



## Distance learning course: Risk Assessment using IWRAP MK II

Duration: 3 weeks.

Time commitment: 30 – 35 hours.

Pace: blended (self-study and online lecture).

Language: English.

Cost: €1,000.

Cost includes participation in all sessions and a certificate of completion.

Online registration is available on the IALA website.

For further information please contact the IALA World-Wide

Academy: [academy@iala-aism.org](mailto:academy@iala-aism.org)

### INTRODUCTION

The IALA Waterway Risk Assessment Program (IWRAP MK II) is used to model the waterway to be analysed. The model describes the geometry of the shipping routes, the traffic volume and composition, and the bathymetry of the waterway to estimate the annual probabilities of collisions and groundings. The results from IWRAP MK II are suitable to estimate associated consequences and identify and apply risk control measures to reduce the risk as low as reasonably practicable (ALARP).

### GOALS

Upon the successful completion of this course, you will be able to use IWRAP MK II to estimate the annual probabilities of collisions and groundings in real-world scenarios.

### SUGGESTED SKILLS

This course was designed for those involved in the design, marketing, and management of waterways.

### PREREQUISITE COURSES

Completion of the Introduction to the IALA Risk Management Toolbox and comprehension of IALA Guideline 1018 – Risk Management.

### HARDWARE AND SOFTWARE

- Microsoft enabled computer and a mouse.
- Reliable internet connection capable of supporting MS Teams.

### DATA (OPTIONAL)

If you are interested in modelling a waterway within your State, you would need:

- Terrestrial AIS (T-AIS) data for a minimum period of two weeks; the longer the period the better. This data would be used to estimate the annual probabilities of collisions and groundings within the waterway, it should therefore be a good representation of the ship traffic throughout the year. For practical reasons, and to limit the calculation time needed, the size of the T-AIS data should be a maximum of 1GB and should be in the raw National Marine Electronics Association (NMEA) format outlined on page three.
- Electronic copies of the largest scaled nautical charts available for the waterway.
- Historical information about ship traffic accidents within the waterway.

### COURSE READINGS

Required reading material which would be referred to during the course:

- IALA Guideline G1123 – The use of IALA Waterway Risk Assessment Programme.

## PROVISIONAL COURSE SCHEDULE

### INTRODUCTION TO RISK ASSESSMENT USING IWRAP MK II

During this meeting you will be introduced to the structure of the course and a case study of the application of IWRAP MK II.

Pace: online lecture

### CHAPTER 1: ADVANCED PRINCIPLES AND DEVELOPMENT OF IWRAP MK II

This chapter explains the principles and development of the IWRAP MK II. After completing this lecture, you will be able to:

1. Discuss key terms used in IWRAP MK II: geometric number of collision or grounding candidates, causation factor value and blind navigation, leg, waypoint, lateral distribution, mean, standard deviation, normal distribution, uniform distribution, types of collisions, types of groundings.
2. Explain the 'basic algorithm' in IWRAP MK II: probability of collisions or groundings ( $\lambda_{Col}$  or  $\lambda_{Grnd}$ ) = geometric number of collision or grounding candidates ( $N_G$ ) x causation factor value ( $P_C$ ).
3. Explain how the 'basic algorithm' in IWRAP MK II relates to the 'risk formula': risk (R) = probability (P) x consequence (C).
4. Identify the resources needed to estimate the annual probabilities of collisions and groundings.
5. List the six main steps which are followed to estimate the annual probabilities of collisions and groundings.
6. Describe the types of collisions and groundings which are assessed in IWRAP MK II.

Estimated study time: 2.5 hours.

Assessment type: quiz.

Pace: self-study.

Weight of the assessment: 20%.

### DISCUSSION OF CHAPTER 1

During this meeting, the advanced principles and development of IWRAP MK II would be discussed.

Pace: online lecture.

### CHAPTER 2: BASIC MODELLING IN IWRAP MK II

This chapter was designed to guide you through the development of a basic model in IWRAP MK II. After completing this chapter, you will be able to apply the principles of IWRAP MK II to:

1. Set up the workspace for creating a model.
2. Create a model and estimate the annual probabilities of collisions and groundings.
3. Interpret and illustrate the annual probabilities of collisions and groundings.

Estimated study time: 8 hours.

Assessment type: model, report.

Pace: self-study.

Weight of the assessment: 20%.

### DISCUSSION OF CHAPTER 2

During this meeting, you would be given the opportunity to present your model to your lecturers and discuss your experience.

Pace: online lecture.

