General Report of the Training Seminar on the use of the IALA Risk Management Toolbox

Date: 18 – 22 November 2019

Location: Cartagena, Colombia

Contents

This report is based on the seminar of the IALA Risk Management Toolbox - IWRAP MkII; PAWSA MkII, SIRA and; Simulation, in waterway planning which was held during 18-22 November 2019, Cartagena, Colombia. This report provides details of the Seminar and a list of participants.

Glossary of Terms

Term	Explanation of term
Aid to navigation (AtoN)	Device, system or service, external to vessels, designed and operated to enhance safe and efficient navigation of individual vessels and/or vessel traffic. For the purposes of IALA this definition includes Vessel Traffic Services.
Automatic Identification System (AIS)	A ship and shore-based data broadcast system, operating in the VHF maritime band
Causation Factor	Probability that the vessel fails to make an evasive action to avoid the grounding or collision
Closest Point of Approach (CPA)/Time to Closest Point of Approach (TCPA)	Closest Point of Approach /Time to Closest Point of Approach limit as defined by the observer to give warning when a tracked target or targets will close to within these limits (IMO,2000).
Consequence	Impact of unwanted incidents. The impact can be long term or short term and can be measured as simulation or as the methods estimates: monetary, count, risk matrix and index
Risk	The possibility that harm (death, injury or illness) might occur when exposed to a hazard. The severity of the hazard, duration and frequency of exposure will determine the level of risk.
Risk Control	Risk control means taking action to eliminate health and safety risks so far as is reasonably practicable, and if that is not possible, minimizing the risks so far as is reasonably practicable. Effective risk control involves establishing and maintaining systems that give opportunity for regular evaluation and review procedures.
Risk Perception	Judgments of the acceptability of a risk based on its perception of the consequences of the risk, rather than on scientific factors like probability. Perception of risk may be influenced by many things, including age, gender, level of education, region, values, and previous exposure to information on the hazard or activity of interest. It should be noted that the public's perceptions of risk may differ from those of technical experts.
Probability	Percentage chance of an unwanted incident/event/accident occurring/how often a scenario might be expected to occur over a specified period of time. Probability can be estimated based on historical data, mathematical or econometric models.
Simulation	Process of designing a model of a real system and conducting experiments with this model for the purpose either of understanding the behaviour of the system or of evaluating various strategies (within the limits imposed by a criterion or set of criteria) for the o peration of the system.
Hazard	An unwanted incident/event/accident/occurrence/a source of potential harm/a situation with a potential for causing harm, in terms of damage to health, property, the environment, or other thing of value; or a combination of these
Risk management	The systematic application of management policies, procedures, and practices to the tasks of analyzing, evaluating, controlling, and communicating about risk issues

1.0 Introduction

The following sections of this report gives an overview of the practical proceedings as well as the concepts and of the training Seminar, on the use of the IALA Risk Management Toolbox. This Seminar was held during 18 – 22 November 2019, at Cartagena, Colombia (refer to Annex A for the programme) and was attended by 34 participants from 12 countries (refer to Annex B for a list of participants).

The aim of the seminar was to present participants with the concepts of risk management, the importance of stakeholder liaison and the value of the four IALA Risk Management Tools. Each participant therefore benefited from experiential learning during the theoretical and practical training delivered by international experts, in different aspects of the Toolbox. Participants were introduced to IALA's shared learning platform (https://learning.iala-aism.org) where they accessed general information about the Seminar, the programme, learning objectives, IALA Recommendations/Guidelines, important learning resources and feedback forms. Upon successful completion of the seminar, participants gained the knowledge and skill needed to use IWRAP MkII within their organizations, organize a PAWSA MKII or SIRA seminar and recognize the benefits of applying Simulations to develop effective AtoN waterway designs and therefore reduce risks in maritime navigation. Discussions during the seminar and the content of this report are based on the publications listed below.

