



# IALA MODEL COURSE

L2.3.7-8

AIDS TO NAVIGATION - TECHNICIAN TRAINING

LEVEL 2 MODULE 3 ELEMENTS 3.7 – 3.8

ROTATING BEACONS AND CLASSICAL LENSES

**Edition 2.0**

December 2016



# DOCUMENT REVISION

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

Date	Page / Section Revised	Requirement for Revision
May 2013		Edition 1
December 2016	Page 9, 10, 11, 12	Module 1 – Section 1.3.1 – Minor changes Module 2 – Section 2.1, 2.3.2 – Minor changes Module 4 – Section 4.3.1, 4.3.2, 4.3.3 – Minor changes



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## FOREWORD

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) recognises that training in all aspects of 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 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 technicians, IALA has adopted Recommendation E-141 on Standards for 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 E-141 Level 2 technician functions. This model course on AtoN Service Craft and Buoy Tenders 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 an introduction to service craft and buoy tenders. Assistance in implementing this and other model courses may be obtained from the IALA World Wide Academy at the following address:

The Secretariat  
IALA World-Wide Academy  
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78100 Saint Germain-en-Laye  
France

Tel: (+) 33 1 34 51 70 01  
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e-mail: [contact@iala-aism.org](mailto:contact@iala-aism.org)  
Internet: [www.iala-aism.org](http://www.iala-aism.org)

## PART 1- COURSE OVERVIEW

### 1. SCOPE

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This course is intended to provide technicians with the practical training necessary to install, set to work and maintain rotating beacons including focussing lamps in classical lenses.

This course should only be conducted after participants have completed successfully Level 2 Module 3 Elements 3.1-3 which includes an introduction to marine lanterns, light characters and ranges. This 'hands-on' course is intended to be supported by further training modules on mercury rotating optics, power supplies, structures, materials and AtoN maintenance. Details of these supporting model courses can be found in the Level 2 Technician training overview document IALA WWA L2.0.

### 2. OBJECTIVE

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Upon successful completion of this course, participants will have acquired sufficient knowledge and skill to safely install, adjust the position of lamps in classical lenses and maintain rotating beacons operated by their organizations.

### 3. COURSE OUTLINE

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This principally practical course is intended to cover the knowledge required for a technician to install, adjust set to work and maintain rotating beacons including those fitted with classical lenses and automatic lamp changers. The complete course comprises 4 workshop or classroom modules, each of which deals with a specific subject covering aspects of rotating beacons, classical lenses, focal position and light source adjustment. Module 5 comprises a site visit designed to consolidate practical knowledge. 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
An introduction to rotating beacons	2.0	This module describes the type and function of rotating beacons used within the organisation
The principles of fixed optics, drum lenses and rotating optics and focussing devices built into classical lenses	2.0	This module describes Fresnel lenses; the rotating optic and the importance of correct focussing
Lamp types and changers used in classical and modern rotating beacons	2.0	Written and practical test conducted on board the vessel (where practicable)
Rotating Beacon Installation and Maintenance	6.0	This module describes modern lamps and lamp changers and the safety aspects concerned with the installation, maintenance and replacement of lamps in both classical and modern rotating beacons
Lighthouse site visit - practical light alignment	5.0	A visit to an AtoN station fitted with a rotating beacon to conduct practical lamp alignment and maintenance routines
Evaluation	1	Practical competency test during site visit
<b>Total Hours</b>	<b>18</b>	Three-day course

## 5. SPECIFIC COURSE RELATED TEACHING AIDS

This course involves both workshop or classroom instruction and a visit to an operational lighthouse. Instruction rooms should be equipped with blackboards or whiteboards, and overhead projectors to enable presentation of the subject matter.

- a rotating beacon;
- complete classical lenses or sections of lens similar to those used in the AtoN service;
- examples of automatic lamp changers and lamps used in the AtoN service.

## 6. ACRONYMS

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

AtoN	Aid(s) to Navigation
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities - AISM
L	Level (technician training - WWA)
LED	Light Emitting Diode
SOLAS	International Convention for the Safety of Life at Sea, 1974 (as amended)
WWA	World-Wide Academy

## 7. DEFINITIONS

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

## 8. REFERENCES

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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 E-200-0 on Marine Signal Lights – Overview.
- 3 IALA Guideline 1043 on Light Sources used in Visual Aids to Navigation.
- 4 IALA Guideline 1077 on Maintenance of Aids to Navigation.
- 5 IALA Guideline 1038 on Ambient Light Levels at which Aids to Navigation should Switch On and Off.
- 6 IALA Guideline 1049 on the use of Modern Light Sources in Traditional Lighthouse Optics.
- 7 Manufacturers' handbooks on marine signal lanterns used by the organisation.



## PART 2 – TEACHING MODULES

### 1. MODULE 1 – AN INTRODUCTION TO ROTATING BEACONS

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#### 1.1. SCOPE

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This module describes the type and function of rotating beacons used within the organisation.

#### 1.2. LEARNING OBJECTIVE

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To gain a **satisfactory** understanding of the types and functions of rotating beacons and associated optics used by the AtoN service provider.

