



International Civil Aviation Organization

Fifth Meeting of the Aerodrome Safety, Planning & Implementation Group

(ASPIG/5) (Doha, 13-15 June 2023)

Agenda Item 2: Regional Performance Framework for Aerodrome Safety

SOLAR POWERED AIRFIELD GROUND LIGHTING SYSTEMS

(Presented by United Arab Emirates)

EXECUTIVE SUMMARY

Installation of sustainable airfield technologies such as solar powered lighting present numerous challenges to States as *Annex 14, Volume I, Aerodromes, Aerodrome Design Manual, Part 5 Electrical Systems* (Doc 9157) and *Airport Services Manual, Part 9, Airport Maintenance Practices* (Doc 9137) assume power input from traditional sources from high voltage, wired electrical systems. The absence of standards and recommended practices related to power inputs from renewable resources, which are independently powered and not reliant on traditional cabling systems, has created barriers to adoption of sustainable technologies and potential for dis-harmonisation in a global approach. Sustainable technologies will increase accessibility and availability of aviation capabilities to foster economic development; while allowing for quantum improvements in the reliability, long term affordability and maintainability of an essential aerodrome safety systems.

REFERENCES

- *ICAO Annex 14, Volume I, Aerodromes*
- *ICAO Doc 9157, Aerodrome Design Manual, Part 5 Electrical Systems, Second Edition, 2017*
- *Doc 9137, Airport Services Manual, Part 9, Airport Maintenance Practices, First Edition 1984*
- *ICAO Eco Aerodrome Toolkit, A Focus on the production of renewable energy at the Airport site*

1. INTRODUCTION

1.1 The working paper is aimed to support the review and revision of ICAO standards, recommended practices, design and maintenance documentation in order to support the adoption of sustainable airfield technologies such as solar powered airfield ground lighting solutions.

1.2 In assessing the numerous bespoke submissions related to the installation, maintenance and monitoring of a solar airfield ground lighting (AGL) solution, the UAE's General Civil Aviation Authority (GCAA) has heavily relied on the operator's safety management system. ICAO SARPS do not specifically provide for oversight of modern electrical infrastructure including solar and battery technologies and the

parameters of a solar lighting system simply do not well align with the ICAO design and maintenance documentation developed in 2017 and 1984.

1.3 The misalignment of sustainable airfield lighting technology to prevailing ICAO SARPS as well as the design and maintenance manuals related to the underlying electrical systems, presents considerable obstacles for both States and operators to readily adopted appropriate technologies best suited to the aerodrome environment.

1.4 In the absence of modernised ICAO SARPS and manuals, these sustainable technologies are subject to state-by-state or case-by-case assessment; fraught with obstacles and subjective interpretations; and necessitate novel regulation or exceptional approvals.

2. DISCUSSION

2.1 *Doc 9157, Aerodrome Design Manual, Part 5 Electrical Systems* published in 2017 included consideration of solar lighting plants. That same year some suppliers began touting “ICAO Compliant” solar lighting solutions for the airfield which did not require elements such as cables, transformers, generators or constant current regulators. The lighting technology was based on the emerging and adopted LED standards associated with luminance and colouring however the underlying electrical system, based on solar charged battery technology, was not aligned to the historical and conventional wired designs.

2.2 *Doc 9137, Airport Services Manual, Part 9, Airport Maintenance Practices* published in 1984 predates development of the modern solar or other sustainable technologies. Maintenance practices associated with solar lighting in the UAE have been developed based on information from the manufacturer along with operator’s safety management system on a case-by-case basis.

2.3 The SARPS related to electrical systems included in *Annex 14, Aerodromes* were predicated on installation of the wired systems described in *Doc 9157, Aerodrome Design Manual, Part 5 Electrical Systems*. Concepts such as interleaving, primary and secondary cabling, switch-over timing and redundancy which are well understood in relation to high voltage systems using tens of thousands of meters of cabling; are not entirely or directly applicable to a system of hundreds of independent lights with discrete power sources.

2.4 Some states such as Australia, Brazil and the United States have developed limited regulation specifically related to the use of solar lighting. Other states, including the UAE, have permitted use of solar lighting on exceptional basis.

2.5 The lack of international documentation presents an obstacle to the adoption of sustainable technology, gives rise development of national practices which may be ultimately misaligned; deters investment in these technologies, and requires all States seeking to advance aviation capabilities through accessible and sustainable technologies to do so on an exceptional basis.

2.6 The UAE GCAA is supporting limited installation of sustainable technologies such as solar powered airfield lighting. Whilst these systems have great merit in terms in preserving the environment; allowing rapid development of smaller aerodromes and aligning to available resources; they are not well supported by existing ICAO SARPS and manuals.

2.7 In the area of solar airfield lighting, the UAE and many other States are working beyond the content of ICAO’s published design and maintenance manuals; and seeking to interpret SARPS based on yesterday’s technology to support the adoption of today’s sustainable alternatives which increase safety, support economic development and protect the environment.

2.8 The UAE GCAA has taken proactive measures to promote adoption of solar lighting technology in aerodromes. To this end, the UAE GCAA launched a National Sustainable Lighting initiative in January 2023. This initiative coincides with the directives of the country's leadership, and the UAE government declaring 2023 the "Year of Sustainability", under the theme "Today for Tomorrow", emphasizing that the concept of sustainability is a major national priority. This also coincides with the UAE hosting the 28th United Nations Climate Change Summit, Conference of Parties (COP 28).

2.9 Further to the National Sustainable Lighting Initiative, the UAE GCAA organised a series of industry workshops, creating a platform for industry experts to exchange ideas, share best practices, and discuss the challenges and opportunities of solar lighting systems. The workshops brought together stakeholders from the aviation industry and government entities to explore the latest innovations and advancements in sustainable lighting technologies.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the content of the paper;
- b) encourage ICAO to initiate regional and international events to allow States and international organisations to share case studies, lessons learned and guidance materials associated with the adoption of sustainable airfield technologies; and
- c) encourage ICAO to review existing aerodrome standards and recommended practices (SARPs) and guidance materials to support adoption of sustainable airfield technologies particularly in the area of airfield ground lighting and the associated electrical supply systems.

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