i. IALA Standard S1010 – Marine Aids to Navigation Planning and Service Requirements
ii. IALA Recommendation R1002 – Risk Management for Marine Aids to Navigation
iii. IALA Guideline 1018 – Risk Management iv. IALA Guideline 1058 – The use of simulation as a tool for waterway design and AtoN planning
iv. IALA Guideline 1123 – The use of IWRAP Mk2
v. IALA Guideline 1124 – the use of PAWSA
vi. IALA Guideline 1138 – The use of SIRA
vii. IALA Guideline 1057 - The use of GIS

2.0 Overview of the IALA Risk Management Process

The risk management process developed by IALA and detailed in the IALA Guideline 1018, is very similar to the Formal Safety Assessment (FSA) method as recommended by IMO (MSC/Circ.1023/MEPC/Circ.392). The process developed by IALA is intended to guide the analysis of all hazards in a waterway so that all transit risks are effectively managed by AtoN Authorities. The Guideline should be used when assessing the optimum mix of physical and electronic aids to navigation and other waterway facilities. When this method is applied, it is important that the process is clearly documented and formally recorded in a uniform and systematic manner. This will ensure the process is transparent and can be easily understood by all parties, irrespective of their experience or background in the application of risk assessment and related techniques.

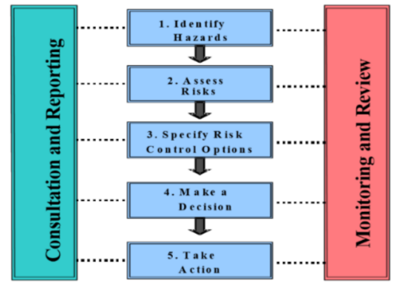

Figure 1: Risk Management Process

The output of the risk management process is largely dependent on the capabilities of the human resources involved in the process, as well as their risk perception. It is therefore recommended that administrations, organizations and persons involved in a risk assessment process have suitable, updated and in-depth knowledge in the application of Human Factors disciplines. An overview of the steps of the risk management process is listed below.

1. **Identify Hazards** - identify and generate a prioritized list of hazards, specific to the waterway under review. This is achieved using standard techniques to identify hazards that can contribute to incidents and by screening these hazards using a combination of available data and judgment. A very important part of the scope is also to set the boundaries of the problem.

2. **Assess Risks** – assess the risks along the waterway based on the prioritized list of hazards. Risk assessment is assumed to include two major sub-activities, risk estimation and risk evaluation. In risk estimation, the frequency and consequences associated with each risk scenario selected for analysis are estimated. In risk evaluation, the distribution of risk is identified, allowing attention to be focused upon high-risk areas, and to identify and evaluate the factors, which influence the level of risk. The conclusions of the risk evaluation exercise include the identification of the high risk areas needing to be addressed, identification of the primary influences within the overall system that effect the level of risk and a determination of whether the risk is acceptable and whether there is a need to reduce the estimated level of expected loss associated with the identified risk.

3. **Specify Risk Control Options –** if the decision at the risk assessment step is that the risk is unacceptable and should be reduced, then at the risk control step, options are considered to reduce the risk. Proposals are made of effective and practical risk control options, comprising the following three principal stages: focus on areas of risk which require control, identify potential risk control measures and their associated costs, and group risk control measures into practical regulatory options.

4. **Make a Decision -** define, in consultation with stakeholders, the recommendations that should be considered. The recommendations should be based on the: comparison and ranking of risks and their underlying causes, the comparison and ranking of the risk control options as a function of associated costs and benefits, and the identification of those risk control options which keep risks As Low As Reasonably Practicable (ALARP).

5. **Take Action -** implement the chosen risk control option or options, evaluate the effectiveness of the decision process and, establish a monitoring and evaluation program to monitor the outcome of implementation.

Monitoring and review is vital to ensure a verification of the decisions, to check if initial conditions have changed and to continuously monitor the performance of the Action taken. Stakeholders, including practitioners and users, shall be consulted and receive feed-back continuously to ensure the best possible input is available to the decision makers in order to validate decisions and to ensure ownership of the results and actions taken. Continuous engagement with stakeholders provides valuable validity and acceptance to any risk assessment.

