REPORT ON A TRAINING SEMINAR ON THE IALA RISK MANAGEMENT TOOLBOX

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CONTENTS

This report includes details of the programme, a list of participants and final recommendations arising from the annual 5 day training seminar on the IALA Risk Management Toolbox held in China 2017.

1. Background and Objective

The sixth annual IALA Risk Management Toolbox Seminar delivered by the IALA World-Wide Academy was held in China from 11 till 15 September 2017. It was delivered in conjunction with China Maritime Safety Administration (MSA). The event took place at Jimei University at Xiamen, China and was attended by 40 participants from 14 countries. In addition to the host nation, these were: Fiji, Australia, Republic of Korea, France, Hongkong, Cambodia, Vietnam, Brunei Darussalam, Singapore, Brazil, Myanmar, Indonesia, Ivory Coast and Canada. A full list of participants is at Annex B.

The seminar aimed firstly to familiarize participants with the PAWSA and Simulation components of the IALA Risk Management Toolbox before providing competency in the use of an IWRAP Mk2 model; a satisfactory understanding of simulation techniques and PAWSA and how the components of the toolbox complement each other.

2. Progress of the Seminar

Day 1 – Monday 11 September 2017

The seminar was opened formally at 0900 by Mr. Qingbiao Li, President of Jimei Univerity. The second speech was delivered by Mr. Ruqing Xu, Director General of China Maritime Safety Administration. The Secretary-General of IALA, Francis Zachariae then took the floor explained the purpose of the seminar and gave a short introduction on the work of IALA. The last keynote speaker was Mr. Omar Frits Eriksson, Dean of the IALA World-Wide Academy.

After the speeches Mr. Qingbiao Li then presented to Mr. Zachariae and Mr. Eriksson a Certificate of Visiting Professor.

Session 2: Introduction to IALA and the IALA World-Wide Academy (IALA WWA)
Obligations under SOLAS Ch V 12; 13 (Programme Manager IALA WWA Gerardine Delanoye)

Mrs. Gerardine Delanoye, the Programme Manager of the IALA World-Wide Academy, delivered her first presentation on IALA which covered its aim and purposes, and its important motto: "successful voyages, sustainable planet". She explained the work of IALA via the Technical Committees and its publications which is the backbone of IALA. She looked closer to the definition of Aids to Navigation. She then briefed on the function and work of the Academy, and its training activity. She also explained the advantages of the planned move to an Intergovernmental Organization Status. Mrs. Delanoye then moved to the Academy's capacity building activities.

The next presentation, delivered by Mrs. Delanoye, was on the obligations of Coastal States under the SOLAS convention (Safety of Life at Sea). She highlighted SOLAS Chapter V Regulation 13 on the establishment and operation of Aids to Navigation (AtoN) before drawing attention to IMO SN.1/Circ 296 which endorsed the IALA Risk Management Toolbox. Mrs. Delanoye covered other important regulations in SOLAS Chapter V before moving on to the importance of national legislation which should make clear who is responsible for the provision of AtoN.

Session 3: Introduction to the IALA Risk Management Toolbox (Omar Frits Eriksson)

Mr. Eriksson then introduced the three components in the IALA Risk Management Toolbox (the quantitative tool IWRAP Mk 2; the qualitative tool PAWSA and simulation) before explaining theoretical background to each. He explained the concept of Risk with some general examples. He highlighted that IWRAP Mk2 focused only on the probabilities of groundings and collisions, not the consequences. Unlike IWRAP Mk2, PAWSA considers both probability and consequence, using a methodical analytical approach to the management of risk. Simulation in risk management is a combination of traditional ship simulators and numerical navigators. Mr. Eriksson pointed out the importance of the development of AIS data as it is a very valuable tool to know the volume of traffic and to know the behavior of vessels.
He drew the attention to the related IALA publication on Risk management being : IALA recommendation *0-134 on the IALA Risk Management Tool for Ports and Restricted Waterways, IALA Guideline 1018 on Risk Management* and the IALA World Wide Academy *Model Course for AtoN: Level 1 AtoN manager training, Use of the IALA Risk management tools*.

