



IALA MODEL COURSE

C2001-9

AIDS TO NAVIGATION– TECHNICIAN TRAINING POWER SOURCES ON BUOYS

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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	Entire document	Minor textual changes
December 2021	Entire document	Review of content



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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 V, Regulation 13, paragraph 2; Contracting Governments, undertake to take into account the international recommendations and guidelines when establishing aids to navigation, including referring to the appropriate recommendations and guidelines of IALA. This includes recommendations on training and qualification of AtoN technicians, and consequently IALA has adopted Recommendation R0141 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 R0141 Level 2 technician responsibilities. This model course on an introduction to power sources on buoys should be read in conjunction with the Training Overview Document IALA WWA C2000 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 the installation and maintenance of power sources on buoys. Assistance in implementing this and other model courses may be obtained from the IALA World-Wide Academy at the following address:

The Dean
IALA World-Wide Academy
10 rue des Gaudines
78100 Saint Germain-en-Laye
France

Tel: (+) 33 1 34 51 70 01
Fax: (+) 33 1 34 51 82 05
e-mail: academy@iala-aism.org
Internet: www.iala-aism.org

PART 1- COURSE OVERVIEW

1. SCOPE

This course is intended to provide technicians with an introduction to the installation, servicing and maintenance of power sources on buoys in a safe and efficient manner.

All persons working on power sources on buoys should be deemed by the competent authority to be responsible individuals.

2. OBJECTIVE

Upon successful completion of this course, trainees will have acquired sufficient knowledge and skill to service and maintain aids to navigation (AtoN) power sources on buoys whilst working within their organisations.

3. COURSE OUTLINE

This course is intended to cover the knowledge and practical competence required for a technician to properly install, service and maintain power sources on buoys. The complete course comprises five modules, each of which deals with a specific subject representing an aspect of power sources on buoys servicing and maintenance. 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.

The required standard of competence is considered to be the level of proficiency that should be achieved for the proper performance of the duties carried out by the technician in their organization.

This Model Course is focussed at the basic level of competence.

Table 1 Levels of Competence

Competence Level	Learning Outcome	Instructional Objectives	Required skills
1	The conduct of routine tasks with some supervision	A basic understanding of facts and principles	First stage in acquiring competency of a complex skill. Appropriate responses are identified through trial and error

4. TEACHING MODULES

Table 2 Table of Teaching Modules

Module Title	Time in hours	Overview
Safety	1.5	This module explains the potential hazards on buoy power systems and how to work safely with them
Battery types	1.5	This module covers the different types of energy storage types suitable for use on buoys
Battery maintenance	2.5	Explains how to maintain, operate and dispose of batteries for maximum life and safe disposal

Charging	1.0	Covers different types of charging methods available and charge regulation
General considerations and site visit	3.0	Covers general items of battery installation and operation before a site visit to consolidate knowledge gained on the course in a practical manner
Evaluation	1.0	
Total Hours	10.5	2 day course

5. SPECIFIC COURSE RELATED TEACHING AIDS

This course involves both classroom instruction and a visit to a buoy refurbishment facility. Classrooms should be equipped with appropriate teaching aids to enable presentation of the subject matter. Trainees should have access to the types of equipment that they will be expected to work with on the job.

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
NiCd	Nickel Cadmium
NiMH	Nickel Metal Hydride
PV	Photovoltaic(s)
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 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

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

- 1 IALA Guideline G1067 on Selection of Power Systems for Aids to Navigation and Associated Equipment
- 2 IALA Guideline G1067-1 on Total Electrical Loads of Aids to Navigation
- 3 IALA Guideline G1067-2 on Power Sources
- 4 IALA Guideline G1067-3 on Electrical Energy Storage for Aids to Navigation
- 5 Technical documentation from equipment manufacturers.

PART 2 – COURSE MODULES

1. MODULE 1 – SAFETY

1.1. SCOPE

This module explains the potential hazards on buoy power systems and how to work safely with them.

1.2. LEARNING OBJECTIVE

To gain a basic understanding of how to work on buoy power sources in a safe manner.

1.3. SYLLABUS

1.3.1. LESSON 1 - STORED ENERGY

- 1 Battery stored energy.
- 2 Danger of exposed terminals.
- 3 Solar PV voltages.