2.0 Overview of the IALA Risk Management Toolbox

Regulation 13, Chapter V of the 1974 SOLAS Convention states that 'each Contracting Government undertakes to provide, as it deems practical and necessary either individually or in co-operation with other Contracting Governments, such aids to navigation as the volume of traffic justifies and the degree of risk requires.' Conducting a Risk Assessment is an essential step in this process therefore IALA, together with others, developed the IALA Risk Management Toolbox to address the need for appropriate tools to conduct such maritime risk assessments. The tools were designed to assist States with different levels of resources in their maritime environment. The tools which make up the IALA Risk Management Toolbox are listed below. IWRAP and PAWSA were endorsed by the IMO via SN.1/Circ.296 in December 2010; this underscored the importance of a formal risk assessment.

1. IALA Waterway Risk Assessment Programme (IWRAP) (Quantitative approach) – IWRAP is available through a computer program named IWRAP MKII, which runs on the Windows 64-bit operating system

2. Port and Waterway Safety Assessment (PAWSA) (Qualitative approach)

3. Simplified IALA Risk Assessment (SIRA) (Qualitative approach)

4. Simulation (Quantitative and qualitative approach) – this is an emerging technology

Each tool provides a different approach to model risk, as defined by the basic risk equation:

Risk (R) = probability that undesired incident occurs (P) x consequences of undesired incident (C)

The results of the applied tools are then used to specify risk control options (RCOs), make decisions based on the costs and benefits of the specified options, then act to reduce the risks as low as reasonably practicable (ALARP) (refer to Figure 1). It should be noted that each tool has its advantages and disadvantages. The quantitative tool can provide direct and scientific information on a specific area but is limited to the number of data points and the quality of the data. The qualitative assessment can capture a more complete spectrum of hazards and issues but does not provide accurate importance for each.

3.0 Overview of the IWRAP Approach

During the period 1998 to 2001, a comprehensive software for grounding and collision analysis was developed within the ISESO Project at the Technical University of Denmark. The ISESO Project was followed by a project named BaSSy. IWRAP MKII constitutes a reduced version of the collision and grounding analysis program, the BaSSy Toolbox (GRISK), which was developed through the BaSSy Project. IWRAP MKII first determines the average number of possible incidents, assuming that no evasive action is taken (blind navigation), then adjusts this number by multiplying it with the probability that and evasive action fails (thinning with Fujii type causation factors) [1]. This is a quantitative approach which uses bathymetric data, vessel traffic statistics of terrestrial AIS messages types 1, 2, 3 and 5) and probabilistic algorithms, to calculate grounding, allision and collision probabilities per year, per square area (the default value is 250 square meters). This approach does not calculate the consequences of incidents, but its results are well suited for such analyses. A general description of the steps undertaken in IWRAP MKII are listed below. These steps can provide baseline results for comparison with sensitivity analyses, to evaluate changes to the waterway based on consequence analyses and the identified risk control options. For example, the Time of Day filter can be used to filter the dataset so that only specific hours of the day are included in the analysis.

[1] For more information on the work done by Fujii et al. and MacDuff (1974), refer to: https://www.iala-aism.org/wiki/iwrap/index.php/Probabilistic_Collision_and_Grounding_Analysis

1. **Define bathymetry (including oil rigs and wind turbines), routes and waypoints which are connected by legs –**
   Nautical Charts or ESRI shape or KML files are used to define the bathymetry of the waterway. Terrestrial AIS data are used to create a traffic density plot which informs the Analyst how to form the routes, waypoints and legs which are formed parallel to traffic flow. The traffic density plots can be customized for example, filters can be applied to the density plots to visualize closest point of approach (CPA)/time to closest point of approach (TCPA).

