



MODEL COURSE

L2.8.1

MARINE AIDS TO NAVIGATION - TECHNICIAN
TRAINING

LEVEL 2 ELEMENT 8.1

AIS AtoN OPERATIONS

Edition 2.0

December 2017



DOCUMENT HISTORY

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

Date	Details	Requirement for Revision
May 2013	1 st issue	Council 55
December 2017	Entire document: General review and update	Council 65



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FOREWORD

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) recognises that training in all aspects of Marine Aids to Navigation (AtoN) service delivery, from inception through installation and maintenance to replacement or removal at the end of a planned life-cycle, is critical to the consistent provision of that AtoN service.

Taking into account that under the SOLAS Convention, Chapter V, 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 technicians, IALA has adopted Recommendation R0141 - Training and Certification of AtoN personnel.

IALA Committees, working closely with the IALA World-Wide Academy, have developed a series of model courses for AtoN personnel having Level 2 technician functions. This model course on AIS AtoN Operations should be read in conjunction with the Training Overview Document IALA WWA.L2.0 which contains standard guidance for the conduct of all Level 2 model courses.

This model course is intended to provide national members, and other appropriate authorities charged with the provision of AtoN services, with specific guidance on the training of AtoN technicians in AIS AtoN Operations. 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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PART 1- COURSE OVERVIEW

1. SCOPE

This course is intended to provide technicians with the theoretical training necessary to have a basic understanding of the principles of operation of AIS AtoN.

This introductory course is intended to be supported by further training modules on theoretical aspects of AIS AtoN operations. Details of these supporting model courses can be found in the Level 2 Technician training overview document IALA WWA L2.0.

2. OBJECTIVE

Upon successful completion of this course, participants will have acquired sufficient knowledge and skill to understand the principles of operation of AIS and AIS AtoN within their organisations.

3. COURSE OUTLINE

This course is intended to cover the knowledge required for a technician to understand the principles of operation of AIS AtoN. The complete course comprises 5 classroom modules, each of which deals with a specific subject covering aspects of AIS AtoN operations. Each module begins by stating its scope and aims, and then provides a teaching syllabus.

4. TEACHING MODULES

Table 1 Table of Teaching Modules

Module Title	Time in hours	Overview
Purpose & Principles of AIS	6.0	This module provides a description of the purpose and operation of AIS, an overview of the different AIS units, and the use of AIS as an aid to navigation.
AIS-AtoN Base Station and repeaters	2.0	This module describes the purpose of an AIS base station and an overview of its operation
AIS-AtoN	2.0	This module provides an overview of the parts of the AIS AtoN functions
Installation, configuration, MMSI & Slot Management	3.0	This module describes how a technician can install, configure and commission an AIS-AtoN
Maintenance and Testing	2.0	This module provides an overview of the maintenance and testing requirements for an AIS AtoN
Evaluation	1.0	Written test
Total Hours	16.0	Two or Three-day course



5. SPECIFIC COURSE RELATED TEACHING AIDS

This course involves classroom instruction with the use of sample equipment, programming units and PCs. Classrooms should be equipped with blackboards, whiteboards, and overhead projectors to enable presentation of the subject matter.

The use of AIS units and programming units / PCs enables the student to gain practical application and programming skills during the course.

6. ACRONYMS

To assist in the use of this model course, the following acronyms have been used:

AIS	Automatic Identification System
AtoN	Marine Aid(s) to Navigation
ECDIS	Electronic Chart Display and Information System
FATDMA	Fixed-Access Time-Division Multiple Access
GNSS	Global Navigation Satellite System
GRT	Gross register tonnage
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ITU	International Telecommunication Union
ITU-R	International Telecommunications Union – Radiocommunications Bureau
L	Level
MKD	Minimum Keyboard and Display
MMSI	Maritime Mobile Service Identity
RATDMA	Random Access Time-Division Multiple Access
SART	Search and Rescue Transponder
SOLAS	International Convention for the Safety of Life at Sea, 1974 (as amended)
SOTDMA	Self-Organising Time-Division Multiple Access
TDMA	Time-Division Multiple Access
VHF	Very High Frequency (30 MHz to 300 MHz)
WWA	World Wide Academy

7. DEFINITIONS

The definition of terms used in this Guideline can be found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) at <http://www.iala-aism.org/wiki/dictionary>.

8. REFERENCES

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

- 1 IALA NAVGUIDE.
- 2 IALA Recommendation A-123 The Provision of Shore Based Automatic Identification System (AIS).
- 3 IALA Recommendation A-124 Automatic Identification System (AIS) Shore Station and Networking Aspect relating to the AIS Service.



- 4 IALA Recommendation A-126 - The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services.
- 5 IALA Guideline G1050 - The Management and Monitoring of AIS Information.
- 6 IALA Guideline G1062 - The Establishment of AIS as an AtoN.
- 7 IALA Guideline G1082 - An Overview of AIS.
- 8 ITU Recommendation ITU-R M.1371 (latest edition) Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band.
- 9 Technical documentation from AIS manufacturers.



PART 2 – TEACHING MODULES

1. MODULE 1 – PURPOSE & PRINCIPLES OF AIS

1.1. SCOPE

This module provides a description of the purpose and operation of AIS, an overview of the different AIS units, and the use of AIS as a Marine Aid to Navigation.

1.2. LEARNING OBJECTIVE

To gain a **basic** understanding of the purpose of AIS in shipping safety and as a Marine Aid to Navigation.

