how and when to use SBAS in maritime.	3	9	13				Completed
3.4.2	Review existing DGNSS infrastructure and provide guidance for current system	3	10	12	14	16		Next work plan
3.4.3	New Recommendation on augmentation for maritime use	3	8	10	13			Completed
3.4.4	Provide guidance, strategy and advice on potential new uses of marine beacon DGNSS infrastructure	3	9	11				Item merged with 3.4.2
3.4.5	High accuracy systems	3	10	14	15			Completed in ENG15, following next work plan
3.5.1	Review and update current documentation under the preview of PNT WG	3	8	14	16			

3.5.2	Monitor developments in GNSS, DGNSS, radar, resilient PNT, e-Pelorus, terrestrial systems, R-Mode, inertial and any other relevant areas etc.	3	8	14	16				
3.6.1	Update to ITU M.823, potential replacement for A.915, Liaison with IMO, ITU, RTCM, etc on related topics and project areas.	3	8	14	16				
3.7.1	Input to MSP, Integrity considerations for resilient PNT, cybersecurity impact for PNT data, DATUM considerations	3	10	14	16				
<b>Standard 1050 Training and Certification</b>									
4.1.1	Development and review of WWA courses	1,2,3	8	14					
4.2.1	Navguide updates and review	VC	9	14					
<b>Standard 1060 – Digital communication technologies</b>									
5.1.1	Review telemetry Guideline 1008	2	10	14					
5.1.2	Review of engineering support for e-navigation services, (including hot/cold climates & radio propagation). TO BE CONFIRMED	3	8	14	16				

**Legend:**

**Green** – progress as planned

**Yellow** – task needs more time, target time prolonged

**Red** – very little progress on the task, target time prolonged

**Grey** – task completed / deleted

**Blank** – task not started

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# Report of the 15<sup>th</sup> Session of the IALA ENG Committee

## 1. GENERAL

The 16<sup>th</sup> meeting of the ENG Committee (ENG16) was held from 17 to 28 October 2023, chaired by Simon Millyard and vice-chaired by Michel Cousquer. The Secretary for the meeting was Jaime Alvarez.

The session was attended by 103 registered participants from 27 countries. 30 participants attended for the first time. Working in four working groups, the Committee considered 56 inputs and produced 14 output documents. Simon Millyard introduced himself and the WG chairs and welcomed newcomers to IALA.

### 1.1 Welcome from the IALA Secretary-General and Deputy Secretary-General

The Deputy Secretary-General, Omar Frits Eriksson, welcomed all participants and was glad to see them all finally in face to face. More and more countries have lifted or are in the process of lifting all restrictions allowing to carry out meetings physically. The Secretariat have started normal work routine in the HQ and travels to meetings and events have already filled up our agendas for the rest of the year.

The Deputy Secretary-General recalled that for those participating online, the register to ENG16 on the IALA Website is needed, otherwise, those participants not registered are not considered as committee participant. The ENG16 schedule is again very busy, with a lot of interesting input documents submitted, and a lot of work to do in order to finish the work programme.

The Deputy Secretary-General, noticed with special interest the input paper from China MSA and MOF in South Korea on various important topics and he must thank them for the tremendous work that lies behind these input papers. The Open Digital Incubator initiative was addressed, the purpose of this initiative is to accelerate the development and implementation of promising technical e-Navigation services and it could form an important part of the South Korean GMDRT initiative and other similar initiatives such as the IHO-Singapore Lab, etc. The paper on radar reflectors and their properties also was stressed recalling that, all around the world, it was observed a limited understanding of the efficacy of radar reflectors. Germany has demonstrated leadership in this important area, first with the excellent work of Dr. Speckter several decades ago, and now with the outstanding work of Peter Schneider and his group.

As Dean of the World-Wide Academy, he thanked the inputs on model courses and training proposals. As all know knowledge and education are key to developing those coastal States who are in need of assistance to fulfil their international obligations such as those stipulated in SOLAS Chapter five regulation 12 and 13.

Heritage is also an important topic and a part of the work of this committee. The lighthouse of the year nomination is of great importance to those that get nominated and helps to secure funding to preserve important cultural heritage world-wide.

It was considered that the work on all these topics may not be finished, and the remaining topics will therefore form a substantial part of the future work program 2023 to 2027 of the committee.

The Deputy Secretary-General, requested to urge participants to think hard about the future work programme and prepare further proposals on ambitious work items which keeps this committee on the cutting edge of developments. IALA is a technical organization producing Standards which can be cited in national law, Recommendations stating IALA members expectations of what they should be doing and Guidelines which say how the Recommendations could be implemented. IALA will through the work programme, be proactively leading the technical development within our domain. The Deputy Secretary-General therefore encouraged ENAV participants to be ambitious and innovative when designing the future work programme.

The Deputy Secretary-General addressed the Inter-Governmental project developments. Ten ratifications or accessions were formally received and several more are coming in the near future. After the reception of 30 ratifications or accession, IALA will transform into an Inter-Governmental Organization. The Secretariat is working on all the new structures and administrative issues that need to be in place for the new Organization.

The Deputy Secretary-General recalled the war in Europe and this difficult time. IALA thoughts are with the whole people of Ukraine. The Deputy Secretary-General emphasized the privilege to work for an organisation that seeks to bring people together in a spirit of cooperation and compromise, and where understanding and mutual respect are important. The international institutions and global corporation have again proven to be very important.

The Deputy Secretary-General wished all the participants good luck and thanked them once again for their contribution to the global safety of navigation over this busy period.

## **1.2 Approval of the agenda**

The agenda (ENG16-1.2.1) was adopted.

## **1.3 Apologies and Introductions**

The session was attended by 103 registered participants from 27 countries. 30 participants attended for the first time.

The list of Committee Members who attended ENG16 is shown in ANNEX B. New participants were welcomed in addition to those returning to the Committee.



## **1.4 Working arrangements for ENG16**

The following statements were read to Committee members:

*IALA is required to comply with the General Data Protection Regulations of the European Union. In the report of this meeting, IALA will include a list of participants with their contact information. Any participant who wishes to remove their personal information from the participants' list should advise the Committee Secretary as soon as possible.*

*If anyone present has knowledge of any patents, including pending Patents, held either by themselves or by other organisations or individuals, the use of which may be required to practice or implement the content of IALA Documents being developed or worked on in this Committee to inform the IALA Secretariat.*

The Secretary briefly presented the Dashboard developed by IALA staff which will continue to be the One-Stop-Shop for conducting the Committees and centralised all the information, status and meeting needs for the member during the Committee working period.

## **1.5 Style Guide**

The Secretary recalled the [IALA Style Guide](#) designed to assist those members in preparing and reviewing IALA documentation. The purpose of this guide is to provide a common language, structure, and appearance.

This document is divided into three main parts:

- Style - Content (section 2) - this includes the preferred standards for grammar, language, punctuation, and spelling.
- Structure – Structure and formatting (section 3) - this includes how documents should be structured and ordered and includes the use of customised styles and fields in Microsoft Word.
- Appendices – including a supplementary table of spelling, a summary of the styles applied within the document templates and an extract from the IALA Brand Guidelines to illustrate the corporate colours.

## **1.6 ENG committee structure**

The Chair then introduced and gave the floor to the Working Group Chairs and Vice Chairs:

- WG1 Light & Vision Physics chaired by Malcolm Nicholson
- WG2 Technical Knowledge and Sustainability chaired by Peter Schneider and Jörg Unterderweide
- WG3 Radionavigation Services chaired by Alan Grant
- WG4 Heritage and Culture chaired by Peter Hill

## **2. REVIEW OF ACTION ITEMS FROM ENG15**

Input paper ENG16-2.1.1 refers. Action items for the IALA Secretariat from ENG14 were noted as complete. WG chairs were requested to review Members actions. The action item on bringing to the attention of the PAP Committee the use of, and any liability associated with the use of, the software tools provided by IALA was addressed. This is in discussion in LAP. Christina Schneider, LAP Chair has forwarded a input paper to LAP with a disclaimer proposal for the web site referencing, the tools and publications. This will be included in the LAP meeting 8 and 9 November.

## **3. REVIEW OF INPUT PAPERS**

### **3.1 Input papers**

It was noted that all input papers were available on the IALA website. The Committee considered 56 input papers, some of them were received the week before the opening plenary. Chairman requested participants to forward the input papers before the deadline in order to provide enough time to be read.

## **4. REPORTS FROM OTHER BODIES**

### **4.1 Reports from IALA**

#### **4.1.1 IALA Council**

Minsu Jeon, IALA Technical Manager, provided the committee with the report of Council 74 (ENAV30-3.1.1), which was held in June 2022. The following points are relevant to note for the ENAV Committee:



- Revision of the Current drivers and trends
- The Council approved the revised Committee work programme for 2018-2023
- Council approved the workshop proposal on Digital Maritime Communication infrastructure to be held in 20-24 Feb 2023 in Tokyo, Japan. Registration is required.
- The Council approved the change of the heritage lighthouse of the year selection process and agreed to apply it for the heritage lighthouse of the year 2023.
- The Council approved Homigot Lighthouse, the Republic of Korea, as the Heritage Lighthouse of the Year 2022.
- The progress of the review of R1001 IALA Maritime Buoyage System.

#### **New and revised recommendations:**

- R1023 Maritime Resource Names (MRN), Ed1.0, June 2022
- **R0204 Marine signal lights – determination and calculation of effective intensity, Ed3.0, June 2022**
- **R0141 Training and certification of Marine Aids to Navigation personnel, Ed5.0, June 2022**
- R0119 Establishment of a VTS Ed4.2, June 2022

#### **New and revised guidelines:**

- Revised Guideline G1018 on Risk management, Ed4.0, June 2022
- Revised Guideline G1123 on the use of the IALA Waterway risk assessment programme or IWRAP, Ed2.0, June 2022
- Revised Guideline G1124 on Ports and waterways safety assessment (PAWSA MK II), Ed2.0, June 2022
- Revised Guideline G1058 on The use of simulation as a tool for waterway design and AtoN planning, Ed3.0, June 2022
- **Revised Guideline G1135 on Determination and calculation of effective intensity, Ed 3.0, June 2022**
- **Revised Guideline G1127 on Systems and services for high accuracy positioning and ranging, Ed2.0, June 2022**
- **Revised Guideline G1129 on the retransmission of SBAS corrections using MF-radio beacon and AIS, Ed 2.0, June 2022**
- **New Guideline G1147 on The use of enhanced radar positioning systems, Ed1.0, June 2022**
- **New Guideline G1168 on Quality control of third-party AtoN service providers, Ed1.0, June 2022**
- **New Guideline G1169 on Training and certification of marine Aids to Navigation personnel, Ed1.0, June 2022**
- **New Guideline G1170 on Solar modules for a marine environment, Ed1.0, June 2022**
- Revised Guideline G1150 on Establishing planning and implementing a VTS, Ed3.0, June 2022
- New Guideline G1171 on Human factors and ergonomics in VTS, Ed1.0, June 2022

**Liaison to RTCM ENG Working Group 3** was reviewed by China MSA to be further progressed in WG3

- Liaison note to RTCM SC104 on R-Mode messages

#### **Revoked document**

- Revoked G1097 on Technical Features and Technology Relevant for Simulation of AtoN, Ed1.0

**Liaison notes to IMO NCSR** (more information is provided in the point of the agenda)

**Council 76 will be held 12 – 16 December 2022 in Brazil**

#### Upcoming events:

- ENAV 31, 30 Jan - 03 Feb 2023 in IALA HQ
- D@S International conference, 6-7 Feb 2023 in Copenhagen, Denmark
- IALA workshop on Digital Maritime Communication infrastructure to be held in 20-24 Feb 2023 in Tokyo, Japan

##### 4.1.1.1 Heritage Lighthouse Award

WG4 Chair Mr. Peter Hill recalled the importance of the culture and the heritage that these lighthouses provide beyond their function as AtoN. This link is at IALA members disposal <https://heritage.iala-aism.org/> for more information and get the template to submit information for the next IALA HLY nomination.