2. **Enter traffic volume distributions on each leg –**
   IWRAP MKII divides the traffic into 14 categories based on vessels' types (for eg: General Cargo Ship, Crude Oil Tanker, etc.) and lengths (for eg: 0-25 m, 25 – 50 m). Using the AIS data, the software assigns vessel statistics (for eg: average speed) to each of these 14 categories. This can be edited by the Analyst.

3. **Define traffic lateral distribution**
   A passage line is drawn perpendicular to the vessel traffic flow along each leg. IWRAP MKII calculates parameters (for eg: weight, mean and standard deviation) which forms a lateral distribution of the traffic along each leg. This can be edited by the Analyst.

4. **Define Grounding and Allision due to Drifting**
   Based on the bathymetry, traffic volume distribution and lateral distribution of each leg. IWRAP MKII models the probability of grounding and/or allision, while drifting due to power outage/blackout. Parameters which includes the time taken to recover from a blackout and the drifting speed and direction can be edited by the Analyst.

5. **Define other traffic in the area**
   IWRAP MKII allows the Analyst to model non-AIS vessels in an area of interest for eg: fishing vessels and leisure boats. This is done by forming a polygon to represent the area of interest and assigning a density of each vessel type per square kilometer, per year. This is a crude method because it assumes a uniform density of objects across the polygon.

6. **Select causation probability factors**
   The causation probability factors are assigned to the conditions of collisions and groundings. Factors are defined by IALA based on literature and can be edited by the Analyst. If the factors are edited by the Analyst, this should be stated in his/her report.

7. **Result calculation of the probability, per year of:**
   i. Collisions: overtaking, head-on, crossing, merging, bend and area
   ii. Groundings and Allisions: powered and drifting

   The latest version of IWRAP MKII can also estimate the CO2, NOx and SOx emissions within the waterway. The program also has a replay/movie function which visualizes the closest point of approach (CPA)/time to closest point of approach (TCPA) between vessels, showing the safety ellipses around ships as they navigate.

To consolidate the principles of IWRAP MKII, participants created an IWRAP model using training data across Hatter Barn.

4.0 Overview of the PAWSA Approach

PAWSA was developed by the United States Coast Guard, to address waterway user needs and place a greater emphasis on partnerships with Industry, to reduce risks in the marine environment. PAWSA applies the Delphi method during a structured two-day workshop, to identify waterway safety hazards, estimate risk levels and evaluate potential mitigation measures, by converting the opinions of experts with local knowledge, into quantified results. The workshop requires a joint effort of up to thirty competent stakeholders including waterway users and the agencies responsible for implementing RCOs, one facilitator and a dedicated administration team. Also required are detailed records of maritime traffic, nautical charts and publications based on modern surveys (where possible), meteorological records, details of proposed or planned maritime projects in or near the waterway being assessed and details of any IWRAP risks assessments or simulations in or near the waterway.

The quantitative assessments are organized into five segments which are referred to as ‘Books’ (a description of each Book is listed below). When each Book is completed by the participants, the responses are entered in the PAWSA Excel software and, except for Book 1, the Facilitator provides a summary of the responses to the participants. Participants are then allowed to revise their previous answers based on the summary presented by the Facilitator; this reduces the range of answers, allowing the team to converge to the ‘correct’ answer. Except for Books 1 and 2, the participants use the results from each preceding Book as the basis for discussion during the subsequent phase of the process.

Book 1: Team expertise – captures the current expertise of each team relative to the other teams in the workshop. The results of this Book are used to weight each team’s inputs for all other Books.

Book 2: Risk factor rating scales – there are six risk categories and twenty-four corresponding risk factors in the Waterway Risk Model in the PAWSA. Measurement scales for each risk factor are developed by asking participants to compare specified qualitative descriptions to each risk factor, in a pair-wise manner. The qualitative descriptions characterize the range of possible conditions that affect risk in a waterway for that factor.

Book 3: Baseline risk levels – participants determine where their waterway falls in the risk scales developed in Book 2. What results is the risk level for each factor, not considering actions already implement to reduce risk in the waterway.

