Doc 9157-AN/901
Part 5

AERODROME DESIGN MANUAL

PART 5

ELECTRICAL SYSTEMS

FIRST EDITION — 1983

Approved by the Secretary General
and published under his authority

INTERNATIONAL CIVIL AVIATION ORGANIZATION

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AMENDMENTS

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AMENDMENTS		
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FOREWORD

Proper design, installation and maintenance of electrical systems for navigation aids, both visual and non-visual, are prerequisites for the safety, regularity, and efficiency of civil aviation. To this end, this manual provides guidance on the design and installation of electrical systems for aerodrome lighting and radio navigation aids.

The electrical systems for aerodrome lighting and radio navigation aids include features which are not usually involved in other electrical installations. This manual therefore discusses not only the general features of electrical practices and installations but also those features which are of special significance for aerodrome installations. It is assumed that readers of the manual will be familiar with electrical circuits and general design concepts, but may not be knowledgeable of certain features of aerodrome installations which are less frequently encountered in other installations. It is important to note that the material presented in this manual is intended to complement national safety codes related to electrical installations.

The manual does not discuss electrical systems for buildings located on an airport other than the effect of such buildings on total power requirements for primary and secondary power supplies. Similarly, the manual does not deal with the maintenance of electrical systems. For guidance on this latter issue the reader is advised to refer to the Airport Services Manual, (Doc 9137), Part 9, Airport Maintenance Practices.

Future editions of this manual will be improved on the basis of experience gained and of comments and suggestions received from users of this manual. Readers of this manual are invited to give their views, comments and suggestions to the Secretary General of ICAO.

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CHAPTER 1

INTRODUCTION

1.1 PURPOSE

1.1.1 To ensure the regularity and safety of aviation, it is necessary that aerodrome lighting and radio navigational aids have high integrity and reliability. It is considered that the probability of failure of well designed and maintained lighting and radio aids at a critical moment is extremely low.

1.1.2 The following material is intended as a guide to the recommended electrical engineering practices for design and installation of new systems and the modification of existing systems of aerodrome fixed lighting and of distribution of power to radio navigation aids. It does not imply that existing installations, if different, are wrong and should be changed automatically. It does mean that some of the earlier designs adopted are not recommended for repetition since they have been superseded by later thinking. Because of the differences in engineering style and equipment in different countries, this material establishes only basic design principles. It is not intended to illustrate detailed design or particular pieces of equipment or systems unique to any one State.

1.1.3 The electrical systems for aerodrome visual aids and navigation systems require good quality installations and consideration for features which are not usually involved in other electrical installations. This manual discusses the general features of electrical practices and installations with emphasis on those features which are less commonly involved or have special significance for aerodrome operations. It is assumed that those using this manual will be familiar with electrical circuits and general practices but may not be knowledgeable of certain features of aerodrome installations which are less frequently encountered in other electrical systems. Some of these features are that most electrical circuits are installed underground, series circuits are used for most lighting systems, higher reliability is required of the input power sources, and rapid, automatic transfer to secondary power in case of power failures. Each aerodrome is unique, and its electrical installation should be designed to provide economically power and control which is safe, reliable, and easily maintained.

1.2 ORGANIZATION OF THE MANUAL

1.2.1 This manual provides information on the Electricity Supplies in Chapter 2, Electrical Circuits for Aerodrome Lighting and Navigation Aids in Chapter 3, Underground Electrical Systems in Chapter 4, and Cables for Underground Service at Aerodromes in Chapter 5.

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CHAPTER 2

ELECTRICITY SUPPLIES

2.1 SOURCES OF POWER

2.1.1 General

2.1.1.1 The primary sources of power for aerodromes should be determined before the designs of the aerodrome lighting installations and the radio navigation aids are initiated. The electrical power for these installations is usually only a small part of the electrical power used by the aerodrome. Whether the visual and radio navigation aids being installed are for a new aerodrome or for modernization and expansion of an existing aerodrome, the sources of power should be analyzed for availability, capacity, reliability, practicality for the proposed installation, and for future expansion. This analysis should include both the primary power source and the secondary power source required by Annex 10, Volume I, 2.9 and Annex 14, 8.1 for use in cases of failure or malfunction of the primary power source.

2.1.2 Primary power sources

2.1.2.1 The primary sources of power for most aerodromes are feeders from a widely interconnected electricity network outside the aerodrome, usually from either a commercial or a public mains supply. In some cases the power may come from a local generating plant or from a limited distribution system. Two independent incoming power sources are desirable for major aerodromes, instead of a single primary power source. They should come from widely separated sections of the electricity network beyond the aerodrome with each supplying separate circuits that would provide integrity of facilities if one failed. Preferably, these sources will have separate feeders from separate substations and will also be from different generators. Other supply arrangements may be used depending on the security, reliability, statistics, or economics applicable to a particular situation.

2.1.2.2 This power is usually supplied at higher voltage (over 5 000 volts) to the aerodrome main power substation.

2.1.3 Secondary power sources

2.1.3.1 Most aerodromes with aerodrome lighting and radio navigation aids should be provided with secondary electrical power for the aids required as a minimum for operations. The circuits and facilities to be provided with secondary power vary with the most critical class or category of flight operations. The aerodrome facilities for which a secondary power supply is recommended are indicated in Annex 14, Chapter 8 for visual aids and in Annex 10, Volume I, Part I, Chapter 2 for radio navigation aids. Those facilities for which secondary power is required should be arranged to automatically connect to the secondary power supply on failure of the primary source power.

2.1.3.2 Sources of secondary power. As recommended in Annex 14, Chapter 8, sources of secondary power may be independent public power sources or stand-by power units.

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