##### 4.1.2 IALA Policy Advisory Panel (PAP)

The 47th session of PAP was held in person between 13 – 15 September 2022. Key outcomes included:

- The review of entries in the IALA Dictionary.
- The latest versions of the standards.
- The future dates for the committees, PAP and other IALA events were agreed.
- A draft input to IMO regarding IALAs activities regarding MASS.

The PAP was also updated on many items including:

- The transition arrangements for IALA to go from an NGO to an IGO.
- The progress of the review of R1001 IALA Maritime Buoyage System.
- Maritime Resource Registry.
- Maritime Services

The new work items proposals coming from the working groups need to be fulfilled in the template. They will then be submitted to PAP48 and to the Council in December 2022.

##### 4.1.2.1 Technical Documents Catalogue

The edition 5 of the [technical document catalogue](#) is available in the website with the latest updates.

##### 4.1.2.2 Sustainability

Simon Millyard underlined the sustainability matter in the scope of IALA and the ENG Committee. Simon Millyard recalled the submission of an input to PAP (ENG14-12.0.2) gathering ideas related to climate change and environmental actions in IALA. This paper was welcomed by the PAP and after a positive discussion the PAP suggested ENG consider a workshop on Sustainability and a presentation at the General Assembly. A plan for this workshop was developed at ENG15 and the steering committees are being planned. The date is still not fixed but it is targeted to 2025. This will be a key topic in the IALA Conference.

##### 4.1.2.3 2023-2027 Work Plan

ENG Vice-Chair Michel Cousquer briefed about the document ENG Work plan draft 2023-2027 after PAP47 (ENG16-4.1.2.2) which is the result of the working groups preparations to achieve the number of tasks proposed for the next period 2023-2027. The second document ENG16-4.1.2.2.1 Work plan draft 2023 2027 with the updates from ENG15.

The tasks are split by Standards and the output document expected with each of the tasks. The tasks are also pre-allocated to a certain working group assuming that the working group will remain the same during the next work plan. Vice-Chairs also expressed the possibility to comment on the plan and any remark from the members will be considered. WGs are requested to review and add to this document to enable it to be considered a final draft after ENG16.

#### 4.2 MASS task group



Simon Millyard reported the latest outcomes from this group. ENAV Committee have drafted a Guideline on MASS and each Committee (including LAP) is invited to contribute into the different sections of the Guideline with their respective technical expertise. Working Groups 1,2 & 3 in ENG are requested to develop their allocated sections. ENAV will retain overall ownership of the Guideline. This was cited as a good example of inter committee working.

The 4 topics allocated to ENG are PNT, Position augmentation, Power availability and Conventional AtoN visibility to MASS

### 4.3 IMO Meetings

Minsu Jeon presented the status of discussion on IMO meetings since the ENG15 and the implication of IALA on them:

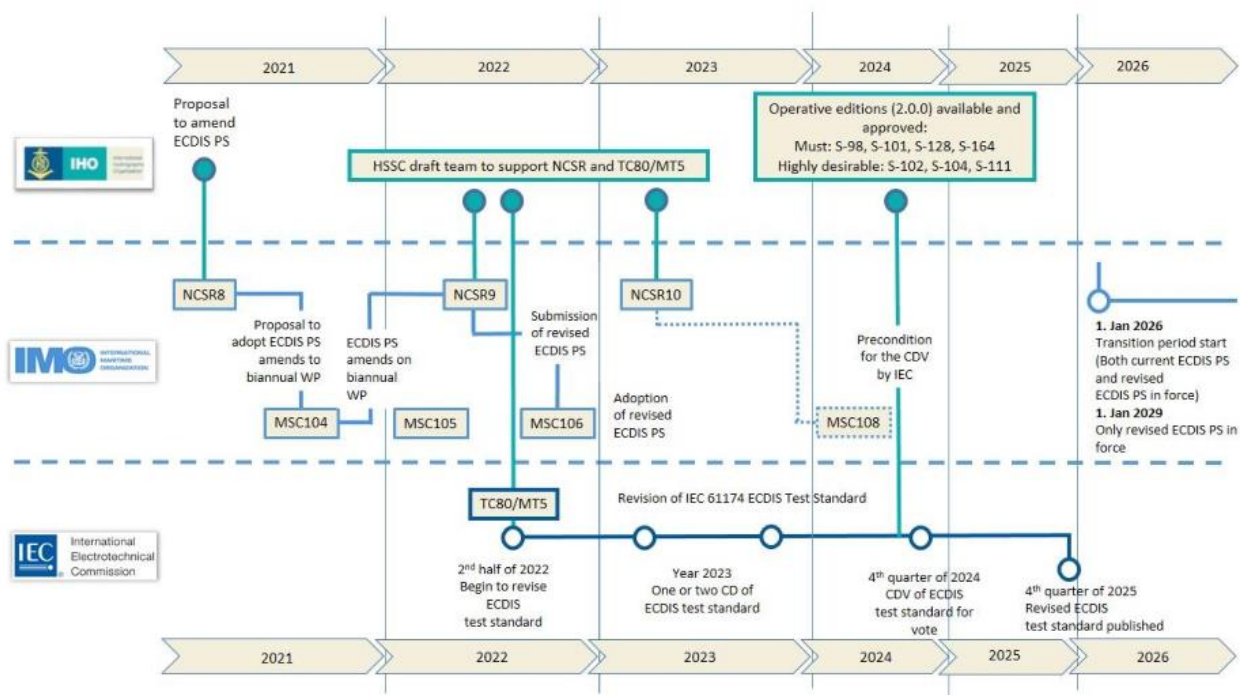
The input paper referred was ENG16-4.3 Report on IMO NCSR 9 The following meetings were held during this period:

- The following input papers were sent to NCSR9:
  - NCSR 9-7-2 - Development of Maritime Services descriptions. There are currently 16 Maritime Services. MS 1, 2 and 3 are provided by VTS, the new IMO Res 1158 on VTS only considers one service merging the three old services. IALA also proposed to add one new service for AtoN. This agenda item will be postponed to NCSR10.
  - NCSR 9-12-9 - Proposal on WRC-23 agenda item 10 – IALA proposes the digitalisation of VHF voice communications and VDES R-Mode. This issue is considered at Joint IMO/ITU Expert Group meeting 18 in December 2022.
  - NCSR 9-INF.12 - Report of the trial on digital voice communication in the maritime VHF band.
  - NCSR 9-INF.13 - VDES ranging mode (R-Mode) (IALA)
- **Revision of ECDIS Guidance and performance standards:**
  - Contributions (via Canadian Coast Guard) in the IMO performance standard on ECDIS to add AIS connection in the ECDIS.
  - The updates to the performance standards introduce, in particular, the application of new IHO Data Standards and product specifications (S-98, S-100 and S-101) with regard to ECDIS equipment installed on or after 1 January 2029 and, optionally, for equipment installed after 1 January 2026 and before 1 January 2029.
  - Draft resolution on ECDIS performance standards will be considered by IMO MSC106 in November for adoption. Some documents were received to comment the resolution. The matter on interconnectivity ECDIS/AIS could be added to the agenda for NCSR10.
- MSC105: agreement on the development of goal-based MASS instruments targeted to be completed in 2025. MSC105, in April 2022, will start this activity. This will be a non-mandatory MASS code but will be considered to be mandatory in future.

### 4.4 IHO/IALA liaison

Minsu Jeon referred to the report on the IALA IHO joint workshop on S-100/200, 5-9 Sep 2022, in Norway. NCSR9 endorsed an implementation phase for the new resolution, including S-100 and a transition period was agreed upon:

- S-100 ECDIS will be legal to use after 1 January 2026 and,
- from 1 January 2029 new systems must comply with the new IMO Resolution on ECDIS PS (mandatory requirement).



## 4.5 ITU

Please refer to the input paper to get further details - ENG16-4.5 IALA Report of ITU-R WP5B meeting July 2022. The following documents and topics, among others are, of interest for IALA were reviewed:

Maritime mobile service including Global Maritime Distress and Safety System (GMDSS) and radiodetermination service, with particular emphasis on the development of VHF Data Exchange System (VDES), Automatic Identification System (AIS), Autonomous Maritime Radio Devices (AMRD) and e-Navigation. The following matters are addressed in this input:

- WRC-23 agenda item 1.11 (Modernisation of the GMDSS and implementation of e-navigation)
- Revision of Recommendation ITU-R M.1371-5 (Automatic Identification System - AIS)
- Revision of Recommendation ITU-R M.2135-0 (Autonomous Maritime Radio Device - AMRD)
- Revision of Recommendation ITU-R M.2010-1 (NAVDAT system in 500 kHz) and ITU-R M.2058-0 (NAVDAT HF)
- Revision of Recommendation ITU-R M.493-15 and ITU-R M.541-10 (Digital selective-calling DSC)
- New report on the electromagnetic interference (EMI) from LED and other sources
- New report on digital voice communication in the VHF maritime band
- EPIRB MMSI encoding for craft associated with a parent ship

## 4.6 RTCM

The following special committees could be interesting for ENG participants:

- SC 131 on Multi-System Shipborne Navigation Receivers: standardised SBAS messages to provide integrity and DGNSS corrections into the receiver.
- SC 134 on Integrity for High Accuracy GNSS-Based Applications
- SC 135 Radio Layer for Real-Time DGNSS Applications

## 4.7 PIANC

Minsu Jeon briefed about the monitoring activity of IALA in the work in PIANC, any subject in the scope of IALA will be coordinate with them. Some topics of interest are *Permanent floating houses along the IWW banks and infrastructure* and *Bottlenecks and best practices of transport of containers on IWW*.

#### 4.8 ESNB Tsunami monitoring

IALA Secretariat is continuing supporting ESNB group to contribute with their task force on Augmenting Tsunami Monitoring frame Committee. High accuracy systems are currently used as ocean observing tools. High observation tools. WG2 in the next work programme – complementary use could be the frame to discuss these topics.

### 5. REPORTS FROM RAPORTEURS

Nothing to report during the ENG committee.

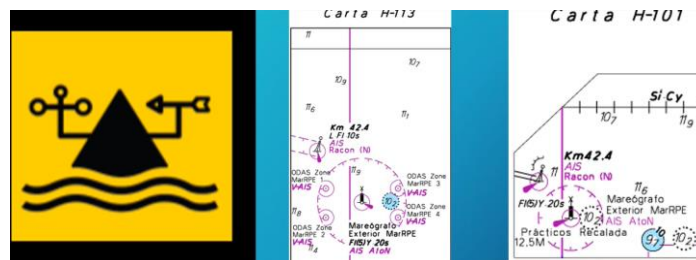
### 6. ADVERTISING PRESENTATIONS

The following presentations were scheduled during the working period and the video recording is posted here:

Day / Time	Topic	Presenter
Opening plenary	Installation task of a special ODAS buoy at the limit with Ocean Atlantic	Mariano Marpegan (Emepa S.A)
	Resilient PNT for the Black Sea and Danube region	(Florin Mistrapau) (GMV)
	Use of lithium batteries for AtoN	(Marticia Jo) (Quantum)
Tuesday 18 – 09.00	EGNOS performance in Baltic Sea	Rodrigo Gonzalez (ESSP)
Wednesday 19 - 09.00	Authentication OSNMA	Ana Senado (EUSPA)
	OSNMA tests	Héctor Llorca (GMV)
Friday 21 – 10.00	IALA Conference 2023 in Rio de Janeiro	Alberto Piovesana (Marinha do Brazil)

#### 6.1 Installation task of a special ODAS speque buoy at the limit with Ocean Atlantic

Mariano Marpegan provided the overview of the provision, installation, and start-up of AtoN in ODAS area. Special mark fitted with AIS, anemometer, tide gauge and ODAS zone. The area of installation was different of the normal working area, upper Rio de la Plata River. Finite elements software was used in order to measure the impact of tidal strength in specific parts of the buoy. Two sensors were fitted to measure the tide: pressure and radar sensors. The charts were adjusted accordingly with the provision of this new AtoN with the hydrographic office and the use of pictogram was in accord with G1122:



The data were recorded during several months, some calibrations were accomplished to improve the quality of the data provided to the Argentina and Uruguayan Navy.

