International Association of Marine Aids to Navigation and Lighthouse Authorities

IALA

Association Internationale de Signalisation Maritime

AISM

IALA World Wide Academy

Model Course for
Aids to Navigation

LEVEL 1
Aids to Navigation Manager Training

Introduction to e-Navigation
(IALA WWA.L1.4)

Edition 1

December 2013

Document Revisions

Revisions to the IALA Document are to be noted in the table prior to the issue of a revised document.

Date	Page / Section Revised	Requirement for Revision

FOREWORD

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) recognises that training in all aspects of the management of Aids to Navigation (AtoN) service delivery is critical to the consistent provision of that AtoN service.

Taking into account that under the SOLAS Convention, Chapter 5, Regulation 13, paragraph 2, Contracting Governments, mindful of their obligations published by the International Maritime Organisation, undertake to consider the international recommendations and guidelines when establishing aids to navigation, including recommendations on training and qualification of AtoN managers, IALA has adopted Recommendation E-141 Edition 2 on Standards for Training and Certification of AtoN personnel.

IALA Committees working closely with the IALA World Wide Academy (The Academy) have developed a series of model courses for AtoN personnel having E-141 Level 1 management functions. This model course on an introduction to e-Navigation should be read in conjunction with IALA Recommendation E-141/1 – Model Course on Level 1 Manager Training, which contains standard guidance for the conduct of all Level 1 model courses.

This model course is intended to be delivered by The Academy in conjunction with a national member and other appropriate authorities charged with the provision of AtoN services in a particular region. It contains specific guidance on the training of AtoN managers on the principles of the e-Navigation concept. Assistance in implementing this and other model courses may be obtained from the IALA World Wide Academy at the following address:

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TABLE OF CONTENTS

1   PART A - COURSE OVERVIEW

1.1   Scope

This course is intended to provide aids to navigation managers and other interested parties with the training necessary to have a satisfactory understanding of the e-Navigation concept.

1.2   Objective

Upon successful completion of this course, participants will have acquired sufficient knowledge to explain the principles of the e-Navigation concept to members of their organizations and associated stakeholders.

1.3   Course Outline

This course is intended to cover the knowledge required for an aids to navigation manager to gain an understanding of e-Navigation and disseminate that knowledge more widely. The course comprises 5 teaching modules.

1.4   Table of Teaching Modules

Module Title	Time in hours	Overview
The background to e-Navigation	1	This module describes the inception, adoption and development of the e-Navigation concept
Electronic Nautical Charts and ECDIS	1	This module describes the importance of valid electronic chart data required to support e-Navigation
Position Navigation and Timing	1.5	This module describes why an uninterrupted determination of position, navigation and coordinated time is essential to e-Navigation
Communications and AIS	1.5	This module describes the communications systems necessary to support e-Navigation
Information Systems	1	This module describes existing and developing information systems which are designed to improve the flow of information ship to shore; ship to ship and shore to ship
Total Hours:	**6**	One day course

1.5   Specific Course Related Teaching Aids and Notes

1   This course will be classroom based with presentations delivered using MS PowerPoint®. Although the course is limited to 30 participants, the classroom should be big enough to permit the participants to sit at desks large enough to operate a laptop computer with room for printed material to hand. Each desk should be provided with a power socket.

2   The classroom should be equipped with overhead projectors and screens to enable presentation of the subject matter.

3   To enable all participants to receive clear guidance from instructors and to raise questions that can be heard throughout the classroom, lapel or fixed lectern microphones should be provided together with a roving microphone for use by participants.

4   Participants should have Wi-Fi internet access.

1.6   References

In addition to any specific references required by the Competent Authority, the following material is relevant to this course:

- The IALA NAVGUIDE

- IALA Information Paper on e-Navigation Architecture

- IALA Maritime Radio Communications Plan

- IALA World-Wide Radionavigation Plan

- IALA Recommendation e-NAV140 on e-Navigation Architecture - the initial shore-based perspective

- IALA Recommendation e-Nav 144 on Harmonized implementation of Application Specific Messages

- IALA Guideline 1072 On AtoN Information Exchange & Presentation

- IALA Guideline 1085 On the Standard Format for Electronic Exchange of AtoN Product Information

- IALA Guideline1086 On the Global Sharing of Maritime Data

- IALA Guideline 1087 On Procedures for the Management of the IALA Domains under the IHO GI Registry

- IALA Guideline 1088 On an Introduction to Preparing S-100 Product Specifications

- IALA Guideline 1096 on Anticipated user e-Navigation requirements from Berth to Berth, for AtoN Authorities