Session 4:Regional Case Study of the use of IALA Risk Management Tools (Roger Barker);

Mr. Roger Barker delivered a presentation on case studies in the English Channel and North Sea between the United Kingdom and Continental Europe. The topics of his presentation covered PAWSA as a qualitative ports and waterways safety assessment tool, IWRAP as a quantitative tool and simulation. He showed how AIS plots, contour delimitations, AtoN overlays and IWRAP Mk2 can be used to present risk mitigation measures such as routing measures to governmental authorities when considering the geographical locations of, for example, offshore windfarms. He concluded by reminding participants of other considerations such as AIS carriage requirement by non-SOLAS vessels, different risks/causation factors applied for different classes of vessels and the value of local "qualitative" knowledge. This regional case study was very useful to understand the important relationship between the different risk assessment tools and how the respective tools can be used to consider mitigation measures for specific issues.

Session 5: Use of Simulation in Risk Management (Knud Benedict)

Mr. Knud Benedict continued with a presentation on the Use of Simulation in Risk Management, definitions and samples. He started with some initial information about his former work field in the Maritime Simulation Centre Warnemünde and its projects. The definition of simulation was explained and Mr. Benedict listed the relevant IALA publications about simulation. He continued with the definition of simulation, areas of application, the importance and purpose of simulation. The role of simulation in Risk Management for Maritime Systems & Processes was explained in principle and specifically for the ship risk and the risk in waterways and ports. Samples for Application of Maritime Simulation, Methods & Results were given: The general elements of using simulation were shown for the sample EU Project FAROS on "Human Factors in Risk-Based Ship Design Methodology". Finally, specific samples for Waterway and Accident Investigations and samples for Risk Management in Ship Operation were explained in detail.
He ended by providing an overview of how simulation was used as a key component of the IALA risk management toolbox and its interaction with IWRAP Mk2 and PAWSA.

Day 2 – Tuesday 12 September 2017

Session 6:IWRAP Mk2 Development and Principles Practical Applications of IWRAP Mk2 (Omar Frits Eriksson)

Mr. Eriksson provided greater detail of the evolution, development and principles of IWRAP Mk2. He explained that it was based on defined traffic "legs" each of which used a probability curve to determine the lateral traffic distribution on each leg. A traffic separation scheme would show clear offsets between sets of distribution curves for traffic steaming in each lane. Traffic density plots are developed for small (e.g. 100m x 100m) squares using historical AIS data with higher densities shown in red, and few ships in lighter colors. The purpose is to predict the annual number of collisions and groundings on each leg. He explained that human "causation" factors (Pc) are used to weight the

calculation of accident frequencies. He proceeded by explaining the rationale behind the analysis of powered and drifting groundings and categories of collisions.

Session 7: PAWSA Development and Principles (Gerardine Delanoye)

Mr. Eriksson started with a short explanation on the history of PAWSA and the relation with IMO documents. Mrs. Delanoye then provided an overview of the qualitative risk assessment tool PAWSA and its risk factors before moving on to its planning and implementation procedures. Basically, apart from assessing the current risk, PAWSA also covers evaluation of the effectiveness of existing mitigation measures and additional mitigations including their effectiveness. She advised that PAWSA is a two-day workshop together with all the participants which focus on 24 risk factors in its risk model (4 risk factors under each of 6 risk categories). The waterways risk model may be tailored keeping in mind the main focus and it is not possible to delete 1 box, only the content of the box as it is an Excel spreadsheet. The ideal proportion of participants is a split of 60/40 of users/stakeholders and divided into teams with 2 or 3 in each. She gave the advice to only approach an organisation for participants instead of individuals. It should be the decision of the organisation who to send to a PAWSA workshop and not the choice of the facilitator.