## 6.2 Resilient PNT for the Black Sea and Danube region

The RIPTIDE (NAVISP-EL3-006) project targets a first phase in the development of a resilient PNT solution dedicated to the particularities of the Black Sea and Danube Lower Basin region, in order to cover a national need of resilient PNT tailored to address a sensitive region of Romania and of the European Union. The project aimed at achieving the following objectives:

- To perform a technical analysis of the current positioning solutions and their resilience with respect to the Black Sea and Danube environment;
- To perform a dedicated campaign in the Black Sea and Danube Lower Basin covering the following main goals:
  - to emulate different jamming/spoofing scenarios and provide a view of the impact at user/system level;
  - to provide a strong showcase facilitating the engagement of relevant authorities and experts from early requirements consolidation phase;
  - to collect data checking for existing jamming / spoofing situations;
- To perform a thorough review of the current initiatives in the maritime domain that target resilient and secure navigation;
- To identify the requirements for a resilient solution (system/user level) which could serve civil users in the region;
- To provide recommendations for a resilient PNT in the Black Sea and Danube region;
- To define and consolidate a roadmap for adoption;
- To enable the acknowledgement of different stakeholders on the need of such solutions.

In order to achieve its goals, the project ran several maritime campaigns in the Black Sea and on the Romanian sector of the Danube (see map below) using three different vessels to collect both real time data about possible existing events in the targeted environment, as well as emulating different scenarios of jamming / spoofing. The equipment used in these campaigns was divided in two subgroups:

- SG#01 outside the impact of jamming / spoofing generator – recording SiS;
- SG#02 inside the area affected by the project jamming / spoofing generator.
- Each of these two subgroups contained a GMV laboratory tool used to detect interferences. The signal in SG#02 was injected in parallel to a GNSS receiver and to a test AIS equipment.

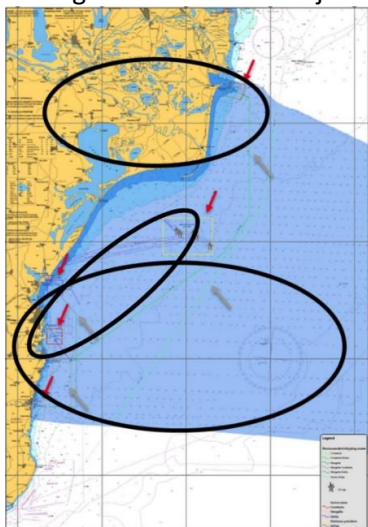


Figure 1 Campaigns areas

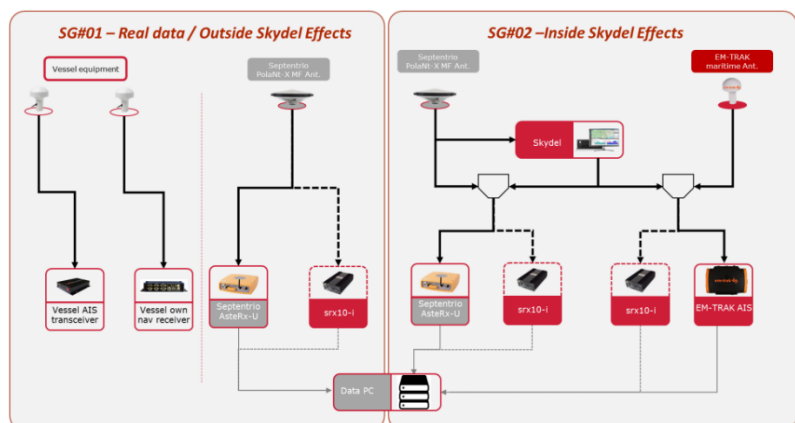


Figure 2 Campaigns equipment

Different configurations were used to facilitate testing the impact of jamming / spoofing attacks in several types of receivers, starting from the most basic receivers operating in GPS L1-only and gradually increasing

the number of constellations and frequencies up to using GPS L1/L5 and Galileo E1/E5. Also, different types of attacks were simulated for a proper analysis of what would be the impact and effects of jamming and spoofing in the maritime environment at user and authority level. The campaigns ensured the provision of a clear showcase for the authorities to understand the vulnerabilities and risks on the current context of operations.

Several candidates for resilient PNT solution were analysed from feasibility, technical, performance and their associated impact perspective. Considering their main roles, these solutions have been divided in two categories: monitoring and protection solutions. Monitoring actions could be included either at vessel level or at authority level, featuring GNSS spectrum monitoring capabilities. Protection function could be achieved through different means, such as Dual-Frequency Multi Constellation (DF-MC) receivers, Navigation Message Authentication (NMA), Multi-System Concept, Additional Ranging Signals or Cryptography Processing Facility. Following the analysis, an integrated monitor and protect approach is recommended based on the following concepts:

- Applicable at authority level:
  - GNSS interference monitoring of coastal areas and ports
  - Provision of additional ranging signals, such as VHF R-mode based on current AIS/VDES infrastructure
  - Distribution of authentic/verified NM based on a SIS NMA(OSNMA/CHIMERA) or AGNSS approach using the AIS/VDES infrastructure
- Applicable at vessel/user level:
  - Usage of DF-MC or MF-MC GNSS receivers
  - Usage of NMA-enabled GNSS receivers as soon as they will be available
  - Usage of R-mode receivers or GNSS/R-mode multi-system receivers to benefit from the additional ranging signals
  - Usage of vessel level interference detection and mitigation techniques

The next phase of the Resilient PNT for the Black Sea and Danube Region RIPTIDE initiative will focus on the design and prototyping of an integrated solution applicable at authority level, ending with a demonstrator which shall be tested at a lower scale in a representative environment.

### **6.3 Use of lithium batteries for AtoN**

Marticia Jo presented the use of lithium batteries in the maritime domain, for the time being there is no guidelines in IALA addressing such new use. Quantum is participating in a 5 year project with MOF and would like to share their experience. Despite the ability to rapidly charge and discharge capability and efficiency mentioned above, the current lithium batteries often lead to fire accidents or explosions due to various reasons such as shock, high temperature, and design problems. After the end of the project, they will be able to provide inputs to IALA for the management of such batteries. They have observed that, in order to operate safely, AtoN's BMS/BPU should be configured, including components suitable for the marine environment.

1. Waterproof connector
2. Connection of power and communication functions
3. BMS/BPU for battery management/control
4. Compliance with a communication protocol for management/control

In Korea, the SMART AtoN project verifies the efficiency of the lithium battery system, and the government and industry are actively discussing various guidelines for safer operation. These inputs could be addressed into the task on energy storage.

### **6.4 EGNOS performance in Baltic Sea**

EUSPA (the European Union Agency for the Space Programme) and ESSP (the EGNOS service provider), with the collaboration of the Finnish Transport Infrastructure Agency (Väylä) and the OSM Group AS (Norwegian Oil Transport provider), have carried out a GNSS data collection campaign of 92 days in 2021 along the Baltic Sea covering the trajectory from an oil tanker vessel.

This article analyses thus EGNOS performance in the Baltic Sea during a long period of time in a real maritime environment with a maritime GNSS receiver. The purpose is to demonstrate the benefits of EGNOS for maritime navigation, showing that EGNOS L1 service is compliant with the operational requirements defined in the IMO Res. A.1046 (27) for ocean waters, coastal waters and harbour entrances/approaches.

## 6.5 OSNMA tests (Open Service Navigation Message Authentication)

This presentation discusses the implementation of the new Galileo OSNMA functionality in a shipborne dual-frequency multi-constellation receiver within the ASGARD project. In the current situation where spoofing attacks are a reality, the use of a signal authentication system such as OSNMA offers extra protection to maritime navigation. The presentation discusses a maritime testbed for OSNMA considered in the ASGARD project for different spoofing attacks and what results could be expected.

## 6.6 Authentication OSNMA

The presentation contains information about two Galileo topics. On the first hand, the Galileo UTC Dissemination Accuracy is presented. Galileo defines a Minimum Performance Level (MPL) for UTC Dissemination Accuracy of 30 ns. The presentation shows that the actual accuracy is far beyond the MPL, being around 6ns. This excellent performance allows to use Galileo as an accurate source for timing synchronization. On the other side, Galileo Open Service Navigation Message Authentication (OSNMA) service is explained. This service authenticates Galileo navigation message and it allows users to assure that the Galileo message is received from original Galileo satellites and not from malicious source, contributing to the resiliency of the position computed.

## 6.7 IALA Conference 2023 in Rio de Janeiro

Alberto Piovesana provided the overview of the 20<sup>th</sup> IALA Conference in Rio de Janeiro, Brazil hosted by Marinha do Brazil and organised IALA with the theme of Marine Aids to Navigation - Innovation For a Sustainable Future starting the May 27 to the June 03, 2023. The location will be in the Windsor Convention & Expo Center, Rio de Janeiro, Brazil. The preliminary programme was presented:

Activities & Dates	Saturday May 27 <sup>th</sup>	Sunday May 28 <sup>th</sup>	Monday May 29 <sup>th</sup>	Tuesday May 30 <sup>th</sup>	Wednesday May 31 <sup>st</sup>	Thursday Jun 1 <sup>st</sup>	Friday Jun 2 <sup>nd</sup>	Saturday Jun 3 <sup>rd</sup>
4 <sup>th</sup> Heritage Seminar								
Registration								
WWA Pre-Conference Seminar								
77 <sup>th</sup> Council Meeting								
Welcome Reception								
Opening Ceremony								
IALA Activities Presentations								
Official Photo								
VIP Lunch								
Industrial Exhibition								
Ilha Rasa Lighthouse Virtual Tour								
Conference Official Dinner								
Technical Sessions								
Speakers Corner								
Partners Program								
IM Evening								
IM General Assembly								
IALA General Assembly								
Closing Ceremony								
78 <sup>th</sup> Council Meeting								
Conference Gala Dinner								



An industrial exhibition area and conference rooms will be available hosting the expositions and interesting presentations received. The official website is running providing the most accurate information: <https://iala-brazil2023.rio.br/>. Alberto Piovesana invites to all participants to the IALA Conference in Rio.

## 7. OVERVIEW OF PLANNED WORK FOR ENG16

The working group Chairs informed participants about the tasks expected to be developed during the Committee session. Such tasks and activities could be consulted in the ENG16 action plan section of the Dashboard.

- 7.1. WG 1 - Visual & Physical AtoN - Malcolm Nicholson
- 7.2. WG 2 - Knowledge & Sustainability - Peter Schneider/ Jörg Unterderweide
- 7.3. WG 3 - Radionavigation Services - Alan Grant
- 7.4. WG 4 - Heritage & Culture - Peter Hill

## 8. ESTABLISH WORKING GROUPS

### 8.1 Establishing working groups

Four working groups were established, as outlined below.

Working Group		Working Group Chair	Working Group Vice Chair
WG 1	Visual & Physical AtoN	Malcolm Nicholson	Alwyn Williams
WG 2	Knowledge & Sustainability	Peter Schneider Jörg Unterderweide	
WG 3	Radionavigation Services	Alan Grant	Michael Hoppe
WG 4	The Heritage & Culture	Peter Hill	Jonghun Kim

## 9. WORKING GROUP 1 – VISUAL & PHYSICAL ATON

The working group met in person for the first time since ENG10 and was made up of 11 members and they considered 7 input papers. Some of the papers received were for information, whilst others were input to developing recommendations and guidelines. The main aim of this session was to continue the work identified in the work program and update the task register in preparation of the next work program.

### 9.1 Develop Guideline on Port Traffic Signals (Task 2.1.2)

Task is postponed until the next work programme. However, input was received to ENG16 and has been referenced in the task register.