1.7   Pre-Course Reading

Participants should be encouraged to study:

- IALA Recommendation e-NAV140 on e-Navigation Architecture - the initial shore-based perspective

1.8   Certification

Participants who attend this model course can be presented with an AtoN Level 1 Manager certificate which states that they have completed successfully sub-elements 2a.3.9; 2b.2; 4b.4-5 and 4d.3 of Complementary Modules 2 and 4 which form part of the syllabus for Level 1 AtoN Managers set out in IALA Recommendation E-141/1. An example is at Annex A. It should be noted that such a certificate should **not** be considered a Certificate of Competence as no formal test of competency will be conducted.

2   PART B - TEACHING MODULES

2.1   Module 1 – The background to e-Navigation

2.1.1   Scope

This module describes the inception, adoption and development of the e-Navigation concept.

2.1.2   Learning Objectives

To gain a **satisfactory** (Level 2) understanding of the definition and principles of the e-Navigation concept and its development.

2.1.3 DETAILED TEACHING SYLLABUS FOR MODULE 1 – THE BACKGROUND TO e-NAVIGATION

Table 1   Detailed Teaching Syllabus Module 1

Module	Element	Sub-element	Subject	Level of Competence	Recommended training aids and exercises	References Rec = Recommendation GL = Guideline	Lecture No.
1			**BACKGROUND TO e-NAVIGATION**				
	1.1		**The Definition of e-Navigation**				
		1.1.1	The need for e-Navigation				
		1.1.2	IMO definition and scope of e-Navigation			NAVGUIDE Chapter 4	
		1.1.3	Key components of e-Navigation ashore and afloat	2		Rec e-NAV140	
		1.1.4	Introduction to the concept of a Common Maritime Data Structure				
		1.1.5	Introduction to proposed e-Navigation architecture				
	1.2		**The Development of e-Navigation**				
		1.2.1	Role of IMO in the development of e-Navigation				
		1.2.2	Role of IALA and the e-Navigation Committee	2			1
		1.2.3	Strategy Implementation Plan and its status				
		1.2.4	Update on phased implementation programme				
		1.2.5	The user-driven approach to the design of e-Navigation elements			GL 1096	
		1.2.6	Human Element Analysing Process (HEAP)	1			
		1.2.7	Risk Control Options (RCO) and Formal Safety Assessments (FSA)				
		1.2.8	Concept of test beds				

2.2 Module 2 – ELECTRONIC NAVIGATIONAL CHARTS AND ECDIS

2.2.1   Scope

This module describes the importance of valid electronic chart data required to support e-Navigation.

2.2.2   Learning Objectives

To gain a **basic** understanding of Electronic Navigational Charts and their use in Electronic Chart Display and Information Systems.

2.2.3 DETAILED TEACHING SYLLABUS FOR MODULE 2 – ELECTRONIC NAVIGATIONAL CHARTS AND ECDIS

Table 2   Detailed Teaching Syllabus Module 2

Module	Element	Sub-element	Subject	Level of Competence	Recommended training aids and exercises	References Rec = Recommendation GL = Guideline	Lecture No.
2			**ELECTRONIC NAVIGATIONAL CHARTS AND ECDIS**				
	2.1		**Electronic Navigational Charts**				
		2.1.1	The definition and properties of ENCs			GL 1085	
		2.1.2.	Status of accurate hydrographic data world wide	1		GL1086	
		2.1.3	Availability of ENCs and the role of RENCs			GL 1087	
		2.1.4	Problems with datum alignment			GL 1088	
	2.2		**ECDIS**				2
		2.2.1	General specifications of an ECDIS				
		2.2.2	IMO carriage requirements	1			
		2.2.3	Harmonisation of navigation systems on board a vessel				

2.3 Module 3 – Position, Navigation and Timing

2.3.1 Scope

This module describes why an uninterrupted determination of position, navigation and coordinated time is essential to e-Navigation.

2.3.2 Learning Objectives

To gain a **satisfactory** understanding of the systems from which continuous timing and position at sea can be obtained, their vulnerabilities and plans to mitigate against such vulnerabilities.