### CHAPTER 3: ADVANCED MODELLING IN IWRAP MK II

This chapter was designed to guide you through the development of an advanced model in IWRAP MK II. After completing this chapter, you will be able to apply the principles of IWRAP MK II to:

1. Verify and calibrate your model.
2. Conduct what if analyses by adjusting the composition, volume, and lateral distribution of traffic.
3. Apply filters, which are useful to explore, work with, and focus on a subset of data.
4. Calculate the annual emissions from ships within the waterway.
5. Report on the risk assessment process.

Estimated study time: 8 hours.

Assessment type: model, report.

Pace: self-study.

Weight of the assessment: 20%.

### DISCUSSION OF CHAPTER 3

During this meeting, you would be given the opportunity to present your model to your lecturers and discuss your experience.

Pace: online lecture.

### CHAPTER 4: CASE STUDY

In this chapter, you would consolidate your knowledge about IWRAP MK II by modelling a waterway and estimating the probabilities of collisions and groundings. If you would like to model a waterway within your State, you should have the data listed on page 1.

Estimated study time: 8 hours.

Assessment type: model.

Pace: self-study.

Weight of the assessment: 40%.

### DISCUSSION OF CHAPTER 4

During this meeting, you would be given the opportunity to present your model to your lecturers and discuss your experience.

Pace: online lecture.

Pace	Day	Title
Online lecture	Day 1	Introduction to risk assessment using IWRAP MK II
Self-study	Day 1 – Day 4	Chapter 1: Advanced Principles and Development of IWRAP MK II
Online lecture	Day 4	Discussion of Chapter 1
Self-study	Day 4 – Day 8	Chapter 2: Basic Modelling in IWRAP MK II
Online lecture	Day 8	Discussion of Chapter 2
Self-study	Day 8 – Day 12	Chapter 3: Advanced Modelling in IWRAP MK II
Online lecture	Day 12	Discussion of Chapter 3
Self-study	Day 12 – Day 21	Chapter 4: Case study
Online lecture	Day 21	Discussion of Chapter 4

Online lecture: real-time, instructor-led interaction.

Self-study: virtually online and through prepared resources, without real-time, instructor-led interaction.

## AIS DATA EXCHANGE FORMAT

The following describes the types of AIS sentences, and their associated timestamp needed for Risk Assessment using the IALA Risk Assessment Toolbox, particularly IWRAP.

### Types of AIS sentences

- The data set should contain **all types of AIS sentences** (both static and dynamic) available.

### Data formats

- The AIS data should be raw NMEA sentences.
- Each AIS sentence **must have a timestamp** attached in front of the sentence:

#### *Example of a full AIS sentence with (simple) timestamp:*

```
24-12-2015 10:00:26.750,IBSVDM,1,1,,A,17bG;L001Kawad2D5fHR6Qrj00Sp,0*61
24-12-2015 10:00:26.752,IBSVDM,1,1,,A,16K2;8h000awF:FD@QsB03tl0D3c,0*6D
24-12-2015 10:00:26.753,IBSVDM,2,1,5,A,56KPiQT2=:Bt`kKK7F1@4Tdv0I59F222222221@80;5760e,0*00
```

#### *Another example with a different type of timestamp (NMEA) which also is acceptable:*

```
$DSZDA,040000.52,28,02,2017,0,0*69
IBSVDM,1,1,,B,B7h29r00A;<INSuIF>IpgwP5oP06,0*5E
$DSZDA,040000.87,28,02,2017,0,0*61
IBSVDM,1,1,,B,B7h;4>00H;<I5VuO9iafSwPWkP06,0*06
```

#### *A third type of time stamp (Comment Block) which also is acceptable:*

```
\g:1-2-1764,s:rORBCOMM000,c:1476489690,T:2016-10-15 00.01.30*35\
!AIVDM,2,1,4,B,53e5An02;cfcTPe?J210ThT<6222222222221??HJ6A6a20F50CD2@kp88,0*7F
\g:2-2-1764,s:rORBCOMM000,c:1476489690,T:2016-10-15 00.01.30*36\
!AIVDM,2,2,4,B,88888888880,2*23
```

### File size, naming and compression:

- To facilitate the further processing of the data, it must be delivered in files of less than 300 MB each.
- The division between files should be based on time (say week by week or month by month).
- Filenames must reflect the period contained within the file.
- Each file should preferably be compressed (ZIP)

### Delivery of dataset

- The dataset could be made available via an FTP server with good bandwidth or other file-sharing alternatives.

IALA World-Wide Academy  
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