### 9.2 Develop E-112 Leading Lights and 1023 Leading Lines into a Guideline (Task 2.1.3)

Task is postponed until the next work programme. However, input was received at ENG15 and has been referenced in the task register.

### 9.3 Update Guideline 1048 LED technologies and their use in signal lights (Task 2.1.5)

This task has been moved to the next work programme.

### 9.4 Review & update guideline 1043 on Light sources (Task 2.1.6)

Refer to 9.5 (Task 2.1.5)

### 9.5 Develop E200-3 on measurement of light into a Guideline (Task 2.2.1)

A number of input papers on this subject have been received. This work can only be started when task 2.2.2 on Marine Light Terms of Measurement has been completed. To that end all the input paper received on this topic have been placed in the task register for the next work programme.

*Action Item:*

**Lingyan Wang and Frank Hermann** are requested to submit an input paper to ENG17 on the Draft Guideline to support R0203.

## **9.6 Develop new Recommendation on Marine Light Terms of Measurement (Task 2.2.2)**

The working paper on this subject was finalised during ENG16 and is ready to go through the approval process.

*Action item:*

The **Secretariat** is requested to send the Draft Recommendation on Definitions of Marine Signal Lights Terms of Measurement (ENG16-12.1.1) to Council for approval. The ENG Committee request that should the recommendation be approved that it be an Informative recommendation until such time that the accompanying guideline is complete.

The **Secretariat** is requested to add the following definitions in the recommendation to the IALA Dictionary: Vertical Divergence, Horizontal Divergence, Specification Peak Intensity, Flash Duration, Sector Colour Boundary, Sector Intensity Boundary, Sector Width, Sector Boundary, Sector of Uncertainty.

## **9.7 Develop E200-5 on Optical Performance into a Guideline (Task 2.2.3)**

Work continued on the development of the Guideline with a view to completion. However, there are some technical checks to be finalised and therefore it was decided to move the remainder of this task to the next work programme.

*Action item:*

The **Secretariat** is requested to forward the working paper on the Guideline on Optical Performance and Calculation (ENG16-12.1.2) to ENG17.

## **9.8 Revise Guideline on effective intensity (Task 2.2.4)**

Task completed at ENG12

## **9.9 Develop Guidance on monitoring of function and degradation of AtoN light sources (Task 2.2.5)**

Moved to 2023-2027 Work Programme

## **9.10 Develop Guidance on service factors (Task 2.2.6)**

Task completed in ENG10 as it has been incorporated into Guideline G1148.

## **9.11 Develop Guidance on Colour fading of AtoN (plastic and painted) – methods to measure and assess (Task 2.2.7)**

Task completed at ENG13

## **9.12 Finish Guideline G1148 Marine Signal Lights - Calculation of Luminous Intensity and Range (Task 2.2.8)**

Task completed at ENG10.

## **9.13 Update G1041 on Sector Lights to define ‘Angle of Uncertainty’ (Task 2.2.9)**

It was agreed that G1041 was in need of a general review and that should be a work item for the next work programme.



#### 9.14 Deliver a Workshop - IALABATT/ IALALITE (Task 2.4.2)

Following the approval from Council and a submission from Australia to host the workshop, a steering committee meeting was held during ENG16. A decision to have the workshop in October 2024 was made.

### 10. WORKING GROUP 2 – KNOWLEDGE & SUSTAINABILITY

The Working Group was joined by 33 members of 15 nations (in person and online) who participated in three Task Groups. The Working Group reviewed 13 input papers. Some of these documents were for information, one was a Liaison note and the remainder were input to guideline development.

The focus at ENG16 was on finalizing the tasks 2.3.1 and 2.5.2 and the further development of task 2.5.1. (see below).

The working group started with the review of input papers.

Input paper ENG16-3.1.2.4 (Establish guidelines for safe management of lithium batteries.docx) was recognized, but it was considered to collect more information on lithium batteries before updating guideline 1067-3 Ed.3 (Electrical Energy Storage for AtoN Dec 2018).

The input papers ENG16-3.1.2.5 (Model Course Level 2\_Module12.docx), ENG16-3.1.2.5.1 (Annex module 12 Marking of waterways and fairways.doc), ENG16-3.1.2.10 (Suggestions on Training the Maintainer of AtoN for Bridge.docx) and ENG16-3.1.2.12 (Qualification and Basic Knowledge Course for Light Keepers.docx) were discussed and will be forwarded to the WWA for information. If WWA agrees, an update of lessons and the development of a new module will be undertaken at ENG17.

Input paper ENG16-3.1.2.7 (Draft Outline for New Guideline on Buoy Tender Crew Operation.docx) and the Liaison Note from ARM (ENG16-3.2.3 Liaison note to ENG regarding Buoy Tender Crew Training (ARM15-11.2.1.2)) were recognised. A responding Liaison Note to ARM suggesting that this topic is best covered by a L2 course module, written at a high level to enable each Accredited Training Organisation or individual organisation to deliver the subject matter to suit their equipment, environment and buoy fleet was prepared.

Input paper ENG16-3.1.2.6 (Use of modern equipment in traditional lighthouses.doc) was recognised and decided to forward to ENG17 for review and update of guideline 1043 (on Light sources).

Input paper ENG16-3.1.2.9 (Application of 5G technology in tidal current data collection and display in Ningbo Zhoushan Port.doc) was considered as very interesting and questions on transmitting distance of 5G (118km), cameras on buoys and cost of data transmission were discussed. It was decided to forward the document to ENG17 as input for the update of G1008 (Remote control and monitoring of AtoN May 2009) and the development of a guideline on meteorological and oceanographical data dissemination.

Input paper ENG16-3.1.2.13 (Tidal current chart drawing test by using multi-functional buoy in Shanghai port.docx) was recognised with interest and some questions were discussed, but not all could be answered. Therefore WG2 is encouraging the author to prepare a presentation for ENG17 opening plenary.

#### Action Item

*The **Secretariat** is requested to forward The Status of Distribution for the AtoN Integrated Management System in Korea (ENG16-3.1.2.2) to ENG 17 as Input paper for Task Update G1008 May 2009 Remote control and monitoring of AtoN*

*The **Secretariat** is requested to forward Model Course Level 2\_Module12 (ENG16-3.1.2.5), the Annex module 12 Marking of waterways and fairways (ENG16-3.1.2.5.1), the Suggestions on Training the Maintainer of AtoN for Bridge (ENG16-3.1.2.10) and Qualification and Basic Knowledge Course for Light Keepers (ENG16-3.1.2.12) to WWA and to ENG17.*

*The **Secretariat** is requested to forward Liaison Note on the proposal for a new guideline on buoy tender crew operation to ARM (ENG16-12.2.5).*

*The **Secretariat** is requested to forward ENG16-3.1.2.6 (Use of modern equipment in traditional lighthouses.doc) to ENG17*

The **Secretariat** is requested to forward ENG16-3.1.2.9 (Application of 5G technology in tidal current data collection and display in Ningbo Zhoushan Port.doc) to ENG17

**China MSA** is encouraged to prepare a presentation for ENG17 opening plenary on input paper ENG16-3.1.2.13 (Tidal current chart drawing test by using multi-functional buoy in Shanghai port.docx) AtoN equipment and structures exposed to extreme environmental conditions (Task 2.3.1.)

### 10.1 AtoN equipment and structures exposed to extreme environmental conditions (Task 2.3.1.)

Nine participants (in person) and one virtual attendant were working in the task group on this guideline. The guideline was finalised and is ready for council approval.

#### Action Item:

The **Secretariat** is requested to forward the draft Guideline on Extreme Environmental Conditions (ENG16-2.3.1) document to the Council for approval

### 10.2 Develop guidance quantifying characteristics to meet nautical and operational requirements and ways to verify them (Task 2.5.1)

One intersessional meeting and various other drafting sessions by TG members were completed between ENG15 and ENG16, where new text inputs were discussed and the resources section brainstormed and developed. The Task Group met twice during ENG16 working period, where the further development work on the guideline was completed. The meetings were hybrid and attended by 16 participants from 12 different countries (several online, others in person).

The document itself is very much in its infancy and some consideration will be needed to ensure the document's title is more reflective of its purpose. Due to the scale and scope of the topic there is a significant amount of duplication and overlap currently which will require editing which can be undertaken during future intersession sessions. That said all members are asked to think about any potential missing sections or content and several areas were discussed for inclusion.

Liaison Note to ARM is possibly required to advise on the content of section 3 Navigational Requirements.

All members were requested to upload buoy images that can be used in the guideline to enhance understanding of the intended reader.

Further intersessional meetings were proposed and a doodle poll will be sent to all those interested. The task group were asked to forward any draft text to the task group leaders for inclusion in the master working document.

#### Action Items

The **Secretariat** is requested to forward the draft working paper Guideline on Quantifying characteristics to meet nautical and operational requirements and ways to verify them (ENG16-12.2.4) as a working document to ENG17 Committee meeting.

The **Secretariat** is requested to send Liaison Note to ARM (ENG16-12.2.3) on quantifying characteristics to meet nautical and operational requirements and ways to verify them.

That **Committee participants** are requested to think about any potential missing sections or content and to provide pictures in the guideline on quantifying characteristics to meet nautical and operational requirements and ways to verify them (ENG16-12.2.4).

### 10.3 Radar Reflector (Task 2.5.2.)

The working paper of the guideline, which was an input paper to ENG16 since September 2022, was further developed in a small group before ENG16 started. During this, a quality control was performed. Some simulations, that were still missing, were performed by an external company and have been added to the guideline.

During ENG16 the working group had up to 20 participants. Many discussions took place about the content of some chapters. On the afternoon of October 20, 2022 a version was ready to be submitted to the Council for approval.

#### *Action Items*

*The **Secretariat** is requested to forward the draft Guideline on Radar reflectors (ENG16-12.2.1) to council for approval.*

## **11. WORKING GROUP 3 – RADIONAVIGATION SERVICES**

The WG Chair and Vice Chair express their gratitude to WG participants for their hard work and perseverance this week. The WG Chair and Vice Chair would also like to thank all of the Task Group leaders for their time and effort in progressing their work items.

As the new IALA document share will not be cleared after each meeting, working documents have been placed in a folder marked as such within each task's sub-folder.

### **11.1 Resilient PNT (Task 3.1.1)**

During this session the draft guideline on resilient PNT was reviewed and the development progressed. The latest version of the draft has been uploaded to the Fileshare and will be carried over as a working document. It is anticipated that work on this task will continue between ENG16 and ENG17 (via correspondence) with an open invitation for Committee members to make contact with Kaisu Heikonen if they wish to participate.

#### *Action item:*

*That **Committee participants** interested in supporting the development of the resilient PNT Guideline between sessions are invited to contact the task leader Kaisu Heikonen ([Kaisu.Heikonen@vayla.fi](mailto:Kaisu.Heikonen@vayla.fi))*

### **11.2 Terrestrial radionavigation systems (Task 3.2.1)**

This item has been completed.

### **11.3 R-Mode (MF) (Task 3.2.2)**

The Committee discussed the development of the draft Guideline on R-Mode implementation using MF radio beacons and VHF transmissions and agreed that a splitting of the existing guideline into two would be more beneficial according to the R-Mode standardisation process. Thus, it was agreed to further develop two guidelines:

- Guideline on MF R-Mode signal structure and navigation message.
- Guideline on implementation of MF and VDES R-Mode system and service.

Both Guidelines were further progressed according to a new structure and the appropriate content.

It is planned that the Guideline on MF R-Mode signal should be further developed intersessional with the aim to provide a mature input to ENG17. The work will be performed in correspondence between interested members. Committee members which are interested to contribute to this guideline are invited to provide their interest by E-Mail to [stefan.gewies@dlr.de](mailto:stefan.gewies@dlr.de).

Further the Committee reviewed the following input documents:

ENG16-3.1.3.7, ENG16-3.1.3.7.1 and ENG16-3.2.9 according to an IALA submission to the Joint IMO/ITU expert group. The output of this discussion is captured under task 3.6.1 below.