Book 4: Mitigation effectiveness – After the participants describe the risk mitigation strategies that already exist, to help reduce risk in the waterway, Book 4 is used to evaluate the effectiveness of those strategies in reducing the risk level for each factor in the model. What results, is the present risk level, considering existing mitigations. Participants then decide whether the risk mitigation strategies already in place balance the resulting risk level. If for a given risk factor, there is a strong consensus that the existing mitigations do not adequately deal with the risk, the risk factor could be dropped from further discussions.

Book 5: Additional mitigations – allow the participants to offer ideas about specific risk mitigation actions that should be taken, and to estimate how effective those actions would be in reducing risk levels. Participants first discuss what more should be done only for those risk factors where the results from Book 4 show that risk levels are not adequately balances with existing mitigations. Following the discussions, participants decide which ideas have the most promise for each risk factor that was discussed and what mitigation category the ideas relate to. They then write a short description of the action needed, that is the idea with the most promise, and then evaluate how much risk reduction would result if that idea was implemented.

The output from PAWSA identifies the existing risks in the waterway as:

1. Acceptable and that no further work is needed unless changes occur in significant criteria, such as the traffic pattern or types of vessels using that waterway.

2. Not acceptable but the risk control options necessary to make the risk level of the waterway acceptable have been identified adequately.

3. Not acceptable and more detailed study is necessary to enable the risk control options that will make the risk level of the waterway acceptable to be identified adequately.

To consolidate the application of PAWSA, a test case across the Port of Gladstone, Australia was presented and discussed.

5.0 Overview of the SIRA Approach

The idea of developing a simplified risk management tool was initiated by the IALA Risk Management Steering Group in the late 2012. The IALA World Wide Academy produced an initial version of SIRA in 2013, which was based on the risk management system endorsed by the AtoN Competent Authority of the Sultanate of Oman in 2006 and was adopted by the service provider in Bahrain in 2010. SIRA is a simple, qualitative risk assessment tool which was developed to assist States whose maritime environment does not include comprehensive terrestrial AIS information, which is required for IWRAP MKII, or the participation of up to thirty competent stakeholders which is required for PAWSA. The key input for SIRA is a satisfactory understanding of the maritime environment and traffic patterns. IWRAP MKII and PAWSA were endorsed by the IMO in 2010 therefore it is recommended that States which applied SIRA also apply the endorsed tools when the resources become available. The SIRA risk assessment process is based on IALA Guideline 1018 and includes the following steps:

1. **Select the waterway to be analyzed**

2. **Define assessment zones and describe each area** - divide the waterway into geographical Zones with similar environmental conditions, volume of traffic and degrees of risk. For example, the offshore and coastal areas can be defined as two large zones, and the coastal area can be divided into smaller zones of restricted waters and choke points.

3. **Identify hazards within each zone and develop associated scenarios** - A comprehensive description is documented of the factors of the marine environment and infrastructure, which affect the safety of navigation within each zone. The document is then used to identify hazards within each zone, and scenarios of unwanted incidents which can be caused by the hazards. For example, a grounding scenario can be developed based on bathymetry, draft, speed, vessel motions and met-oceans conditions. When defining the zones, interaction between hazards in overlapping or nearby zones should be considered, as well as the effects of changes in seasons, and between day and night-time conditions.

4. **Assess the probability and impact of each scenario** - The probability and impact of each scenario are then assessed based on five levels of probability and impact which are outlined by the SIRA. The assigned scores are then multiplied to calculate the final risk score for each scenario.

5. **Identify and prioritize possible risk control options** – recommendations are then identified and prioritized, to reduce risk as low as reasonably practicable can of each scenario.

6. **Produce a comprehensive report of the risk assessment**

7. **Communicate result to the decision makers**

Steps 2 – 6 of this process should be carried out in a on or two-day workshop together with relevant stakeholders. Preparation for the workshop includes performing a preliminary zone selection, describing each zone in detail, identifying all relevant stakeholders, and inviting the stakeholders who should participate in the workshop. The outcome of the workshop should be adequately documented, supported by a matrix with the details of the identified hazards, scenarios and risk mitigating measures for each zone.