1.3.2. LESSON 2 - CHEMICAL HAZARDS

- 1 Acid electrolyte.
- 2 Toxic chemicals on high technology batteries.
- 3 Hydrogen.

1.3.3. LESSON 3 - PERSONAL PROTECTIVE EQUIPMENT

- 1 Gloves, goggles, apron.

1.3.4. LESSON 4 - ELECTROLYTE SPILLAGE MANAGEMENT

- 1 Spillage of electrolyte and safe clean up.

2. MODULE 2 – BATTERY TYPES

2.1. SCOPE

This module covers the different types of energy storage types suitable for use on buoys.

2.2. LEARNING OBJECTIVE

To gain a basic understanding of the different types of batteries suitable for use in power systems on buoys.

2.3. SYLLABUS

2.3.1. LESSON 1 - NON RECHARGEABLE BATTERIES

- 1 Alkaline, Lithium.
- 2 Applications including when a non-rechargeable would be selected.
- 3 Safe disposal.

2.3.2. LESSON 2 - RECHARGEABLE BATTERIES

- 1 Gel/ liquid lead acid.
- 2 NiMH/NiCad.

- 3 Lithium.
- 4 Applications including when a rechargeable battery would be selected.
- 5 Battery housing and ventilation.

2.3.3. LESSON 3 - MATCHING LOADS TO BATTERIES

- 1 Voltages in common use.

3. MODULE 3 – BATTERY MAINTENANCE

3.1. SCOPE

Explains how to maintain, operate and dispose of batteries for maximum life and safe disposal.

3.2. LEARNING OBJECTIVE

To gain a basic understanding of how to maintain batteries and how to optimise battery life.

3.3. SYLLABUS

3.3.1. LESSON 1 - BATTERY STORAGE

- 1 Storage locations.
- 2 Effects of complete discharge in storage.
- 3 Maintaining charge during storage.

3.3.2. LESSON 2 - RECHARGEABLE BATTERIES

- 1 Advantage of battery conditioning prior to use in service.
- 2 Methods of battery conditioning.
- 3 Frequency of battery conditioning.

3.3.3. LESSON 3 - ROUTINE MAINTENANCE

- 1 Visual inspection:
 - a Swelling of the casing.
 - b Terminal and connection integrity.
 - c Signs of electrolyte leakage.
 - d Corrosion.
 - e Corrosion prevention as per manufacturer's recommendations.
 - f Policy decision on when to replace.

3.3.4. LESSON 4 - TESTING

- 1 Expected voltages.
- 2 Discharge testing.
- 3 Use of propriety condition monitors and test equipment.

3.3.5. LESSON 5 – DISPOSAL

- 1 Safe disposal.
- 2 Local regulation.

4. MODULE 4 – BATTERY CHARGING

4.1. SCOPE

This module covers different types of charging methods available and charge regulation.

4.2. LEARNING OBJECTIVE

To gain a basic understanding of the options for charging buoy batteries and how to maintain charging systems.

4.3. SYLLABUS

4.3.1. LESSON 1 - CHARGING SOURCES

- 1 Solar PV.
- 2 Wind generation.
- 3 Other charging sources.

4.3.2. LESSON 2 - CHARGE REGULATION

- 1 Regulation integral to the charging source.
- 2 Regulation external to the charging source.

4.3.3. LESSON 3 - CHARGE SYSTEMS MAINTENANCE

- 1 Charge output checks

5. MODULE 5 – GENERAL CONSIDERATIONS AND SITE VISIT

5.1. SCOPE

This module covers general items of battery installation and operation before a site visit to consolidate knowledge gained on the course in a practical manner

5.2. LEARNING OBJECTIVE

To gain a basic understanding of the overview of conditions and general issues pertinent to power systems on buoys.

5.3. SYLLABUS

5.3.1. LESSON 1 - ENVIRONMENTAL PROTECTION

- 1 Terminal covers:
 - a Open.
 - b Sealed.
- 2 Battery boxes:
 - a Sealed
 - b Vented
- 3 Location:
 - a. Access.
 - b. Theft.

- c. Wave protection.

5.3.2. LESSON 2 - SITE VISIT

- 1 Visit to a buoy yard to view power system installations.
- 2 Visit to battery conditioning installation.