In addition, the Committee reviewed input paper ENG16-3.1.3.10 (Status update on Korean R-Mode test bed project) and will use the provided information within the appropriate R-Mode guidelines.

Further the Committee reviewed the input paper ENG16-3.1.3.9 (Technical implementation of VDES R-Mode). The committee was of the opinion that the content of this paper could be used for the R-Mode implementation guideline as well as for the Guideline 1158 which is hosted in the ENAV committee. Thus, a

Liaison Note was drafted to submit the input paper ENG16-3.1.3.9 to the ENAV committee for further consideration.

The Committee further reviewed ENG16-3.1.3.8 (VDES-R Advanced user technologies for alternative PNT\_VAUTAP) and ENG16-3.1.3.3 (Galileo Timing and Authentication Service) without any further action during this session.

*Action item:*

*That **Committee participants** interested in supporting the development of the R-Mode Guideline between sessions are invited to contact the task leader Stefan Gewies (Stefan.Gewies@DLR.de)*

*The **Secretariat** is requested to forward liaison note ENG16-12.3.5 “VDES R-Mode implementation” to the ENAV Committee.*

#### **11.4 R-Mode (AIS/VDES) (Task 3.2.3)**

At ENG12 it was agreed that the technical specification of R-Mode activities over AIS/VDES frequencies would be managed by the IALA ENAV Committee. The R-Mode (MF) Guideline would include operational considerations for all R-Mode configurations.

#### **11.5 Workshop on R-Mode in 2019 (Task 3.2.4)**

This item has been completed.

#### **11.6 R-Mode testbed progress coordination (Task 3.2.5)**

Nothing to report for this meeting.

#### **11.7 Develop and maintain relevant product specifications (Task 3.2.6)**

The Committee has finalised work on the S-245 (eLoran ASF data) product specification and have shared this with the Secretariat for uploading to the IALA website as a draft for testing (ED 1.0.0).

*Action item:*

*The **Secretariat** is requested to add the S-245 (ED 1.0.0) into S-200 product specification testbed (ENG16-12.3.3).*

#### **11.8 Guidance on timing and synchronisation (Task 3.2.7)**

The Committee progressed work on the Timing and Synchronisation Guideline. The latest version has been saved to the fileshare as a working paper. This work will continue into the new work period.

#### **11.9 eRacon (standard approach); Review recommendations ENAV146 & R-101 & Guideline 1010 (Task 3.3.1)**

The Committee reviewed ENG16-3.1.3.4 from China MSA and incorporated the paper’s conclusions into the on-going work to standardize Racons in-general.

The Committee reviewed the work of the ERPS Workshop (paper ENG15-3.2.8) and discussed what is needed to complete the Liaison Note to IMO on the Enhanced Radar Positioning System. It is anticipated that this Liaison Note would be an output of ENG17.

The Committee discussed the updating of existing IALA Racon documents (R0101, G1010, R0146) and noted that the work is planned for 2023-2027.

#### **11.10 Consideration on how and when to use SBAS (Task 3.4.1)**

The Committee received an update on a new work item proposal being developed for submission to IMO MSC. The aim of this document is to request a new work item on the agenda of the IMO Navigation, Communications and Search and Rescue (NCSR) sub-committee. The work item would be to develop SBAS

maritime receiver performance standards which would then support the use of SBAS on SOLAS vessels, where currently SBAS functionality exists but is not subject to maritime requirements or testing.

This proposal is being supported by many national administrations and while the document is not yet finalized, the ENG Committee recommended that IALA should support the submission.

*Action item:*

*The **Secretariat** is requested to work with international colleagues to finalise the paper on SBAS-ARAIM IMO Minimum Performance Standard (ENG16-12.3.4) and to seek Council approval when appropriate.*

#### **11.11 Review of existing DGNSS infrastructure and provision of guidance for current system (Task 3.4.2)**

At ENG15 the Committee prepared a Liaison Note to RTCM seeking support on the development of R-Mode messages within RTCM's broadcast standard. This liaison note was not approved by Council. The Committee has reviewed and updated the document, taking into account proposals from Council and believe it is now ready to share with RTCM. The Liaison Note seeks to address two aspects, one is the future need for the RTCM 2.4 broadcast standard and the second is the development of new RTCM 2.x messages in support of R-Mode.

The Guideline on DGNSS was not progressed during this meeting and will be carried over to the new work period.

*Action item:*

*The **Secretariat** is requested to forward liaison note ENG16-12.3.2 for RTCM "Multi-GNSS Corrections and R-Mode messages" to Council for approval. As this is in response to comments from C75, Council is invited to consider this out of session.*

#### **11.12 Recommendation on augmentation for maritime use (Task 3.4.3)**

This item has been completed

#### **11.13 Provide guidance, strategy and advice on new uses of marine beacon DGNSS infrastructure (Task 3.4.4.)**

This work item has been merged with Task 3.4.2 and will be closed.

#### **11.14 High accuracy systems (Task 3.4.5.)**

The Committee considered an input paper on the topic of Precise Point Positioning (PPP) and the potential for a new IALA Guideline. The Committee considered whether this topic should be considered as an amendment to the existing G1127 on "Systems and Services for high-accuracy positioning and ranging" or not.

On reflection the Committee felt that two new work items would be required in the new work period, one to provide guidance on how PPP solutions work for global systems, considering new and emerging services from GNSS constellations (i.e. Galileo's HAS and BeiDou's proposed PPP service).

The second proposed work item, following on from the first, is to consider PPP solutions and how they could be used in maritime domain and the need for standardisation.

These aspects have been captured on the work plan for the next period.

#### **11.15 Review and update current documentation under the purview of PNT WG (Task 3.5.1)**

The Committee had planned to continue the review and update to the IALA WWRNS during this period but unfortunately ran out of time. This work will be carried over to the new work period.

#### **11.16 Monitor developments in GNSS, DGNSS, radar, resilient PNT, e-Pelorus, terrestrial systems, R-Mode, inertial and any other relevant areas etc. (Task 3.5.2)**

The Committee discussed a number of general topic areas including the closure of the Canadian DGPS system, potential for re-use of the GLA DGPS infrastructure, the potential use of Earth Observation imagery to support AtoN deployment and monitoring, amongst other updates

#### 11.17 Liaison with sister organisations (IMO, ITU, RTCM etc.) on related topics (Task 3.6.1)

The Committee noted the need to update ITU M.823 and added it to activities to consider in the new work period.

The Committee reviewed an input paper from the ENAV Committee on an input paper to the Joint IMO/ITU experts group recommending that the radio regulations should be updated to recognise the positioning aspects of VDES as well as the communications aspects. A draft input was reviewed and finalised for Council approval. The joint expert group is due to meet in December 2022, with the deadline for documents early November. As such, the Committee invites Council to review this document out of session.

##### *Action item:*

*The **Secretariat** is requested to forward ENG16-12.3.1.1 “IALA input to IMO/ITU Expert group on VDES R-Mode” to the IMO following Council approval by correspondence, considering the deadline of the meeting.*

*The **Secretariat** is requested to seek a presentation slot at joint IMO/ITU Expert group meeting in December to provide an update on VDES R-Mode.*

#### 11.18 Input to MSP, Integrity considerations for resilient PNT, cybersecurity impact for PNT data, datum considerations (Task 3.7.1)

The Committee provided updates to several documents that are being developed by all of the Committees, namely:

- Cyber security Recommendation and Guideline
- Maritime Services definition document

The development of these documents are being led by the ARM Committee and liaison notes with updates have been prepared accordingly.

The Committee considered how it could support the development of the MASS Guideline, but was unable to provide an update during this meeting. This will be considered further at ENG17.

The Committee considered a Liaison Note from ENAV on its review of new technologies. It reviewed the approach and also the technologies reviewed to date and provided feedback for consideration by the ENAV Committee.

##### *Action item:*

*The **Secretariat** is requested to forward liaison note ENG16-12.3.8 “Liaison Note to ARM on Cyber Security” to the ARM Committee.*

*The **Secretariat** is requested to forward liaison note ENG16-12.3.7 “Liaison note to ARM on Maritime Services” to the ARM Committee.*

*The **Secretariat** is requested to forward liaison note ENG16-12.3.6 “Liaison note to ENAV on New Technology Review” to the ENAV Committee.*

#### 11.19 Development and review of WWA courses (Task 4.1.1)

No updates during this session.

## 12. WORKING GROUP 4 – THE HERITAGE & CULTURE

ENG WG4 – Heritage & Culture considers its overall objective to be:

*“To further the declaration and recommendations contained within the Incheon Declaration and within IALA Recommendation R1005 – ‘Conserving the built heritage of lighthouses and other aids to navigation’.*



Over the course of ENG 16, WG4 received the participation of 19 people for all or part of the WG's work (including online participants).

BAE	Yong Chan	Republic of Korea	Ministry of Oceans and Fisheries
BURNS	Gillian	Scotland	Northern Lighthouse Board
HILL	Peter	UK - England	Trinity House
KIM	Jonghun	Republic of Korea	Ministry of Oceans and Fisheries - Paichai University
KIM	Songyi	Republic of Korea	Korea Institute of Science & Technology
LAKSHMAN	Sarah-Jane	Australia	Australian Maritime Safety Authority
LAZAR	Nisrine	Morocco	Ministère de l'Équipement et de l'Eau
YOO	Naehyuk	Republic of Korea	KATON
KIM	Song Yi	Republic of Korea	KATON
Keskküla	Pärtel	Estonia	Estonian Transport Administration
CHO	YongHun	Republic of Korea	Ministry of Oceans and Fisheries
NOGUCHI	Hideki	Japan	Japan Coast Guard
RANXUAN	Ke	People's Republic of China	Navigation Institute of JiMei University
LIU	Juan	People's Republic of China	China Maritime Safety Administration (MSA)
HUSIN	Siti	Malaysia	Malaysia Marine Dept
ABDULLAH	Burhanndin	Malaysia	Malaysia Marine Dept
LAGHCHIMI	Salma	Morocco	Ministère de l'Équipement et de l'Eau
LYAZIDI	Safae	Morocco	Direction des Ports et du Domaine Public Maritime
PEEVER	Gregory	Australia	AMS

Meetings were chaired by **Peter Hill** and **Jonghun Kim** was Vice-Chair.

## 12.1 Heritage seminar (Task 2.6.5)

The Heritage Seminar Steering Group met outside of WG4 and the group were updated on progress. The seminar will now run as the first two days of the 20th IALA Conference in Windsor Convention Center, Rio de Janeiro, Brazil. Saturday May 27, and Sunday May 28 2023 under the theme Innovation for a Sustainable Future – The Heritage Perspective. A well worked up technical programme was in place with most topics and speakers confirmed. At Least 2 participants of ENG16 WG4 would be amongst them. The seminar can be attended either on its own or as part of IALA Conference.

### Action Items:

*That **Committee participants** are requested to encourage participation in the Heritage Seminar in Rio de Janeiro 2023 – both amongst those already planning to partake in the 20<sup>th</sup> IALA Conference and also amongst those with a particular interest in lighthouse heritage, culture and sustainability.*

## 12.2 Plaque for Heritage Lighthouse of the Year (IALA HLY) (Task 2.6.4)

WG4 were pleased to receive a presentation on Input paper: ENG16-3.1.4.1 from Naehyuk Yoo (Korean Institute of Aids to Navigation). The paper set out the proposed design for the plaque which would be used for the 2023 IALA HLY award and in subsequent years. It was noted that Korea generously continue to sponsor the award up until 2026. The design was well received. Comments and suggestions on the design were provided by WG4 and KATON were invited to consider these in finalising the design and to circulate amongst ENG16 WG4 participants inter-sessional.