6.0 Overview of the Simulation Approach

In the context of Guideline 1058, the purpose of Simulation in AtoN design, planning and evaluation, is to test, demonstrate and document scenarios for the deployment of AtoNs and waterway design under different conditions, with the aim of identifying optimal operational safety and efficiency. The simulation approach identifies and mitigates the risks (quantitatively), for the mariner operating in a specific waterway, channel and port area. It also includes the evaluation (qualitatively) of channel layout, placement and technical specification of AtoNs and maneuvering aspects. Simulation can incorporate both physical and digital methods however, the IALA Guideline 1058, which is used in conjunction with the IALA Guideline on the use of Geographic Information Systems by AtoN Authorities (1057), addresses computer-based simulation. By using a simulation tool, an overall improvement in safe and efficient operation can be realized by assisting in demonstrating the operation of the waterway, channel design and associated AtoNs, before the reality of navigating a vessel. It should be noted that simulations can provide high levels of realism if the purpose of the simulation, is matched by the accuracy of the models. An overview of the key factors to consider when undertaking the simulation approach are listed below:

Scoping of the simulation study – before performing the simulation, there may be the need for stakeholders in the maritime environment to undertake an initial analysis incorporating a risk assessment. This analysis could provide the inputs and parameters for the simulation. The minimum scope of the analysis includes:

1. Identifying the objectives of the AtoN project;
2. Identifying the geographic boundaries, results of a site visit, timing constraints and broad funding constraints
3. Confirming the operational requirements for example, vessel types, and prevailing met-ocean conditions
4. Define the scope of feasible channel marking options for example boundary markers, hazard markers and AtoN types.

Simulation planning - some of the issues that should be considered when planning a simulation study are:

1. Aims and objectives of the simulation, with regarding details of the AtoNs for example, it's placement, position, type and characteristics.
2. Determination of present and future layout of the channel, waterway and/or port area being studied.
3. Environmental conditions to be evaluated for example, wind, current, tide, bathymetry etc.

Role of participants – AtoN and waterway authorities should involve local pilots and mariners in the placement of AtoNs in the waterway/port study process, including planning of the simulation program and scenarios and development of conclusions and recommendations; to ensure 'buy-in' or acceptance. If a simulation service provider is being involved, their input should be an unbiased, third party expert opinion.

Simulator software capabilities – when assessing the simulation systems, the AtoN and waterway authorities should consider the capabilities of the software as explained in IALA Guideline 1058.

Simulation tools and their use and limitations – there are several different simulation tools available for design studies and have different capabilities, functionalities and applications. For reference, the IALA Guideline 1058 describes the applicability, advantages and disadvantages of the following simulation tools: fast time, desktop, part task, full mission and traffic flow simulation.

Requirements for analysis, reporting and documentation – IALA Guideline 1058 provides a detailed description of the requirements for analysis, reporting and documentation. In general, the report should include conclusions and recommendations of the proposed placement of AtoNs for the study area, as well as it's effectiveness in co-ordination with the rules and procedures of navigation, scope and service levels, including the possible installation of some AtoNs, whose use could be devoted specifically to any ship or maneuver. The comments, conclusions and recommendations from participating local pilots or captains should also be documented. The data should be presented in a digital form that can be used for post processing. Any adjustments to the data (for example filtering of the data if the quantity of data exceeds the capacity of the simulator) should also be documented to ensure appropriate transparency.

Accuracy and realism considerations – simulator studies seek to establish acceptable levels of safety and efficiency. The basis for decisions and processes that match these requirements must be given; this ensures accuracy, realism and transparency throughout the study.

7.0 Presentations Delivered by Participants

The risk assessment method developed for Colombia, was presented by Commander Javier Gomez, Coordinator of Marine Scientific Research Group and Navigation Aids. A risk assessment method for the Greater Caribbean Region, which is being developed by Dawn Seepersad was also presented. Both presentations generated discussions among the participants, about the applicability and importance of various risk assessment methods.