#### 1.3. SYLLABUS

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##### 1.3.1. LESSON 1 – ROTATING BEACONS – GENERAL

- 1 Types of rotating beacons used.
- 2 Ranges of operational rotating beacons.
- 3 Standard flash characters used.
- 4 On-off cycle and sun switches.
- 5 Standby and emergency lanterns.
- 6 Protective housings and light loss through glass.

##### 1.3.2. LESSON 2 – TRADITIONAL AND MODERN ROTATING BEACONS

- 1 The components of a traditional rotating optic.
- 2 The components of a modern rotating optic.

### 2. MODULE 2 – THE PRINCIPLES OF FIXED OPTICS, DRUM LENSES AND ROTATING OPTICS AND FOCUSING DEVICES BUILT INTO CLASSICAL LENSES

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#### 2.1. SCOPE

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This module describes Fresnel rotating optics, fixed drum lenses and the importance of correct focusing.

#### 2.2. LEARNING OBJECTIVE

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To gain a **basic** understanding of the principle of Fresnel rotating optics and fixed drum lenses and to gain a **satisfactory** understanding of the importance of correct focussing.

#### 2.3. SYLLABUS

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##### 2.3.1. LESSON 1 – GLASS AND ACRYLIC LENSES

- 1 Glass Fresnel optics.
- 2 Glass safety issues.
- 3 Isolation of optic rotation power supply.
- 4 Modern acrylic drum lenses.
- 5 Lens maintenance and cleaning procedure.

### 2.3.2. LESSON 2 - FOCUSING PROCEDURES

- 1 The importance of focusing.
- 2 Optical alignment devices.
- 3 Mechanical focal position indicators.
- 4 Dummy lamps.

## 3. MODULE 3 – LAMP TYPES AND CHANGERS USED IN CLASSICAL AND MODERN ROTATING BEACONS

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### 3.1. SCOPE

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This module describes modern lamps and lamp changers and the safety aspects concerned with the installation, maintenance and replacement of lamps in both classical and modern rotating beacons.

### 3.2. LEARNING OBJECTIVE

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To gain a **satisfactory** understanding of the types and functions of lamps and lamp changers used in both classical and modern rotating beacons and a **good** understanding of safety issues associated with their maintenance.

### 3.3. SYLLABUS

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#### 3.3.1. LESSON 1 – LAMPS AND LAMP SAFETY

- 1 Types of lamps used in rotating beacons:
  - a LED lamps and arrays.
  - b Incandescent lamps.
  - c Discharge lamps.
- 2 Isolation of lamp power supply.
- 3 Precautions while handling hot lamps.
- 4 Precautions against possible lamp explosion.
- 5 Hazards of intense light sources.

#### 3.3.2. LESSON 2 - LAMP CHANGERS USED IN ROTATING OPTICS

- 1 Traditional lamp changers.
- 2 Maintenance procedures for traditional lamp changers.
- 3 Modern lamp changers.
- 4 Programming modern lamp changers.
- 5 Maintenance procedures for modern lamp changers.

## 4. MODULE 4 – ROTATING BEACON INSTALLATION AND MAINTENANCE

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### 4.1. SCOPE

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This module describes how firstly to install a modern rotating beacon on an approved pre-levelled platform and then how to maintain an installed rotating beacon.

## 4.2. LEARNING OBJECTIVE

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To gain a **satisfactory** understanding of how to install a modern rotating beacon under supervision and how to maintain it thereafter. **Note** that the supervision may be conducted by an IALA Industrial Member in a workshop or on site.

## 4.3. SYLLABUS

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### 4.3.1. LESSON 1 – PREPARATION

- 1 Quality control checks and reports on delivery of component parts.
- 2 Preparation of tools and safety equipment.
- 3 Checks on power supplies and isolation procedures.
- 4 Pre-install inspection and testing.

### 4.3.2. LESSON 2 - ROTATING BEACON ASSEMBLY

- 1 Step by step assembly procedures.
- 2 Alignment of lamps.
- 3 Levelling of the optic.
- 4 Checks on obscuration or reflection.
- 5 Rotation speed (flash character) setting.
- 6 Sun switch setting.
- 7 Standby lamp connections.
- 8 Testing and setting to work.
- 9 Commissioning.

### 4.3.3. LESSON 3 – MAINTENANCE OF ROTATING BEACONS

- 1 Site visit reports.
- 2 Cleaning and inspecting lenses, housings, topmarks, bird spikes and securing bolts.
- 3 Checks of batteries, power supply cables and seals.
- 4 Hot lamp and power isolation safety procedures.
- 5 Correct opening procedures.
- 6 Internal inspections including cable terminations.
- 7 Diagnostic checks and component replacement including lamps.
- 8 Lamp alignment checks.
- 9 Re-sealing procedures.
- 10 Final test procedures.
- 11 Maintenance records.

## 5. SITE VISIT

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The purpose of the visit is to:

- 1 Permit participants to consolidate the practical knowledge gained in the classroom/workshop through a visit to a suitable AtoN station fitted with either a classic optic or modern rotating beacon.

- 2 Conduct practical lamp alignment and maintenance routines at an AtoN station fitted with a rotating beacon.
- 3 Check lamp alignment and conduct practical maintenance procedures at one or more AtoN stations.

During the site visit, each participant should be tasked to conduct the maintenance procedure competencies acquired during Module 4 section 4.3.3.