1.3. SYLLABUS

1.3.1. LESSON 1 – PURPOSE OF AIS & AIS-ATON

- 1 Principles of operation.
- 2 Overview of an AIS system and AIS units.
- 3 Positive identification.
- 4 Limited Range.
- 5 Trackable:
 - a Satellite.
 - b Terrestrial.
- 6 Mandated carriage >300GRT

1.3.2. LESSON 2 – PRINCIPLES OF OPERATION

- 1 Component parts:
 - a VHF Transceiver.
 - b Minimum keyboard display (MKD).
 - c GNSS Receiver.
 - d AIS Processor.
 - e Antennas.
- 2 User interfaces:
 - a MKD.
 - b ECDIS.
 - c Radar Display.
- 3 VHF bands:
 - a VHF Channels for AIS use.
 - b Licensing and MMSI.
- 4 TDMA Principles:
 - a Concepts of Time Slots of Different Stations.
 - b Slot Synchronisation to Avoid Conflict in Messages.



- c Methods of Access for Stations.
- d RATDMA.
- e FATDMA.
- f SOTDMA.

1.3.3. LESSON 3 – AIS TYPES

- 1 AIS AtoN:
 - a Type 1.
 - b Type 2.
 - c Type 3.
- 2 Class A.
- 3 Class B.
- 4 Base Station.
- 5 Repeaters.
- 6 AIS SART.

1.3.4. LESSON 4 - AIS & AIS-ATON MESSAGES

- 1 IALA Recommendations A-126 and A-124.
- 2 Dynamic Voyage Information.
- 3 Static Voyage Information.
- 4 AIS AtoN Information.
- 5 Other Messages.
- 6 AIS Management Information.

2. MODULE 2 – AIS BASE STATION AND REPEATER

2.1. SCOPE

This module describes the purpose of an AIS base station and an overview of its operation.

2.2. LEARNING OBJECTIVE

To gain a **basic** understanding of the purpose and operation of an AIS base station.

2.3. SYLLABUS

2.3.1. LESSON 1 – PURPOSE OF AN AIS BASE STATION

- 1 Collection of AIS data for Vessel Traffic Monitoring.
- 2 Verification of AIS-AtoN performance.
- 3 Transmission of Virtual AtoN.

2.3.2. LESSON 2 - SHORE BASED INFRASTRUCTURE

- 1 Component parts of an AIS Base Station.
- 2 Slot reservation.
- 3 The Base Station Network:



- a Control of network.
- b Access and authority to access.

2.3.3. LESSON 3 – BASE STATION MESSAGES

- 1 Message 4 – Base Station Report.
- 2 Message 20 – Data Link Management Message (Slot Reservation).
- 3 Message 22 – Channel Management.

3. MODULE 3 – AIS-AtoN

3.1. SCOPE

This module provides an overview of the purpose of AIS as an AtoN.

3.2. LEARNING OBJECTIVE

To gain a **satisfactory** understanding of the purposes of AIS as and AtoN.

3.3. SYLLABUS

3.3.1. LESSON 1 – PURPOSE OF AIS ATO N

- 1 Electronic display:
 - a ECDIS.
 - b Radar.
- 2 Remote monitoring of AtoN status.
- 3 Message 21 – AtoN report.

4. MODULE 4 – INSTALLATION, CONFIGURATION, MMSI & SLOT MANAGEMENT

4.1. SCOPE

This module provides an overview of the installation and configuration of AIS base station, repeaters and AIS-AtoN.

4.2. LEARNING OBJECTIVE

To gain a **satisfactory** understanding to enable the technician to install, configure and commission an AIS-AtoN.

4.3. SYLLABUS

4.3.1. LESSON 1 – AIS ATO N INSTALLATION

- 1 Antenna location:
 - a GNSS receiver location.
 - b VHF Antenna.
- 2 Power supply.
- 3 Watertight integrity.
- 4 Maintenance accessibility.



4.3.2. LESSON 2 - AIS CONFIGURATION

- 1 Identification:
 - a MMSI.
 - b Name.
- 2 AIS AtoN programming:
 - a FATDMA / RATDMA.
 - b Position – Surveyed or GNSS:
 - i Guard radius.
 - ii Off position.
 - c AtoN type.
 - d AtoN Status configuration.
- 3 Base Station Programming:
 - a Surveyed position.
 - b Slot configuration:
 - i For itself.
 - ii For other nearby stations.
 - c Transmission interval (for Type 1).

4.3.3. LESSON 3 – PRACTICAL PROGRAMMING

- 1 Practical programming of a sample AIS AtoN.
- 2 Tracking of serial numbers, configuration data and software version.

5. MODULE 5 – MAINTENANCE AND TESTING

5.1. SCOPE

This module provides an overview of the maintenance and testing requirements for an AIS AtoN.

5.2. LEARNING OBJECTIVE

To gain a **satisfactory** understanding to enable the technician to maintain and test an AIS AtoN.

5.3. SYLLABUS

5.3.1. LESSON 1 – AIS MAINTENANCE

- 1 Visual inspection.
- 2 Cable and connection security and deterioration.
- 3 Damage and security of mounting.
- 4 Power supply.

5.3.2. LESSON 2 - AIS TESTING

- 1 Enhanced AIS Receiver:
 - a Signal Strength.
 - b Slot usage.



- c Message content.
- 2 Base station information.