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Detection and avoidance systems for uncrewed aircraft systems

Systèmes de détection et d'évitement pour les aéronefs sans pilote

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Foreword

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This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 16, *Uncrewed aircraft system*.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

With rapid technological advancements, uncrewed aerial systems (UAS) are continuing to become more autonomous in operation and accessible to consumers. Today, the use of UAS technology is not only prevalent for entertainment purposes but also extending into various industrial applications such as logistics, disaster release, powerline inspection. There is an increasing number of UAS operations in low altitude airspace where the safety considerations can be quite complex, especially in the context of urban areas. All types of UAS operating in such areas must be able to avoid ground objects like high-rise buildings, cranes, public utilities such as power grid and mobile network antennas, along with other users of the same airspace such as low-flying helicopters, other UASs and kites. Micro-weather patterns also pose a challenge because of their uncertainty, invisibility, and unpredictability.

A detection and avoidance (DAA) system is one of the key onboard systems to address these challenges. By sensing the surrounding situations, the DAA system can examine the size and distance of a particular obstacle, apply trajectory planning and then calculate the possibility of collision. It orders the flight control system to make UAS deceleration, completely stop or offset the obstacle in a fully autonomous manner. The function and performance of the DAA system is closely related to its safety speed, which has a direct impact on the scope of UAS. Failure detection also causes instability and unexpected deceleration.

To ensure a safe and secure operating environment, it is of significant importance to develop a standard for DAA systems, which includes the general requirements for key components and functions as well as associated performance.

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Detection and avoidance systems for uncrewed aircraft systems

1 Scope

This document specifies safety and quality requirements for detection and avoidance (DAA) systems used between uncrewed aircraft systems (UAS) and other objects including aircraft. This document includes the requirements for radars and optical sensors used for DAA and is derived to meet the requirements for UAS operations involving DAA set out in ISO 21384-3.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 21384-3:2023, *Unmanned aircraft systems — Part 3: Operational procedures*

ISO 21384-4, *Unmanned aircraft systems — Part 4: Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21384-4 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
field of view
angular range of a target observed by a sensor along a dimension

3.2
fail safe
condition that the system can operate safely in the event of the failure of any single component

3.3
fault diagnosis and isolation
process to check and isolate the fault point when there is any system fault so that the fault does not affect the safety of system

3.4
detection and recognition unit
system comprised of sensors and the *processing unit* (3.5) including its software systems, equipped with an interface to send information into a UAS traffic management (UTM) function or an operator

3.5
processing unit
unit that transmits and processes the information from interfaced systems such as sensors and *UAS control systems* (3.6)

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