She showed a local example in Izmit bay PAWSA chart study where they asked the participants to identify and mark the risk areas for each risk category. Then this was combined with quantified results of PAWSA. Mrs. Delanoye made aware that the outcomes depend a lot on the motivation and continuity of the participants and it is strongly recommended to use the PAWSA implementation guide. It covers 7 modules for example the preparation and conduct of the PAWSA workshop. It is important to provide statistical information as input to the workshop. This can be about traffic volumes, cargoes and beside that hydro/meteo and waterway information should be available during the workshop.

Session 8: PAWSA Use of workbooks (Omar Frits Eriksson)

Mr. Eriksson explained that PAWSA originally uses 5 MS Excel® workbooks to generate risk mitigation measures. After implementing PAWSA in Izmit bay with 5 books, Turkey decided to reduce to 4. The book on risk factor rating scales was not used due to its minor effect that could be ignored. After this he gave a very clear presentation on the function and use of the 5 PAWSA workbooks. He explained the inputs into the Waterways Risk model, the 6 x 4 risk matrix model, and the considerations to be taken during the input process, including the immediate and subsequent consequences of maritime accidents. The content of each box was explained and Mr. Eriksson ones again emphasized you may tailor the 24 factors as appropriate based on the needs of your area. The 6 categories cannot be changed.

Mr. Eriksson then explained that under the guidance of a facilitator (moderator) supported by dedicated note-takers, PAWSA teams input scores (1 – 4) into the relevant workbook input sheets. Once processed by the PAWSA software, the results convert in 1.0 – 9.0 scale on the baseline risk matrix. Book 2 then assessed the relative competency of each team in each of the 6 risk categories resulting in an output of team expertise distribution. The combination of Book 1 and 2 outputs were used to determine the effectiveness of risk mitigation measures which teams agree are balanced or whether additional measures are required. The Book 3 output displays the list of balanced / unbalanced mitigation measures and which require further investigation. Book 4 processes additional interventions and determines the results of such measures before displaying specific measures and cautions.

Session 9:Test Case – Izmit Bay, PAWSA Test Case (Omar Frits Eriksson)

The Izmit Bay PAWSA implementation was shown as a test case to make all clearer. Mr. Eriksson showed the exact programme that was conducted during this PAWSA session. He outlined the maritime environment/domain and traffic pattern in the area before providing statistical details including marine accident figures. One of the most important additional measures proposed by the PAWSA workshop participants was the implementation of a VTS system.

Session 10: Risk Assessment Made Simple (RAMS)Development and Principles (Jeon Minsu)

Mr. Minsu started this session with informing on the status of RAMS as the draft guideline is planned to be approved by the IALA Council 65 as a new tool for the developing countries. The RAMS is a simplified qualitative version of risk assessment tool for a confined area where the other tools cannot be adopted to estimate the levels of risk and the production of potential risk control options to reduce such risk to acceptable levels. This tool can be used individually, sequentially or in parallel with the other tools. Than Mr. Minsu explained the principles of the tool and looked in some more detail to the 3 workbooks. And he made another presentation on the case study of RAMS tool to the Pacific region. It was made clear with an example of Kiribati that for many small developing countries IWRAP or PAWSA is not suitable. They often do not have a comprehensive set of AIS data available nor sufficient number of expertise to conduct a PAWSA workshop. The simplified tool provides them a solution to be able to conduct a Risk Assessment as it is a good starting point and easy to understand.

Session 11: e-Navigation in China, Introduction on Cloud Service Platform of Easy-Navigation (Xi Yiran & Zhu Lian)

Mrs. Xi Yiran and Mr. Zhu Lian gave a very interesting presentation on a new navigation App for smartphone called Easy-Navigation. They provided details on the background, an introduction on the product and it's functions. Mr. Zhu Lian showed a real-time user application via

his smartphone. With a receiver that needs to be installed on board also AIS data from other vessels and a MOB signal could be received via this App. It was found to be a very interesting product, especially for smaller vessels. The product is already available on the App Store.