### Action Items:

*The **Korea Institute of Aids to Navigation** is requested to expedite design and production of the plaque for IALA HLY, taking into account the suggested changes made at ENG WG4 and then to re-circulate the design for further review by ENG16 WG4 participants.*

*The Korea Institute of Aids to Navigation is requested to send the IALA HLY plaque to IALA Headquarters by end of April 2023.*

### 12.3 IALA HLY 2022 (Task 2.6.4)

WG4 were pleased to receive reports of the success of IALA HLY 2022 – Homigot Lighthouse, Korea. The award had been presented at World AtoN Day celebrations on 1<sup>st</sup> July. An Unveiling ceremony for IALA Heritage Lighthouse of the Year 2022 at Homigot Lighthouse was also organised. In all, 50 newspapers in Korea reported on the accolade, significantly raising the profile of HLY.

As reported by Korea.net, “Cheong Tae-song, director-general of the ministry's Maritime Affairs and Safety Policy Bureau, said, “With Homigot Lighthouse's selection as World Lighthouse Heritage, we will actively promote the beauty and value of our lighthouses at home and abroad and strive to utilize them as a resource for marine culture tourism.”

#### Action Items:

**Yonghun CHO (Ministry of Oceans and Fisheries of Korea)** is requested to submit an article on Homigot Lighthouse and the celebration of HLY 2022 for IALA e-Bulletin.

### 12.4 IALA HLY 2023 (Task 2.6.4)

#### 12.4.1 Nominations and means of arriving at a commendation

WG4 was delighted to note that with 13 new nominations submitted there were now 46 IALA Heritage Lighthouse on the website, originating from 20 national members, spread across 6 continents. An additional nomination was received after the 30<sup>th</sup> September deadline and this would be considered for the 2024 accolade.

All participants of WG4 were invited to complete a ranking sheet in respect to nominees. 10 Ranking sheets were received. These sheets were then collated to determine the three IALA Heritage Lighthouses that WG4 would commend. A further discussion was held to reach a consensus as to which of the three it would commend as IALA LHY 2023.

It was agreed by all participants that any one of the nominees considered warrants being an IALA HLY and it was acknowledged that comparing and contrasting lighthouses was almost an impossible task. WG4 was grateful to all who had taken part.

#### 12.4.2 The Three Lighthouses Commended for consideration at IALA HLY 2023



## Cap Spartel Lighthouse, Morocco



All lighthouses have an international dimension, but at Cap Spartel – Morocco’s oldest lighthouse, that dimension is intrinsic to its identity. Its very origins can be traced back to an international incident – the tragic sinking of the Brazilian ship *Dona Isabel* in 1860 with the loss of 250 lives. Built in an Hispanic-Moorish architectural style in the form of a square minaret, this stunning lighthouse was operational by 1864.

Standing as it does in the north-western point of Morocco and Africa, where the Mediterranean Sea meets the Atlantic Ocean (and with Europe just across the narrow Strait-of-Gibraltar), the new lighthouse would guard some of the busiest and most important shipping lanes in the world. Testimony to that international importance and prestige can be found in the 1865 convention between Morocco and 10 other nations for the operating and maintenance costs of the lighthouse. Cap Spartel’s modern history retains an international flavour, having an innovative lighthouse twinning agreement with Mamelles lighthouse in Senegal.

Featuring on stamps and banknotes Cap Spartel lighthouse remains an emblematic icon of the city of Tangier, a source of national pride and a symbol recognized by all Moroccans. An excellent website makes it clear that public accessibility and education have a strong focus here – for all the family. The lighthouse building houses the Museum of Moroccan lighthouses, offering an educational experience on the maritime history of Morocco and promoting the role of navigation aids and their technical evolution over time.

Cap Spartel is an exemplary example of what it means to be an IALA Heritage Lighthouse.

## Lizard Lighthouse, England



Lizard Lighthouse's antiquity takes us back before the days of rotating optics when a distinctive character of a light could only be created either through the periodicity of the light – or by having more than one light. For this reason, Lizard Lighthouse acquired two towers in 1751. The two towers with their coal braziers necessitated more lighthouse keepers, and 7 cottages were built to accommodate them, making the site a hive of activity.

Once a rotating optic was introduced to the Eastern tower in 1903 (for a time making it the most powerful lighthouse in the world), the Western tower became redundant. In time, the fog signal and engine rooms also became redundant and on automation, the 7 cottages were no longer essential. With such a large but under-utilised compound, a comprehensive plan for the re-purposing of these parts of the site was put together. The engine room (still with much of its historic plant) was made into a heritage centre from which the public could tour the operational tower. The cottages were converted to holiday cottages. The expansive lawns were featured with buoys. Public toilets were created and the wider site is again the hive of activity that it used to be. This beautiful, ancient and fascinating lighthouse has become an essential stop for visitors at mainland Britain's most southerly point. In this site can be seen the story of lighthouse development over hundreds of years whilst in its exhibits the story is told of the continued importance of AtoN.

## Kõpu Lighthouse, Estonia



That Kõpu lighthouse is considered to be the third oldest operating lighthouse in the world (dating back to 1531) is in itself good reason to be recognised as an IALA Heritage Lighthouse. Its unusual and striking appearance is certainly another – with a tetrahedral prism shape and with massive buttresses in the directions of principal divisions of the compass. Its sheer size enabled it to be seen, even unlit (as it was for its first 100 or so years) from considerable distance.

The tower itself is complemented by four ancillary buildings (generator building, cellar, sauna(!) and lighthouse keeper's living quarters) – all of which are listed as National Cultural Heritage. Extensive conservation work has been undertaken to conserve this unique lighthouse for future generations.

Few (if any) other lighthouses have gone from being a medieval landmark up to a modern electrified lighthouse, and all the stages in-between as it has adapted through the ages to take advantage of changing technology and requirements. Such a lineage inevitably connects Kõpu lighthouse with significant developments in European history, adding to its international importance.

The light is produced with the only rotating lantern in Estonian lighthouses and its rotating beam is a characteristic feature that is of particular significance to local communities. Kõpu lighthouse is the first and the most visited of the twelve lighthouses opened for public in Estonia and it was voted as Estonia's favourite lighthouse in polls conducted by the EMA in 2018. Tourism is one of the major sources of income for the local communities and Kõpu lighthouse is probably one of the main reasons for sightseers to visit Hiiumaa island – facts that further highlight the value of lighthouse heritage.

**After some discussion, ENG16 WG4 determined to commend Cap Spartel lighthouse, Morocco to IALA Council as IALA Heritage Lighthouse of the Year 2023.**

### *Action Items:*

*The **Secretariat** is requested to send to the Council the commendation of ENG16 as Heritage Lighthouse of the Year 2023 at Council 76 in December 2022.*

*The **Secretariat** is requested to organise a formal presentation of the IALA HLY award to the recipient at a suitable event to which the recipient is in attendance.*

## **12.5 IALA Heritage Lighthouse of the Year (IALA HLY) 2024 and beyond (Task 2.6.4)**



The deadline for nominations to be considered for IALA HLY 2024 will be 30<sup>th</sup> September 2023.

*Action Items:*

*The **Secretariat** is requested to send an e-bulletin out in August 2023 reminding members of the opportunity to nominate lighthouses for IALA HLY and of the 30<sup>th</sup> September deadline for doing so to ensure consideration for the 2024 award.*

*That **Committee participants** are requested to raise awareness of the IALA HLY award in their respective organisations and to submit nominations for lighthouses they consider to have heritage or cultural value.*

## **12.6 Publicising / Raising the Profile of IALA HLY**

A draft letter was produced by Gillian Burns (Northern Lighthouse Board) addressed to the IMO and/or other related organisations and requesting that IALA Heritage Lighthouse of the Year accolade and IALAs Heritage & Culture website amongst its member organisations.

*Action Items:*

*The **Secretariat** is requested to consider the best way to promote the profile of IALA HLY based upon a draft that will be provided to them by WG4 to IMO and other related organisations.*

## **12.7 Heritage Lighthouse Database and Cybercentre (tasks now combined and re-named 'IALA Heritage Webpage') (Task 2.6.3.& 2.6.4)**

The IALA HLY webpages were updated to incorporate the 13 new IALA Heritage Lighthouses that had been submitted. The editors continue to be Peter Hill (Trinity House), *Gillian Burns (NLB)*, and Songyi KIM (Korea Institute of Aids to Navigation)

Training for Songyi KIM in editing the website was discussed. This would be best achieved through talking through the process with an actual nomination to input and either Gillian Burns or Peter Hill would endeavour to do this

*Action Items:*

***Gillian Burns (NLB) and Songyi KIM (Korea Institute of Aids to Navigation)** are requested (subject to required training) to continue to ensure that the IALA Heritage website is up-to-date, accurate and complete, directly undertaking editorial changes and liaising with IALA Secretariat and with Peter Hill (WG4 Chair) as necessary.*

*The **Secretariat** is requested to assist the editing team with the IALA Heritage website editing as required.*

## **12.8 Celebrating the 200 Year Anniversary (in 2023) of Fresnel's work at Cordouan Lighthouse**

Following a presentation given at ENG15 by Jacques Manchard on the subject of the 200 year anniversary of Fresnel's work at Cordouan Lighthouse, France, further information had been provided by Mr Manchard about the development of those plans.

Consideration was being given to schedule events for the general public near Cordouan, just before or after the next meeting of ENG 17 - either the weekend preceding it (October 14 and 15, 2023) or the following one (October 21 and 22, 2023) so as to allow ENG 17 participants the opportunity to more easily participate. Additionally, a one-day seminar was being considered either on Friday October 13, 2023, or on Monday October 23, 2023, highlighting both Fresnel and the work he has conducted but also current developments in terms of light and other current topics either in the field of aids to navigation or in other technical fields. The location of this event remains to be determined. WG4 welcomed these events and the efforts made to connect with ENG17.

*Action Items:*

*That **Committee participants** are requested to consider taking part in celebrations in 2023 for the 200th anniversary of Fresnel's work on lenses at Cordouan lighthouse scheduled immediately prior to or after ENG17.*

The **Secretariat** is requested to notify member organisations via the e-bulletin of the details of celebrations in 2023 for the 200<sup>th</sup> anniversary of Fresnel's work on lenses at Cordouan lighthouse scheduled immediately prior to or after ENG17 - should they be confirmed to and communicated to IALA Secretariat.

## 12.9 Task Plan 2023 – 2027 (for note only)

WG 4 considered their proposed tasks for the Task Plan 2023-2027 and concluded that the should be;

- Continuation of the IALA HLY Award
- Continued updating of the IALA Heritage Webpages
- Review of existing Heritage IALA Technical Documents
- Production of a book celebrating IALA HLY

Initial thoughts are that this would comprise the first tranche of lighthouses nominated for IALA HLY Award and appearing on the IALA website as 'heritage lighthouses'. Subsequent volumes in a future task period would be an option as the numbers expand.

- Produce Technical or Guidance document on 'good practice in modernising heritage lighthouses whilst minimising negative heritage impact'

Acknowledging that the very best thing for a heritage lighthouse is to continue to be fit for purposes and in operational use, this document will examine the best practice in balancing heritage impact when undertaking modernisation and include useful case studies of where both objectives have been achieved in harmony.

## 12.10 Damage to Lighthouse Heritage (for note only)

WG4 were saddened by recent reports of the damage or destruction of two lighthouses Adzhigol Lighthouse and the Khablovsky Rear Lighthouse in Ukraine as a result of the ongoing war



### 13. REVIEW OF OUTPUT AND WORKING PAPERS

The Committee reviewed and endorsed the reports of each Working Group. The Committee approved the output and working documents as indicated in ANNEX D.

### 14. REVIEW OF SESSION REPORT

The report of the meeting (ENG16-14.1) was considered and approved. Committee Participants were requested to advise any corrections/amendments within one week, following which the final version of the report will be issued via the IALA web site.

#### *Action item:*

*The **Secretariat** is requested to forward the summary of the ENG16 Committee report (ENG16-14.1) to Council to note.*

### 15. DATE AND VENUE OF NEXT MEETING

The next session of the ENG Committee is planned to be held from 16 to 20 October 2023 at Headquarters, Saint Germain-en-Laye. Other IALA events will be publicised on the IALA website.

