

TECHNICAL SPECIFICATION

IEC TS 62143

First edition
2002-07

Electrical installations for lighting and beaconing of aerodromes – Aeronautical ground lighting systems – Guidelines for the development of a safety lifecycle methodology

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*Installations électriques pour l'éclairage
et le balisage des aérodromes –*

Systèmes de balisage aéronautique au sol –

*Lignes directrices pour l'établissement d'une
méthodologie pour le cycle de vie de sécurité*



Reference number
IEC/TS 62143:2002(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL INSTALLATIONS FOR LIGHTING
AND BEACONING OF AERODROMES –
AERONAUTICAL GROUND LIGHTING SYSTEMS –
GUIDELINES FOR THE DEVELOPMENT OF
A SAFETY LIFECYCLE METHODOLOGY**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62143, which is a technical specification, has been prepared by IEC technical committee 97: Electrical installations for the lighting and beaconing of aerodromes.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
97/72/CDV	97/83/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

The committee has decided that the contents of this publication will remain unchanged until 2005-11. At this date, the publication will be

- reconfirmed;
- withdrawn, or
- replaced by an international standard.

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INTRODUCTION

Aeronautical ground lighting (AGL) at an aerodrome or heliport provides the pilots of aircraft on approach to or take-off from an aerodrome, and pilots of aircraft or drivers of vehicles moving on the aerodrome surface, with location, orientation and alignment information. An AGL system therefore provides a safety-related service and functions. In order to assure that the safety of the service and functions provided by the AGL system is adequately addressed, specific safety assessments should be performed at various instances during the lifecycle of the system. This technical specification provides a methodology whereby this may be done.

This technical specification is primarily concerned with the safety lifecycle of aeronautical ground lighting (AGL) systems. To conform to this technical specification it should be demonstrated to the relevant bodies that the requirements have been satisfied and therefore that the clause objective(s) has been met.

NOTE 1 Examples of relevant bodies would include the following:

- aerodrome management;
- certification and licensing authorities;
- safety regulators;
- notified bodies for international or European directives;
- national standards bodies.

NOTE 2 This technical specification is based on the system and safety lifecycle methodology described in IEC 61508-1. IEC 61508, in all seven parts, provides a methodology to address the safety of safety-related systems and contains an abundance of guidance material, which may be applicable to an AGL system or may be of use to the reader of this technical specification. IEC 61508 contains requirements that are particularly relevant to risk reduction in a software-based AGL system.

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ELECTRICAL INSTALLATIONS FOR LIGHTING AND BEACONING OF AERODROMES – AERONAUTICAL GROUND LIGHTING SYSTEMS – GUIDELINES FOR THE DEVELOPMENT OF A SAFETY LIFECYCLE METHODOLOGY

1 Scope

This technical specification:

- outlines a methodology to address the safety at all lifecycle phases of an AGL system, including the evaluation, design, procurement, manufacture, installation, commissioning, operational use, maintenance, modification, and decommissioning of the AGL system;

NOTE 1 This document contains guidelines of a high-level, objective-based, and non-prescriptive nature. This is intended to permit a flexible approach to meeting the requirements.

- applies to an AGL system at an aerodrome or heliport which provides visual guidance to a pilot and is provided, operated and maintained by the aerodrome authority;

NOTE 2 This document may apply to all or a part of an AGL system as required by the aerodrome authority. The equipment covered shall be defined and listed in the AGL safety case (see 5.6). Any subsequent addition or modification to the AGL system shall be notified as directed in 7.7.3.

- applies primarily to a new AGL system;

NOTE It may also be applied to an existing AGL system or to an existing AGL system that is being modified; however, the relevant documentation for the project phases may not be available. Therefore, retrospective action to cover the applicable lifecycle phases could be carried out or alternative means of providing safety information should be developed, e.g. historical data.

- covers all aspects of safety, including:
 - operational (functional) safety of the AGL system;
 - electrical safety for the installation, maintenance and decommissioning of the AGL system;
 - environmental safety and electromagnetic compatibility (EMC);
 - health and safety at work.
- supports a regulatory regime based on the auditing of a safety management system at an aerodrome, where the safety management system provides documented evidence that safety has been or is being addressed at all phases of the lifecycle. This applies equally to a project to install AGL or the routine operational use and maintenance of the AGL.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60300-3-9, *Dependability management – Part 3: Application guide – Section 9: Risk analysis of technological systems*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61508-1, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements*

IEC 61508-7, *Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 7: Overview of techniques and measures*

IEC 61821, *Electrical installations for lighting and beaconing of aerodromes – Maintenance of aeronautical ground lighting constant current series circuits*

3 Definitions

For the purpose of this International Standard the following definitions apply.

3.1

aerodrome authority

organisation accountable for the safety and security of persons, aircraft operations and facilities at an aerodrome

3.2

AGL safety case

a controlled document, or set of controlled documents, which clearly and comprehensively presents sufficient arguments, evidence and assumptions that all foreseeable hazards have been identified and controlled for both engineering and operational areas to demonstrate that an AGL system is adequately safe

3.3

AGL system safety lifecycle

the safety activities involved in the implementation of an AGL system, occurring during a period of time that starts at the concept phase of the system and finishes when it is no longer available for use and has been decommissioned

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3.4

hazard

potential source of harm

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NOTE The term includes hazards to persons arising within a short time scale (for example, fire and explosion) and also those that have a long-term effect on a person's health (for example, release of a toxic substance).

