



IALA MODEL COURSE

L2.7.1 & L2.7.2

AIDS TO NAVIGATION - TECHNICIAN
TRAINING
MODULE 7 ELEMENTS 1 & 2
LEVEL 2 - RADAR BEACONS (RACON)
MAINTENANCE

Edition 2.0

June 2016



DOCUMENT REVISION

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
June 2016	Pages 3 & 6	Minor text amendments and update of Teaching Modules



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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:

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78100 Saint Germain-en-Laye
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Tel: (+) 33 1 34 51 70 01
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PART 1- COURSE OVERVIEW

1. SCOPE

This course is intended to provide technicians with the theoretical and practical training necessary to acquire a satisfactory competence in the installation and maintenance of Racons.

2. OBJECTIVE

Upon successful completion of this course, participants will have acquired sufficient knowledge and skill to install and maintain Racons within their organizations.

3. COURSE OUTLINE

This course is intended to cover the knowledge and practical competence required for a technician to properly install and maintain Racons used on fixed and floating aids to navigation. The complete course comprises 5 modules, each of which deals with a specific subject representing an aspect of installing and maintaining Racons. Each module begins by stating its scope and aims, and then provides a teaching syllabus. This is a practical, job-centred course designed to provide trainees with a realistic, hands-on educational experience

4. TEACHING MODULES

Table 1 *Table of Teaching Modules*

Module Title	Time in hours	Overview
Introduction to Racon technology	1.0	Racon technology, terminology and the type of Racons used in aids to navigation
Safety	1.0	Safely storing, handling, and working with Racons at height.
Inspection, testing and maintenance	4.0	Understanding manufacturer's specification and testing, inspecting, and troubleshooting problems
Installation	2.0	Wiring, and installing Racons on buoys, ground, structures, lighthouses, and major floating aids
Inventory management and disposal	0.5	Managing the inventory, and properly disposing and recycling
Evaluation	1.0	
Total Hours	9.5	2 day course

5. SPECIFIC COURSE RELATED TEACHING AIDS

- 1 This course involves both classroom instruction and AtoN workshop practical demonstration. Classrooms should be equipped with blackboards, whiteboards, and overhead projectors to enable presentation of the subject matter.
- 2 Trainees should have access to the types of equipment that they will be expected to work with on the job.
- 3 Relevant electrical equipment drawings should be available to each participant.

6. ACRONYMS

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

AtoN	Aid(s) to Navigation
CRO	Cathode-Ray Oscilloscope
GHz	Gigahertz
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
L	Level
Racon	Radar Beacon
RF	Radio Frequency
SOLAS	International Convention for the Safety of Life at Sea, 1974 (as amended)
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 R-101 on Maritime Radar Beacons (Racons).
- 3 IALA Guideline 1010 on Racon Range Performance.
- 4 Technical documentation from Racon equipment manufacturers.

PART 2 – TEACHING MODULES

1. MODULE 1 – INTRODUCTION TO RACON TECHNOLOGY

1.1. SCOPE

This module provides an overview of Racon technology and the various AtoN applications.

1.2. LEARNING OBJECTIVE

Upon completion, the student will understand how Racons work and be familiar with their various applications as an aid to navigation.

1.3. SYLLABUS

1.3.1. LESSON 1 – RACON TECHNOLOGY

- 1 Physical construction.
- 2 Principles of operation.
- 3 Terminology.

1.3.2. LESSON 2 – RACON TYPES

- 1 9Ghz Band.
- 2 3Ghz Band.
- 3 Frequency Agile.
- 4 Advantages and disadvantages.
- 5 Typical uses and applications.

2. MODULE 2 – SAFETY

2.1. SCOPE

This module describes methods for safely storing and handling Racons.

2.2. LEARNING OBJECTIVE

Upon completion, the student will understand how to work with Racons safely.

2.3. SYLLABUS

2.3.1. LESSON 1 – POTENTIAL HAZARDS

- 1 Working with RF:
 - a Dangers of exposure to RF.
 - b First aid measures.
 - c Dangerous voltages.
- 2 Personal protection:
 - a Climatic protection.
 - b Body protection.
 - c Hand and foot protection.

- 3 Safe handling and storage:
 - a Guidelines for transportation and storage.
 - b Proper lifting methods.

3. MODULE 3 – INSPECTION AND TESTING

3.1. SCOPE

This module outlines the procedures for testing and transporting Racons. Applicable safety procedures from Module 2 will be reinforced during the lessons.

3.2. LEARNING OBJECTIVE

Upon completion, the student will be able to properly and safely inspect, test, and troubleshoot problems with Racons.

3.3. SYLLABUS

3.3.1. LESSON 1 – MEASUREMENT AND TEST EQUIPMENT

- 1 Cathode-ray oscilloscope (CRO).
- 2 Power meter.
- 3 Power sensor.
- 4 Signal generator.
- 5 Circulators.
- 6 Racon test unit.
- 7 Remote working radar.

3.3.2. LESSON 2 - PROGRAMMING THE RACON

- 1 Testing Racon using remote ship's 3 and 9Ghz radar(s).
- 2 Morse Code programming.

3.3.3. LESSON 3 – TRANSPORTING RACONS

- 1 Demonstrated competence in Racon shipment, including:
 - a Racon shipment accessories required.
 - b Racon packaging.
 - c Racon shipment procedures.

4. MODULE 4 – INSTALLATION

4.1. SCOPE

This module describes the methods for changing, wiring and installing Racons on buoys, structures, lighthouses and major floating aids. Applicable safety procedures from Module 2 will be reinforced during the lessons.

4.2. LEARNING OBJECTIVE

Upon completion, the student will be able to properly and safely install Racons on aid to navigation structures.

4.3. SYLLABUS

4.3.1. LESSON 1 – INSPECTION PRIOR TO INSTALLATION

- 1 Physical condition.
- 2 Documenting asset details.

4.3.2. LESSON 2 - WIRING

- 1 Cable types.
- 2 Connections.

4.3.3. LESSON 3 – INSTALLATION

- 1 Physical requirements:
 - a Racon orientation.
 - b Protection of the Racon against site environmental conditions.
 - c Working at heights.
- 2 Installing Racons:
 - a Racon stands.
 - b Dissimilar materials contact.
 - c Racon terminal boxes.

5. MODULE 5 – INVENTORY MANAGEMENT AND DISPOSAL

5.1. SCOPE

This module describes the procedures for managing the Racon inventory, and for proper disposal and recycling of Racons.

5.2. LEARNING OBJECTIVE

Upon completion, the student will be familiar with the policies and regulations in his or her organization which govern the proper management and disposal of Racons.

5.3. SYLLABUS

5.3.1. LESSON 1 – INVENTORY MANAGEMENT

- 1 Legal requirements and regulations governing management.
- 2 Procedures for life-cycle inventory tracking.
- 3 Racon labelling.
- 4 Inspection records.

5.3.2. LESSON 2 - DISPOSAL

- 1 Legal requirements and regulations governing disposal.
- 2 Methods of disposal:
 - a Recycling options.
 - b Proper disposal methods.
- 3 Disposal records.