8.0 Conclusion

During the training seminar, participants were presented with the concepts of risk management, information about the importance of stakeholder liaison, the value of the four IALA Risk Management Tools in relation to international guidelines, and training sessions to apply each tool to different scenarios. Participants of the seminar were interactive with the lecturers during each session and the lunch/coffee breaks; the nature of the interactions indicated that they had a good understanding of the information presented to them.

Annex A - Programme

Time	Event	Content	Chair/Presenter	Place
Day 0- Sunday 17 November				
All day	Participants Arrival	Check in		Hotel
Day 1-Monday 18 November				
When not indicated in the programme, the **dress code** for the seminar is business attire				
08:30 – 09:00	Registration			Avella Auditorium - ENAP
09:00 – 09:30	Session 1	**Opening Ceremony**		Avella Auditorium - ENAP
		Opening Speech	ENAP/DIMAR	Avella Auditorium - ENAP
		Opening Speech	Omar Frits Eriksson, Dean of the IALA WWA	Avella Auditorium - ENAP
9:30-9:35		Group photograph	OCOMES ENAP / All participants	CAMOF ENAP
09:35 – 10:30	Session 2	**Introduction to IALA and the IALA WWA and international obligations under SOLAS**	Gerardine Delanoye, CB and Resources Manager IALA WWA	Avella Auditorium - ENAP
10:30 – 11:00	Break	Coffee break	OCOMES ENAP / All participants	CAMOF ENAP
11:00 – 12:00	Session 3a	**Introduction to the IALA Risk Management Toolbox** Introduction to navigation risk IALA Risk Management Toolbox Overview	Omar Frits Eriksson	SIG Classroom
12:00 – 13:30	Lunch			CAMOF ENAP
13:30 – 14:15	Session 4a	**Reginal Case Study of the use of IALA Risk Management Tools**	Roger Barker	SIG Classroom

14:15 – 15:15	Session 4b	**IWRAP Mk II** Development and Principles	Omar Frits Eriksson	SIG Classroom
15:15 – 16:00	Session 4b	Practical Applications of IWRAP Mk II	Omar Frits Eriksson	SIG Classroom

Time	Event	Content	Chair/Presenter	Place
16:00 – 16:30	Coffee break			CAMOF ENAP
16:30 – 18:00	Session 5	**SIRA - Introduction**	Gerardine Delanoye	SIG Classroom
18:00 – 21:00	Ice-breaker reception	Cocktail Attire	Gerardine Delanoye	Naval Officers Club Castillogrande
Day 2 –Tuesday 19 November				
09:00 – 10:30	Session 6a	**PAWSA Mk II - Introduction**	Neil Trainor	SIG Classroom
10:30 – 11:00	Coffee break			CAMOF ENAP
11:00 – 12:00	Session 6b	PAWSA Mk II – Risk Factors	Neil Trainor	SIG Classroom
12:00 – 13:30	Lunch			CAMOF ENAP
13:30 – 14:30	Session 6c	PAWSA Mk II – The Five Books	Neil Trainor	SIG Classroom
14:30 – 16:00	Session 6d	PAWSA MK II – Test Case	Neil Trainor	SIG Classroom
16:00 – 16:30	Coffee break			CAMOF ENAP
16:30 – 18:00	Session 7	**Use of Simulation in Risk Management**	Knud Benedict	SIG Classroom
Day 3 –Wednesday 20 November				
09:00 – 10:30	Session 8	**IWRAP Mk II Modelling** Creation of an IWRAP Mk II model using AIS data	Omar Frits Eriksson & Per Engberg	SIG Classroom
10:30 – 11:00	Coffee break			CAMOF ENAP
11:00 – 12:00	Session 9	**Overview of Maritime Simulators** Simulation Techniques in risk management	Knud Benedict	SIG Classroom