Day 3 – Wednesday 13 September 2017

Session12: Creation of an IWRAP Mk 2 model using Singapore AIS data (Omar Frits Eriksson)

Assisted by Mr. Per Christian Engberg, Mr. Eriksson guided participants through the process of creating an IWRAP Mk2 model based on the Singapore traffic approaches. AIS data and chart data were then uploaded before traffic route "legs" and topographic areas were defined. Al participants then started with the first exercise on collision and a second exercise on groundings. They explained how to copy data of legs and the volume of the traffic. By copying a leg, automatically a master leg is created. When later on the volume of traffic in that leg is changed, only the master needs to be amended. The participants had plenty of time to exercise with the tool and some of the results were discussed.

Session 13: Overview of Maritime Simulators, Simulation Techniques in risk management (Knud Benedict)

Mr. Benedict started this second session on maritime simulators with an overview of all different simulator types and new developments, from VTS and bridge simulation to decision support simulators. He also took a closer look at all the pro's and con's about advanced simulations systems. Mr. Benedict's presentation dealt with samples of the application of maritime simulation based on a description of objective and tasks including human factors in risk-based ship design methodology. This was expanded to highlight specific factors to be considered in accurate simulation. Exercises with desk top and fast time simulation were shared. He informed about several European projects, for example a maritime simulator network and sea traffic management project.

Session 14:Advanced IWRAP Mk2 modelling (1)

It was decided to have the technical visit to Xiamen Port in the evening as we could then see the AtoN in operation during night. Therefore it was offered to the participants that after lunch break they could continue to practice with IWRAP. The experts would be available to help and explain in greater detail.

Day 3 – Thursday 14 September 2017

Session 15: AIS Data Exchange (Omar Frits Eriksson)

Mr. Eriksson started this day with a presentation on IALA-Net and other applications for AIS data sharing. He explained the benefits of sharing AIS data and showed some recent developments on analyzing this data on abnormal behavior for example collisions and groundings. When budget is available for further development algorithms could be customized to detect GPS outages and pirate attacks.
He then showed a movie of an IWRAP application in Strait of Hurmuz.

Session 16: IALA Risk Management Tools Application in Xiamen Bay (Ke Ranxuan, Tian Chai ,Chen Zhihui)

Mrs. Ke showed in this case study the application of IWRAP with data from Xiamen Bay provided by China MSA. The collision frequency in the main channel of Xiamen bay was displayed. The results showed that the general cargo ship has a highest collision frequency, while oil tanker has a lower collision frequency. The vessels in head-on situation have the highest collision frequency while those in overtaking situation have the lowest one. Considering that the collision accidents of oil tankers and passenger & RORO could result in serious casualties and oil spill. This study is only the first step to evaluate the ships' collision risk in Xiamen bay. The model of quantitative risk assessment including the factor of the collision consequence shall be established in order to better evaluating the ships' collision risk.
Mr. Eriksson closed this session by emphasizing the benefits of working with the commercial version of IWRAP Mk2. In the Xiamen Bay case, information was extracted from AIS data with external tools, and manually entered into IWRAP. It took several people many days, representing an effort of 3-400 man-hours, and in the commercial version this is done much more swiftly, typically within a few hours, and more or less automatically.

Session 17: Simulation for Decision Support in Maritime Operation & Elements of Maritime Simulation and Modelling (Knud Benedict)

Mr. Benedict pointed out that his previous presentations covered simulation in risk assessment from preparation point of view. This presentation showed the use of simulation as an On-line decision support tool. He started with explaining risk management and human failures both from ship and shore perspective and the potential countermeasures from the management /procedures and equipment side.
How simulation can be used for on board decision support but also decision support on shore and how the information can be shared between both sides for the new e-Navigation and Sea Traffic Management. He showed the example of how cruise liner companies can follow their vessels world-wide in their Fleet Operation Centers already now and explained specifically the potential to not only exchange route plans but also Maneuvering Plans and even decision support by maneuvering prediction in future. He then moved on with simulation in ships motion modelling and forces for maneuvering characteristics. And finally very important how simulation can be used for modelling and

visualization of environment and AtoN. The slides clearly showed the high level of realism the present visual systems can generate and that this is essential for a good simulation of AtoN.
He ended with pointing out IALA Guideline 1058 on simulation as it provides high level guidance on the use of simulation as a tool for waterway design and AtoN planning and guideline 1097 as it provides specific guidance for AtoN designers, developers, researchers and testers on capabilities, limitations and specifying demands to simulation tools.