### 16. CLOSE OF THE MEETING

The Committee Chairman thanked the Vice-Chair, working group Chairs and all Participants for their hard work and output during the session and the four-year work period. He thanked the IALA Secretariat for their support. Secretary-General celebrated the face-to-face meeting and good outputs from ENG16, now proceeding to Council for approval. The work has progressed very conveniently virtually but as an international organisation, the preferred option will be to continue organising physical and hybrid meetings. Francis Zachariae congratulated all the work done during this work plan having in mind the difficult time during the covid-19. The Secretary General also thanked a lot the role and work done by Simon Millyard as Chair of the ENG. Francis Zachariae welcomed all the participants to the IALA Conference in Rio de Janeiro next May 27 to the June 03, 2023. The next ENG17 Committee will take place in Saint-Germain-en-Laye (16 to 20 October 2023).

### 17. LIST OF ANNEXES

- 1     Agenda  
      A copy of the agenda is at ANNEX A.
- 2     Participants  
      A list of participants is at ANNEX B.
- 3     Input Papers  
      A list of input papers is at ANNEX C.
- 4     Output and Working papers  
      A list of output and working papers is at ANNEX D.
- 5     Action Items  
      A list of action items is at ANNEX E.

## AGENDA



# ANNEX A 16<sup>th</sup> Meeting of the AtoN Engineering and Sustainability Committee (ENG16)

## AGENDA

### Opening Plenary

- 2. Introduction
  - 2.1. Welcome address from the Deputy Secretary-General
  - 2.2. Approval of the agenda Simon Millyard
  - 2.3. Apologies and Introductions Simon Millyard
  - 2.4. Working arrangements Jaime Alvarez
  - 2.5. Style Guide Jaime Alvarez
  - 2.6. ENG committee structure Simon Millyard
    - 2.6.1. WG1 Overview
    - 2.6.2. WG2 Overview
    - 2.6.3. WG3 Overview
    - 2.6.4. WG4 Overview
- 3. Review of action items from last meeting Simon Millyard / Jaime Alvarez
  - 3.1. Review of action items from ENG15
- 4. Review of input papers Simon Millyard
  - 4.1. Review of input papers to ENG16
  - 4.2. Input papers for action/allocation
- 5. Reports from other bodies
  - 5.1. IALA
    - 5.1.1. IALA Council
      - 5.1.1.1. Documents approved by Council Minsu Jeon
      - 5.1.1.2. Heritage Lighthouse Award Peter Hill
      - 5.1.1.3. Document catalogue Minsu Jeon
    - 5.1.2. IALA Policy Advisory Panel (PAP)
      - 5.1.2.1. Sustainability Simon Millyard
      - 5.1.2.2. 2023-2027 Work Plan Michel Cousquer
  - 5.2. Update on MASS task group Simon Millyard
  - 5.3. IMO Minsu Jeon
  - 5.4. IHO Minsu Jeon
  - 5.5. ITU Minsu Jeon

- |      |                         |                |
|------|-------------------------|----------------|
| 5.6. | RTCM                    | Alan Grant     |
| 5.7. | PIANC                   | Minsu Jeon     |
| 5.8. | CIE                     | Alwyn Williams |
| 5.9. | ESBN Tsunami monitoring | Minsu Jeon     |
6. Advertising Online Presentations (planned during the opening plenary and the working period)
    - 6.1. Hidrovia – Installation task of a special ODAS speque buoy at the limit with Ocean Atlantic (Mariano Marpegan)
    - 6.2. GMV – Resilient PNT for the Black Sea and Danube region (Florin Mistrapau)
    - 6.3. KAtON – Use of lithium batteries for AtoN (Marticia Jo)
    - 6.4. Working group presentations:
      - 6.4.1. ESSP – EGNOS performance in Baltic Sea (Rodrigo Gonzalez - Tuesday 18 – 09.00 LT Paris)
      - 6.4.2. EUSPA – Authentication OSNMA (Ana Senado - Wednesday 19 - 09.00 LT Paris)
      - 6.4.3. GMV – OSNMA tests (Marcos Lopez / Héctor Llorca – Wednesday 19 – 09.20 LT Paris)
      - 6.4.4. Marinha Do Brazil – IALA Conference 2023 in Rio de Janeiro (Alberto Piovesana)
  7. Overview of planned work for ENG15
 

7.1.	WG 1 - Visual & Physical AtoN	Malcolm Nicholson
7.2.	WG 2 - Knowledge & Sustainability	Peter Schneider/ Jörg Unterderweide
7.3.	WG 3 - Radionavigation Services	Alan Grant
7.4.	WG 4 - Heritage	Peter Hill
  8. Establish Working Groups and Task Groups
  9. END OF OPENING PLENARY
  10. Working Groups/Task Groups progress work plan
  11. CLOSING PLENARY
  12. Review of output and working papers
  13. Review of session report
  14. Date and venue of next meeting
  15. Close of meeting
 

Simon Millyard
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## LIST OF PARTICIPANTS

The list of ENG16 registered participants is available through this link: <https://www.iala-aism.org/committee-dashboards/eng-dashboard/resources-eng/>

## ANNEX B

## LIST OF INPUT PAPERS

All papers were posted to the Committee website

Meeting	Agenda Item	Output Paper Title	Source	Action
ENG16- ANNEX C	1.2.1	Draft Agenda	IALA Secretariat	All
ENG16-	2.1	Report of ENG15 (ENG15-14.1)	IALA Secretariat	All
ENG16-	2.1.1	Review of action items from ENG15	IALA Secretariat	All
ENG16-	3.0	Input paper Committee meeting template	IALA Secretariat	All
ENG16-	3.0.1	List of Input papers	IALA Secretariat	All
ENG16-	3.1.1.1	Design of visual signal stations	WSV	WG1
ENG16-	3.1.1.1.1	Annex to the design of visual signal stations for port traffic signals	WSV	WG1
ENG16-	3.1.1.2	Standard Measurement Conditions	GRAD	WG1
ENG16-	3.1.1.3	Guidelines to Support Recommendation R0203	GRAD	WG1
ENG16-	3.1.1.4	Establishment of Optical Performance Standards for Bridge Lantern to Improve Visibility	K-AtoN	WG1
ENG16-	3.1.1.5	Guideline on light measurement_Goniophotometry of marine signal lights	WSV	WG1
ENG16-	3.1.1.5.1	Annex on goniophotometry	WSV	WG1
ENG16-	3.1.2	ENG16 WG2 working program	WG2 Chairs	WG2
ENG16-	3.1.2.1	WG2 overview	WG2 Chairs	WG2
ENG16-	3.1.2.2	The Status of Distribution for the AtoN Integrated Management System in Korea	K-AtoN	WG2
ENG16-	3.1.2.3	Draft Guideline AtoN equipment exposed to Extreme Environmental Conditions_sept22	ENG15	WG2
ENG16-	3.1.2.4	Establish guidelines for safe management of lithium batteries	Quantum Solution	WG2
ENG16-	3.1.2.5	Model Course Level 2_Module12	MSM	WG2
ENG16-	3.1.2.5.1	Annex module 12 Beaconing of waterways and fairways	MSM	WG2
ENG16-	3.1.2.6	Use of modern equipment in traditional lighthouses	China MSA	WG2
ENG16-	3.1.2.7	Draft Outline for New Guideline on Buoy Tender Crew Operation	China MSA	WG2
ENG16-	3.1.2.8	Draft Chapter 12 Identifying buoy characteristics to meet navigational and operational requirements	China MSA	WG2
ENG16-	3.1.2.9	Application of 5G technology in tidal current data collection and display in Ningbo Zhoushan Port	China MSA	WG2
ENG16-	3.1.2.10	Suggestions on Training the Maintenaner of AtoN for Bridge	China MSA	WG2

ENG16-	3.1.2.11	New guideline on radar reflector (reflection) properties	WG2 Chairs	WG2
ENG16-	3.1.2.11.1	Annex Guideline on Radar Reflectors	WG2 Chairs	WG2
ENG16-	3.1.2.12	Qualification and Basic Knowledge Course for Light Keepers	GEOCUBA Estudios Marinos, Cuba	WG2
ENG16-	3.1.2.13	Tidal current chart drawing test by using multi-functional buoy in Shanghai port	China MSA	WG2
ENG16-	3.1.3	Plan for WG3 work over the ENG16 period	WG3 Chair	WG3
ENG16-	3.1.3.1	ENG30-3.1.3.1 IALA Guideline on Resilient PNT WP_July22	ENG15	WG3
ENG16-	3.1.3.1.1	ENG30-3.1.3.1 IALA Guideline on Resilient PNT WP_July22_clean	ENG15	WG3
ENG16-	3.1.3.2	Update on Satellite-based Radionavigation Service Plan in Republic of Korea	KRISO / MOF	WG3
ENG16-	3.1.3.3	Galileo Timing and Authentication Service	EUSPA	WG3
ENG16-	3.1.3.4	Proposal on Promoting the Standardization of ERPS	China MSA	WG3
ENG16-	3.1.3.4.1	Annex1 Information of China transportation industry standard Navigation radar on inland waterway vessels	China MSA	WG3
ENG16-	3.1.3.4.2	Annex2 Draft Proposal on R0101 Marine radar beacons modification	China MSA	WG3
ENG16-	3.1.3.5	OSNMA Implementation on Maritime GNSS Receiver	GMV / EUSPA	WG3
ENG16-	3.1.3.6	Introduction of BDS PPP Service	China MSA	WG3
ENG16-	3.1.3.7	Input paper on VDES R-Mode proposal on IMO WRC 23 Joint IMO ITU EG	Michael Hoppe, Stefan Bober, Ronald Raulefs	WG3
ENG16-	3.1.3.7.1	IALA input on VDES R-Mode Agenda10WRC23 Annex	Michael Hoppe, Stefan Bober, Ronald Raulefs	WG3
ENG16-	3.1.3.8	VDES-R Advanced user technologies for alternative PNT_VAUTAP	IALA Secretariat (Telespazio)	WG3
ENG16-	3.1.3.9	Technical implementation of VDES R-Mode	China MSA	WG3
ENG16-	3.1.3.10	Status update on Korean R-Mode test bed project	KRISO / MOF / KOMESTA	WG3
ENG16-	3.1.3.11	eLoran ASF data Product Specification Development	KRISO / MOF / KOMESTA	WG3
ENG16-	3.1.3.11.1	S-245 eLoran ASF data Product Specification_ed.1.0	KRISO / MOF / KOMESTA	WG3
ENG16-	3.1.4	Plan for WG4 over ENG16	ENG Chair	All
ENG16-	3.1.4.1	The Plaque Design of IALA Heritage Lighthouse of the Year	ENG Chair	All
ENG16-	3.2.1	The Open Digital Incubator Initiative	IALA Secretariat	All