12:00 – 13:30	Lunch			CAMOF ENAP
13:30 – 18:00	Session 10	**Visit to COMPAS Port and ENAP Simulator**	Javier Gomez, Diana Sanchez	CIDIAM ENAP

Time	Event	Content	Chair/Presenter	Place
		Business casual attire - long pants and closed shoes are mandatory.		
Day 4–Thursday 21 November				
09:00 – 10:30	Session 11	**Advanced IWRAP Mk II modelling (1)**	Omar Frits Eriksson & Per Engberg	SIG Classroom
10:30 – 11:00	Coffee break			CAMOF ENAP
11:00 – 12:00	Session 11	Advanced IWRAP Mk II modelling (2)	Omar Frits Eriksson & Per Engberg	SIG Classroom
12:00 – 13:30	Lunch			CAMOF ENAP
13:30 – 15:30	Session 11	Final IWRAP Mk II modelling Presentations from participants	Omar Frits Eriksson & Per Engberg	SIG Classroom
15:30 – 16:30	Session 12	**SIRA** Development and Principles SIRA Test Case	Omar Frits Eriksson	SIG Classroom
16:00 – 16:30	Coffee break			CAMOF ENAP
16:30 – 17:00	Session 13	**SIRA -** continued	Omar Frits Eriksson	SIG Classroom
20:00 – 22:00	Dinner	Business casual attire	Javier Gomez	
Day 5–Friday 22 November				
09:00 – 10:30	Session 14	**Discussion on the IALA Risk Management Toolbox** Complementary use of IALA Risk Management Tools, discussion and conclusions	Omar Frits Eriksson Neil Trainor Roger Barker Knud Benedict Gerardine Delanoye	SIG Classroom
10:30 – 12:00	Session 15	**Closing Ceremony** Issue of Certificates and closing remarks	Omar Frits Eriksson, Dean of the IALA WWWA, ENAP, DIMAR	Avella Auditorium - ENAP
12:00 – 14:00	Lunch	Participants disperse on completion		CAMOF ENAP

Annex B – List of Participants

Name	Country	Organization
James Crawford	Chile	Armada de Chile
Valeria León Maturana	Chile	Armada de Chile
Mónica Herrero	Spain	MEDITERRANEO SEÑALES MARITIMAS S.L.
Terry Rambarran	T&T	Trinidad and Tobago Maritime Authority
Marcos dos S.G. da Fonseca	Brasil	Marinha do Brasil
Jorge Di Lorenzi	Uruguay	Armada the Uruguay
Marcelo Leonardo Olivera Cardozo	Uruguay	SOHMA
Javier Silva	Uruguay	Servicio de Illuminacion y Balizamiento - Armada Nacional
Byron Terán Hurtado	Ecuador	Oceanographic Institute of the Navy
Carol Villalta Fernandez	Costa Rica	Asesora Tecnica Naval
Martha Semil	Curaçao	
Lianet Rivero Bastarrechea	Cuba	Geocuba Estudios Marinos
Lorenzo López Herrera	Venezuela	Hydrography and navigation service
Saravanan Sundaravel	India	Directorate General of Lighthouses and Lightships
Ganamukula Satyanarayana	India	Directorate General of Lighthouses and Lightships
Wilson Oñate	Colombia	Lineal Engineering SAS
Anibal De La Parra	Colombia	Lineal Engineering SAS
Luis Alfredo Restrepo Florez	Colombia	Sea&Port Services and Research SAS
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Willie May Coneo	Colombia	DIMAR
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Juan Carilo Rubio	Colombia	DIMAR
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Diana Margarita Sánchez Reyes	Colombia	DIMAR
Javier Gómez	Colombia	DIMAR
Jean Carbs Guerrero Marquez	Colombia	DIMAR
Fernando Parra Ramírez	Colombia	DIMAR
Maritza Yiseed Moreno Calderón	Colombia	DIMAR
Jesús Peñaranda Cabarcas	Colombia	DIMAR
Johan Arciniegas Fajardo	Colombia	DIMAR
Sergio Andrés Barbosa	Colombia	COTECMAR