Session 18:Advanced IWRAP Mk2 modelling (3)

Mr. Eriksson started this session with explaining in detail how to create a leg that reaches the shore. He then showed a case study of Hatter Barn that showed a clear example how the implementation of visual AtoN resulted in a decrease of casualties. He then shared a case study of Malacca Strait. After that he delivered a presentation on estimating causation factors using Bayesian networks. He then described the elements of an IWRAP-Analysis report, and moved on with instructing how to make a project in IWRAP and how to add a new project. It was interesting to see the result of applying a filter on a density plot in Singapore Strait. Applying a speed filter revealed many vessels at anchor. He ended this session with explaining the principle of Closest Point of Approach, and demonstrated how it was possible to illustrate hotspots in a waterway in a video clip, created with IWRAP, while applying CPA/TCPA filtering.

3. Conclusions and closing ceremony

Day 5 – Friday 15 September 2017

Session 19: Complementary use of IALA Risk Management Tools, discussion and conclusions

Mr. Eriksson started this session with a fresh-up on all the elements of the toolbox looking at the current situation and the future. He gave a summary of the interaction between all IALA risk management tools. I discussion took place on the consequence domain, and how to express losses in financial terms, including the cost of loss of life. It was considered that being able to insert cost of life in a risk assessment would be a great improvement. Therefore, it could be of great value for further improvement of the tools if IALA members could share information about the costs of maritime incidents in their area.
From IALA WWA point of view it was advised that developing countries could conduct a RAMS before a WWA technical needs assessment mission or review will take place.
One general observation from the IALA WWA technical missions is that many developing countries are considering to install VTS. Often this is not based on an assessment of the volume of traffic and degree of risk, as required in SOLAS Ch. 5 Safety of Navigation reg. 12. In some countries, the outcome of a risk assessment could be that improving the AtoN provision together with surveys, charting, issuing Maritime Safety Information and pilotage is sufficient to mitigate the risks and that VTS may not be needed.

The Dean finished this session by emphasizing the importance of the IALA WWA Alumni. The participants are the ambassadors of IALA world-wide and should keep in touch.

Session 20: Closing ceremony

During the closing ceremony the Dean expressed his sincere thanks to China MSA and Jimei University for organizing and hosting the seminar. The generous sponsorship from China MSA was not only for the benefit of IALA but also for many participating countries. China MSA is a center of excellence in the region and has expressed its firm intention to continue its close cooperation with IALA and its Academy.