ENG16-	3.2.2	Report on the Joint IHO IALA Workshop S-100 S-200 Product Specification Development & Portrayal	IALA Secretariat	All
ENG16-	3.2.3	Liaison note to ENG regarding Buoy Tender Crew Training (ARM15-11.2.1.2)	ARM	All
ENG16-	3.2.4	Liaison note from ARM to all committees on cyber security (ARM15-11.3.1.1)	ARM	All
ENG16-	3.2.5	Liaison Note to re Task 1.2.5 Implications of MASS from a VTS Perspective (VTS52-13.1.1.5 )	VTS	All
ENG16-	3.2.5.1	WP TG.1.2.5 Discussion paper - Implications of MASS from a VTS Perspective (VTS52-13.1.1.5.1)	VTS	All
ENG16-	3.2.5.2	WG1 - Report from TG1.2.5 and TG1.4.3 Joint Session (VTS52-13.1.1.5.2)	VTS	All
ENG16-	3.2.6	Liaison Note to all committees re Task 1.4.3 Future VTS (VTS52-13.1.1.6)	VTS	All
ENG16-	3.2.6.1	WP Task 1.4.3 Future VTS Discussion Paper (VTS52-13.1.1.6.1)	VTS	All
ENG16-	3.2.6.2	WG1 - Report from TG1.2.5 and TG1.4.3 Joint Session (VTS52-13.1.1.6.2 )	VTS	All
ENG16-	3.2.7	Liaison note to PAP, MTF and all committees on MASS	VTS	All
ENG16-	3.2.7.1	Discussion paper - Implications of MASS from a VTS Perspective	VTS	All
ENG16-	3.2.8	Liaison note to all Committees on New Technologie Review	ENAV30	All
ENG16-	3.2.9	Liaison note to ENG on VDES R-mode	ENAV30	All
ENG16-	4.1.1	Final Report Council75 C75-19.1	Council	All
ENG16-	4.1.1.3	Technical documents Catalogue Septembre 2022	IALA Secretariat	All
ENG16-	4.1.2.1	Contribution to the development of the description of the maritime services	PAP	All
ENG16-	4.1.2.2	Committee work programme 2023-2027 post pap PAP47-7.1.2	PAP	All
ENG16-	4.1.2.2.1	Work plan draft 2023 2027 SPM updates at ENG15	ENG15	All
ENG16-	4.2.1	MASS input to ENG16	ENG Chair	All
ENG16-	4.2.2	IALA guideline on developments and implications of maritime autonomous surface ships for coastal authorities	MASS TF	All
ENG16-	4.2.3	MASS roadmap	MASS TF	All
ENG16-	4.2.4	Draft Report 4th session MASS Task Force Meeting	MASS TF	All

## LIST OF OUTPUT AND WORKING PAPERS

**Output documents** are submitted for review/action by a body other than the Committee initiating the document.

ANNEX D

Meeting	Agenda Item	Output Paper Title	Source	Action
ENG16-	12.1.1	Draft Recommendation R0203 Ed.2	ENG16	Council
ENG16-	12.2.1	Draft Guideline on Radar Reflectors	ENG16	Council
ENG16-	12.2.2	Draft Guideline AtoN Equipment and Structures Exposed to Extreme Environmental Conditions	ENG16	Council
ENG16-	12.2.3	Liaison note to ARM on Navigational Requirements and Considerations for Establishment of Buoyage	ENG16	ARM
ENG16-	12.2.5	Liaison note to ARM regarding Buoy Tender Crew Training	ENG16	ARM
ENG16-	12.3.1	Cover note on development of the draft IMO position on world radiocommunication conference 2023 (WRC-23) agenda item 10	ENG16	Council
ENG16-	12.3.1.1	Development of the draft IMO position on World Radiocommunication Conference 2023 (WRC-23) Agenda item 10	ENG16	Council
ENG16-	12.3.2	Liaison note to RTCM SC104	ENG16	Council
ENG16-	12.3.3	S-245 eLoran ASF data Product Specification_ed.1.0	ENG16	Council
ENG16-	12.3.4	SBAS-ARAIM IMO Minimum Performance Standard_v0.1	ENG16	Council
ENG16-	12.3.5	Liaison note to ENAV on VDES R-Mode Implementation	ENG16	ENAV
ENG16-	12.3.6	Liaison note to ENAV on New Technology Review	ENG16	ENAV
ENG16-	12.3.7	Liaison note to ARM on Maritime Services	ENG16	ARM
ENG16-	12.3.7.1	draft Maritime Service 17 AtoN v.0.2	ENG16	ARM
ENG16-	12.3.8	Liaison note to ARM on cyber security (documents embedded)	ENG16	ARM

**Working papers** will remain within the Committee for further review during ENG17.

Meeting	Agenda Item	Output Paper Title	Source	Action
ENG15	12.1.2	WP On Estimation of Optical Performance	WG1	ENG17
ENG15	12.2.4	Draft Guideline guidance quantifying characteristics to meet nautical and operational requirements and ways to verify them	WG2	ENG17

## ACTION ITEMS

### *Action Items for Secretariat*

- ANNEX E
1. The **Secretariat** is requested to send the Draft Recommendation on Definitions of Marine Signal Lights Terms of Measurement (ENG16-12.1.1) to Council for approval. The ENG Committee request that should the recommendation be approved that it be an Informative recommendation until such time that the accompanying guideline is complete. 24
  2. The **Secretariat** is requested to add the following definitions in the recommendation to the IALA Dictionary: Vertical Divergence, Horizontal Divergence, Specification Peak Intensity, Flash Duration, Sector Colour Boundary, Sector Intensity Boundary, Sector Width, Sector Boundary, Sector of Uncertainty. 24
  3. The **Secretariat** is requested to forward the working paper on the Guideline on Optical Performance and Calculation (ENG16-12.1.2) to ENG17. 24
  4. The **Secretariat** is requested to forward The Status of Distribution for the AtoN Integrated Management System in Korea (ENG16-3.1.2.2) to ENG 17 as Input paper for Task Update G1008 May 2009 Remote control and monitoring of AtoN 25
  5. The **Secretariat** is requested to forward Model Course Level 2\_Module12 (ENG16-3.1.2.5), the Annex module 12 Marking of waterways and fairways (ENG16-3.1.2.5.1), the Suggestions on Training the Maintainer of AtoN for Bridge (ENG16-3.1.2.5.1) and Qualification and Basic Knowledge Course for Light Keepers (ENG16-3.1.2.5.1) to WWA and to ENG17. 25
  6. The **Secretariat** is requested to forward Liaison Note on the proposal for a new guideline on buoy tender crew operation to ARM. 25
  7. The **Secretariat** is requested to forward ENG16-3.1.2.6 (Use of modern equipment in traditional lighthouses.doc) to ENG17 25
  8. The **Secretariat** is requested to forward ENG16-3.1.2.9 (Application of 5G technology in tidal current data collection and display in Ningbo Zhoushan Port.doc) to ENG17 26
  9. The **Secretariat** is requested to forward the draft Guideline on Extreme Environmental Conditions (ENG16-2.3.1) document to the Council for approval 26
  10. The **Secretariat** is requested to forward the draft working paper Guideline on Quantifying characteristics to meet nautical and operational requirements and ways to verify them as a working document to ENG17 Committee meeting. 26
  11. The **Secretariat** is requested to send Liaison Note to ARM (ENG16-12.2.3) on quantifying characteristics to meet nautical and operational requirements and ways to verify them. 26
  12. The **Secretariat** is requested to forward the draft Guideline on Radar reflectors (ENG16-12.2.1) to council for approval. 27
  13. The **Secretariat** is requested to forward liaison note ENG16-12.3.5 “VDES R-Mode implementation” to the ENAV Committee. 28
  14. The **Secretariat** is requested to add the S-245 (ED 1.0.0) into S-200 product specification testbed (ENG16-12.3.3). 28
  15. The **Secretariat** is requested to work with international colleagues to finalise the paper on SBAS-ARAIM IMO Minimum Performance Standard (ENG16-12.3.4) and to seek Council approval when appropriate. 29
  16. The **Secretariat** is requested to forward liaison note ENG16-12.3.2 for RTCM “Multi-GNSS Corrections and R-Mode messages” to Council for approval. As this is in response to comments from C75, Council is invited to consider this out of session. 29

17. The **Secretariat** is requested to forward ENG16-12.3.1.1 “IALA input to IMO/ITU Expert group on VDES R-Mode” to the IMO following Council approval by correspondence, considering the deadline of the meeting. 30
18. The **Secretariat** is requested to seek a presentation slot at joint IMO/ITU Expert group meeting in December to provide an update on VDES R-Mode. 30
19. The **Secretariat** is requested to forward liaison note ENG16-12.3.8 “Liaison Note to ARM on Cyber Security” to the ARM Committee. 30
20. The **Secretariat** is requested to forward liaison note ENG16-12.3.7 “Liaison note to ARM on Maritime Services” to the ARM Committee. 30
21. The **Secretariat** is requested to forward liaison note ENG16-12.3.6 “Liaison note to ENAV on New Technology Review” to the ENAV Committee. 30
22. The **Secretariat** is requested to send to the Council the commendation of ENG16 as Heritage Lighthouse of the Year 2023 at Council 76 in December 2022. 35
23. The **Secretariat** is requested to organise a formal presentation of the IALA HLY award to the recipient at a suitable event to which the recipient is in attendance. 35
24. The **Secretariat** is requested to send an e-bulletin out in August 2023 reminding members of the opportunity to nominate lighthouses for IALA HLY and of the 30<sup>th</sup> September deadline for doing so to ensure consideration for the 2024 award. 36
25. That **Committee participants** are requested to raise awareness of the IALA HLY award in their respective organisations and to submit nominations for lighthouses they consider to have heritage or cultural value. 36
26. The **Secretariat** is requested to consider the best way to promote the profile of IALA HLY based upon a draft that will be provided to them by WG4 to IMO and other related organisations. 36
27. The **Secretariat** is requested to assist the editing team with the IALA Heritage website editing as required. 36
28. The **Secretariat** is requested to notify member organisations via the e-bulletin of the details of celebrations in 2023 for the 200<sup>th</sup> anniversary of Fresnel’s work on lenses at Cordouan lighthouse scheduled immediately prior to or after ENG17 - should they be confirmed to and communicated to IALA Secretariat. 37
29. The **Secretariat** is requested to forward the summary of the ENG15 Committee report (ENG16-14.1) to Council to note. 38

#### *Action Items for Participants*

30. **Lingyan Wang** and **Frank Hermann** are requested to submit an input paper to ENG17 on the Draft Guideline to support R0203. 24
31. **China MSA** is encouraged to prepare a presentation for ENG17 opening plenary on input paper ENG16-3.1.2.13 (Tidal current chart drawing test by using multi-functional buoy in Shanghai port.docx) AtoN equipment and structures exposed to extreme environmental conditions (Task 2.3.1.) 26
32. That **Committee participants** are requested to think about any potential missing sections or content and to provide pictures. 26
33. That **Committee participants** interested in supporting the development of the resilient PNT Guideline between sessions are invited to contact the task leader Kaisu Heikonen (Kaisu.Heikonen@vayla.fi) 27
34. That **Committee participants** interested in supporting the development of the R-Mode Guideline between sessions are invited to contact the task leader Stefan Gewies (Stefan.Gewies@DLR.de) 28



35. That **Committee participants** are requested to encourage participation in the Heritage Seminar in Rio de Janeiro 2023 – both amongst those already planning to partake in the 20<sup>th</sup> IALA Conference and also amongst those with a particular interest in lighthouse heritage, culture and sustainability. 31
36. The **Korea Institute of Aids to Navigation** is requested to expedite design and production of the plaque for IALA HLY, taking into account the suggested changes made at ENG WG4 and then to re-circulate the design for further review by ENG16 WG4 participants. 31
37. The **Korea Institute of Aids to Navigation** is requested to send the IALA HLY plaque to IALA Headquarters by end of April 2023. 32
38. **Yonghun CHO (Ministry of Oceans and Fisheries of Korea)** is requested to submit an article on Homigot Lighthouse and the celebration of HLY 2022 for IALA e-Bulletin. 32
39. That **Committee participants** are requested to raise awareness of the IALA HLY award in their respective organisations and to submit nominations for lighthouses they consider to have heritage or cultural value. 36
40. **Gillian Burns (NLB) and Songyi KIM (Korea Institute of Aids to Navigation)** are requested (subject to required training) to continue to ensure that the IALA Heritage website is up-to-date, accurate and complete, directly undertaking editorial changes and liaising with IALA Secretariat and with Peter Hill (WG4 Chair) as necessary. 36
41. That **Committee participants** are requested to consider taking part in celebrations in 2023 for the 200th anniversary of Fresnel's work on lenses at Cordouan lighthouse scheduled immediately prior to or after ENG17. 36



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International Association of Marine Aids to Navigation and Lighthouse Authorities  
Association Internationale de Signalisation Maritime