2.3.3 DETAILED TEACHING SYLLABUS FOR MODULE 3 – POSITION, NAVIGATION AND TIMING

Table 3   Detailed Teaching Syllabus Module 3

Module	Element	Sub-element	Subject	Level of Competence	Recommended training aids and exercises	References Rec = Recommendation GL = Guideline	Lecture No.
3			**Position, Navigation and Timing**				
	3.1		**Review of Determining Continuous Position at Sea**				
		3.1.1	Systems that meet IMO accuracy standards	2		IMO Resolution A.1046(27)	3
		3.1.2	Sources of timing			Rec R-121	
		3.1.3	GNSS and DGNSS			Rec R-135	
	3.2		**GNSS Vulnerability**				
		3.2.1	Sources of vulnerability	2		Rec R-129	
		3.2.2	Systems dependent on PNT				
		3.2.3	Alternative PNT systems			IALA WWRNP	
	3.3		**Resilient PNT Plans**				
		3.3.1	IMO World-Wide Radionavigation System	2			4
		3.3.2	IALA World-Wide Radionavigation Plan			GL 1053	
		3.3.3	SBAS; GBAS and RAIM				
		3.3.4	Planned improvements to space and ground based radionavigation systems				

2.4 Module 4 – COMMUNICATIONS AND AIS

2.4.1 Scope

This module describes the communications systems necessary to support e-Navigation.

2.4.2 Learning Objectives

To gain a **satisfactory** understanding of the function of communications systems, including the Automatic Identification System on which e-Navigation is dependent.

2.4.3 DETAILED TEACHING SYLLABUS FOR MODULE 4 – COMMUNICATIONS AND AIS

Table 4   Detailed Teaching Syllabus Module 4

Module	Element	Sub-element	Subject	Level of Competence	Recommended training aids and exercises	References Rec = Recommendation GL = Guideline	Lecture No.
4			**COMMUNICATIONS AND AIS**				
	4.1		**IALA Maritime Radio Communications Plan**				
		4.1.1	Review of communications required to support e-Navigation	2			5
		4.1.2.	Bandwidth availability				
		4.1.3	Advantages and disadvantages of communication via satellite				
		4.1.4	Modernisation of the use of VHF channels				
		4.1.5	Examples: VDES; ASM channels				
		4.1.6	Overview of GMDSS				
	4.2		**Automatic Identification System**				
		4.2.1	Review of AIS	2		Rec A-123; Rec A-126	6
		4.2.2	Limitations of AIS			Rec A-124 and its suffixes	
		4.2.3	The role of AIS in e-Navigation			GL 1028; 1029	
		4.2.4	Base stations and chaining			GL 1050; 1059; 1062	
		4.2.5	AIS messages specific to e-Navigation			GL 1082;1084; 1095; 1096	
		4.2.6	Satellite AIS				

2.5 Module 5 – INFORMATION SYSTEMS

2.5.1 Scope

This module describes existing and developing information systems which are designed to improve the flow of information ship to shore; ship to ship and shore to ship

2.5.2 Learning Objectives

To gain a **satisfactory** understanding of how both existing information systems and those under development will improve the flow of maritime and safety information between stakeholders and a **basic** understanding of geospatial information registries and test beds.

2.5.3 DETAILED TEACHING SYLLABUS FOR MODULE 5 – INFORMATION SYSTEMS

Table 5   Detailed Teaching Syllabus Module 5

Module	Element	Sub-element	Subject	Level of Competence	Recommended training aids and exercises	References Rec = Recommendation GL = Guideline	Lecture No.
5			**INFORMATION SYSTEMS**				
	5.1		**Information Architecture**				
		5.1.1	Existing information systems ship to ship; ship to shore; shore to ship and shore to shore				
		5.1.2.	Limitations of existing information systems				
		5.1.3	Information systems under development	2			7
		5.1.4	Maritime Service Portfolios				
		5.1.5	The role of Vessel Traffic Services in e-Navigation				
		5.1.6	Considerations for the management of information			GL 1086	
	5.2		**Data Modelling**				
		5.2.1	Concept of a universal Marine Information Registry				
		5.2.2	S-100 Framework and the IHO Geospatial Information Registry				
		5.2.3	Development of product specifications				
		5.2.4	AtoN information	1			8
	5.3		**Test Beds**				
		5.3.1	Review of existing and planned test bed data				
		5.3.2	Guideline on the reporting of test bed results				

Aids to Navigation Certificate

Level 1 – An Introduction to e-Navigation

This is to certify that

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has completed successfully sub-elements 2a.3.9; 2b.2; 4b.4-5 and 4d.3 of Complementary Modules 2 and 4 of the syllabus for Level 1 AtoN Managers set out in IALA Recommendation E-141/1.

Awarded at [City, Country] on [date]

Name

Representative of IALA World-Wide Academy

Name

On behalf of the Chairman of the IALA e-Navigation Committee