Gerardine DELANOYE
Programme Manager IALA World-Wide Academy

2. Program

Time	Event	Content	Chair/Presenter	Place
Day 0- Sunday 10				

All day	Participants Arrival	Check in		JMU hotel Lobby
18:00 – 20:00	Welcome Reception	Sponsored by Jimei University	Jimei University	
Day 1-Monday 11				
08:30 – 09:00	Registration			Shangda Building
09:00 – 10:30	Session 1	**Opening**		Shangda Building
		Opening Ceremony	QingBiao, Li, Jimei University President	
			RuQing, Xu, China MSA Director General	
			Francis Zachariae, IALA Secretary-General	
			Omar Frits Eriksson, Dean of the IALA World-Wide Academy	
10:30 – 11:00	Break	Group photograph & Coffee break	All participants	
11:00 – 12:00	Session 2	**Introduction to IALA and the IALA WWA and international obligations under SOLAS**	Gerardine Delanoye, Programme Manager IALA WWA	Shangda Building
12:00 – 13:30	Lunch			JMU hotel
13:30 – 14:30	Session 3	**Introduction to the IALA Risk Management Toolbox**	Omar Frits Eriksson	Shangda Building
		Introduction to navigation risk		
		IALA Risk Management Toolbox Overview		
14:30 – 15:15	Session 4	**Regional Case Study of the use of IALA Risk Management Tools**	Roger Barker	
15:15 – 15:45	Coffee break			
15:45 – 18:00	Session 5	**Use of Simulation in Risk Management**	Knud Benedict	
18:00 – 20:00	Banquet	Sponsored by CHINA MSA	CHINA MSA	North Bay hotel
Day 2 –Tuesday 12				
09:00 – 10:30	Session 6	**IWRAP Mk2**	Omar Frits Eriksson	Shangda Building
		Development and Principles		
		Practical Applications of IWRAP Mk2		
10:30 – 11:00	Coffee break			
11:00 – 12:00	Session 7	**PAWSA**	Omar Frits Eriksson& Gerardine Delanoye	
		Development and Principles		
12:00 – 13:30	Lunch			JMU hotel
13:30 – 14:30		Development and Principles	Gerardine Delanoye	Shangda Building
14:30 – 15:00	Session 8	PAWSA - Use of workbooks	Omar Frits Eriksson	
14:30 – 16:00	Session 9	Test Case – Izmit Bay / PAWSA Test Case - continued		
16:00 – 16:30	Coffee break			
16:30 – 17:30	Session 10	**Risk Assessment Made Simple (RAMS)** Development and Principles	Minsu Jeon	
17:30 – 18:00	Session 11	**e-Navigation in China** Introduction on Cloud Service Platform of Easy-Navigation	Xi Yiran & Zhu Lian	

18:00 – 20:00	Buffet			JMU hotel
Day 3 –Wednesday 13				
09:00 – 09:30	Session 12	**IWRAP Mk2 Modelling** Creation of an IWRAP Mk2 model using AIS data	Omar Frits Eriksson & Per Engberg	Shangda Building
09:30 – 10:30	Session 13	**Overview of Maritime Simulators**	Knud Benedict	
		Simulation Techniques in risk management		
10:30 – 11:00	Coffee break			
11:00 – 12:00	Session 14	Advanced IWRAP Mk2 modelling	Omar Frits Eriksson & Per Engberg	
12:00 – **13:00**	Lunch			JMU hotel
13:00 – 18:00	Session 14	Advanced IWRAP Mk2 modelling	All experts	
18:00 – 20:00	Banquet	Technical visit Visit Xiamen Port		
Day 4–Thursday 14				
09:00 – 10:00	Session 15	**AIS Data Exchange**	Omar Frits Eriksson	Shangda Building
10:00 – 11:00	Session 16	**IALA Risk Management Tools Application in Xiamen Bay**	Ke Ranxuan, Chai Tian & Chen Zhihui	
10:30 – 11:00	Coffee break			
11:00 – 12:15	Session 17	**Simulation for Decision Support in Maritime Operation & Elements of Maritime Simulation and Modelling**	Knud Benedict	
12:00 – 13:45	Lunch			JMU hotel
13:30 – 16:30	Session 18	**Advanced IWRAP Mk2 modelling**	Omar Frits Eriksson & Per Engberg	Shangda Building
16:30 – 17:00	Coffee break			
17:00 – 18:00		Advanced IWRAP Mk2 modelling		
19:00 – 21:00	Banquet	Sponsored by Jimei University	Jimei University	JMU hotel
Day5–Friday 15				
09:00 – 10:30	Session 19	**Discussion on the IALA Risk Management Toolbox**	Omar Frits Eriksson	Shangda Building
		Complementary use of IALA Risk Management Tools, discussion and conclusions		
10:30 – 11:00	Coffee break			
11:00 – 12:30	Session 20	**Closing Ceremony**	Omar Frits Eriksson, Dean of the IALA World-Wide Academy & Minjie, Cao, Jimei University Vice President	
		Issue of Certificates and closing remarks		
12:30 – 14:00	Lunch	Participants disperse on completion		JMU hotel

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