3.5

hazard analysis

activity of identifying and evaluating those hazards, often following from some initiating event, that can lead to an accident

3.6

hazardous event

occurrence, with possible hazardous consequences, arising as the result of a hazardous condition

3.7

impact analysis

activity of determining the effect that a change to a function or component in a system will have on other functions or components in that system as well as on other systems.

3.8

safety audit

systematic and independent examination to determine whether the procedures specific to the safety requirements comply with the planned arrangements, are implemented effectively and are suitable to achieve the specified objectives

NOTE A safety audit may be carried out as part of a safety assessment.

[61508-4, definition 3.8.4, modified]

4 Competence of persons

4.1 Objective

The objective of this clause is to ensure that persons who have responsibility for any activity or are directly engaged in any aspect of the lifecycle of an AGL system are competent to discharge those duties or perform those tasks.

4.2 Requirements

4.2.1 It is recommended that the appropriate administration or aerodrome authority encourage the development of a formal and structured competency training programme(s). The training programme(s) should consist of multiple tiers that enhance progressively a person's skills and ensure a recognised level of competency for those persons who have satisfactorily completed the programme(s).

4.2.2 All persons involved in any activity, including management and maintenance activities, shall have the appropriate and verifiable training, technical knowledge, experience and qualifications relevant to the specific duties they have to perform. In particular, where involved in work on AGL equipment, they shall be knowledgeable of the specific risks and the safety procedures involved in the work. The training, experience and qualifications of all persons involved in any activity shall be justified taking into account all the relevant competence factors. The justification shall be recorded in appropriate documentation (see 5.3.2 g)).

NOTE The following competence factors should be addressed when assessing and justifying the competence of persons carrying out their duties.

- engineering appropriate to the application area;
- engineering appropriate to the technology (e.g. mechanical, electrical/electronic/software engineering);
- safety engineering appropriate to the technology;
- knowledge of the legal and safety regulatory framework;
- knowledge of the operational aspects related to the AGL system at the aerodrome;
- the consequences in the event of a failure of AGL equipment;
- the consequences of failure to adhere to safety procedures when working on AGL equipment;
- the novelty of the design, design procedures or application;
- previous experience relevant to the specific duties to be performed and the technology being employed;
- relevance of qualifications to the specific duties performed.

5 AGL safety management

In order to prepare and deploy an AGL system fit for operational use at an aerodrome, it is essential that safety is implicit throughout the lifecycle of the system. It is also essential that the organisations involved in all phases of the lifecycle have an embedded culture that addresses safety at all levels of management and work. It should be reminded that technical protection devices do not guarantee a level of safety and, in being able to prevent an accident from occurring, that there is no substitute for safety procedures, and the competence and vigilance of the persons involved. The following subclauses outline those aspects of a safety management system that should, at minimum, be in place within any organisation associated with the lifecycle of an AGL system.

5.1 Objective

The objective of this clause is to define and document all management and technical activities during the AGL system safety lifecycle (clause 6) that may have a direct impact on the operational safety at aerodromes and to ensure the safety of personnel engaged in those activities.

5.2 Documentation

5.2.1 The documentation developed as suggested by this technical specification shall be controlled by an appropriate document control scheme. The development of the documentation shall be initiated before the completion of the evaluation phase of the AGL system safety lifecycle and each document shall be reviewed, amended and approved by the aerodrome authority as necessary throughout the entire lifecycle.

5.2.2 For the purpose of audit, it is essential that all activities required by this technical specification be documented. The documentation produced shall:

- a) suit the purpose for which it is intended;
- b) comprehensively describe the safety assessment, test, system or equipment and the use of it;
- c) be accurate, concise and easy to understand;
- d) be assessable and maintainable.

NOTE The majority of the documentation should be considered as “live” documents, i.e. they are subject to review and revision throughout the lifecycle of the AGL system.

5.2.3 The documentation shall have:

- a) unique identities so it will be possible to reference the different parts;
- b) titles/names as specified in this technical specification;
- c) a revision index (version numbers) to make it possible to search for relevant information. It shall be possible to identify the latest revision (version) of a document or set of information.

NOTE 1 The physical structure of the documentation will vary depending upon a number of factors such as the size of the system, its complexity and the organisational requirements.

NOTE 2 If relevant, other documents, such as applicable regulations and other standards, should be referenced.

5.3 AGL safety plan

5.3.1 An AGL safety plan shall be prepared by the aerodrome authority that outlines the responsibilities and procedures to be undertaken by management and staff engaged in the design, installation or maintenance of an AGL system or its components.

NOTE The AGL safety plan focuses on safety. It may be included in:

- a section in the Quality Plan entitled “AGL Safety Plan”,
- a separate document entitled “AGL Safety Plan”,
- several documents which are referenced in either of the above (e.g. one document could be for the overall AGL system or one document for each component (e.g. CCR), or
- an overall aerodrome safety management system.

5.3.2 The AGL safety plan shall define all management and technical activities for the design, installation or maintenance of an AGL system or its components. In particular the following items shall be specified or referenced in the AGL safety plan:

- a) the scope of the AGL safety plan;
- b) the policy and strategy for achieving safety, together with the means for evaluating its achievement, and the means by which this is communicated within the organisation to ensure a culture of safe working;
- c) the person nominated by the aerodrome authority as responsible for the AGL system and owner of the AGL safety plan;
- d) identification of the persons, departments, organisations or other units which are responsible for carrying out and reviewing safety procedures and their applications in each phase (including where relevant, licensing authorities and safety regulatory bodies) and a description of the relationship between them;