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Unmanned aircraft systems —

Part 3: Operational procedures

Aéronefs sans pilote —

Partie 3: Modes opératoires

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO ~~documents~~document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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

This second edition cancels and replaces the first edition (ISO 21384-3:2019), which has been technically revised.

The main changes are as follows:

- ~~Clause 2~~ ~~Clause 2~~: addition of normative references;
- ~~Clause 3~~ ~~Clause 3~~: addition of several terms and definitions;
- ~~5.1~~ ~~5.1~~: addition of applicable management systems and equipment requirements;

- ~~5.2~~ **5.2**: major restructuring of the subclause, addition of requirements for operators under different preconditions and specified tasks for different personnel to be conducted;
- ~~9.1~~ **10.1**: designation of a remote pilot in control added;
- ~~9.4~~ **10.4**: addition of requirements for handovers of functions and responsibilities, precautions for the operation of multiple UA by one remote pilot, communication and airborne functions for UTM;
- ~~9.5~~ **10.5**: addition of new subclauses on organizational, operational and technical requirements for external service regarding UTM and C2CSP;
- ~~Clause 11~~ **Clause 12**: new clause on conflict management including operational charts and descriptions.

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

This document outlines requirements for unmanned aircraft (UA) operational procedures which, when applied together with any other current and future standard on unmanned aircraft systems (UAS), form a robust UA safety and quality standard. This document applies to all commercial UAS regardless of size, categorization, application or location and represents the international best practice for the safe operation of all commercial UAS. This document is structured in a way to provide a logical pathway from core principles to specific requirements.

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Unmanned aircraft systems — ~~Part 3: Operational procedures~~

Part 3: Operational procedures

1 Scope

This document specifies the requirements for safe commercial unmanned aircraft system (UAS) operations, including the external safety-critical service providing command and control (C2) link.

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 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

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

ISO 23629-12:2022, *UAS traffic management (UTM) — Part 12: Requirements for UTM service providers*

ISO 23665:2021, *Unmanned aircraft systems — Training for personnel involved in UAS operations*

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 terminological 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

C2 LinkLink communications service provider

C2CSP

entity which provides a portion of or all of the C2 Link (3.4(3.4)) service for operation of an UAS

Note 1 to entry: The definition is adapted from Reference [16 [16]].

3.2

designated operational coverage

DOC

volume where the C2 Link QoS (3.9) meets the C2 Link (3.4(3.4)) specified performances and supports the corresponding intended UAS operations

Note 1 to entry: The definition is adapted from Reference [16 [16]].

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3.3

collision avoidance

third layer of conflict management which activates when the separation mode has been compromised

Note 1 to entry: The definition is adapted from Reference [\[17-~~17~~\]](#).

3.4

C2 Link

command and control link service

C2 link

telecommunication service provided for the purpose of supporting command and control of the aircraft

Note 1 to entry: The definition is adapted from Reference [\[16-~~16~~\]](#).

3.5

crew resource management

CRM

utilization of all resources available to the crew to manage human error

3.6

DAA system

~~detect and avoid system support~~

~~system that supports the remote pilot to see, sense or detect conflicting traffic or other hazards and take the appropriate action~~ ~~could be the definition.~~

3.7

external service

service and related provider, necessary for the safety of the UAS flight, encompassing:

- a) ~~a) command and control link communication service provider (C2CSP) [\[3.1-~~3.1~~\]](#);~~
- b) ~~b) other operation support services, whose purpose is to support a single flight but not to manage traffic;~~
- c) ~~c) UTM services~~

Note 1 to entry: The definition is adapted from Reference [\[20-~~20~~\]](#).

Note 2 to entry: Additional information on external services is provided in [Annex B](#) ~~Annex B.~~

Note 3 to entry: Only the safety critical C2CSP is covered in this document.

Note 4 to entry: UTM services and non-safety-critical operation support services are covered in ISO 23629-12.

3.8

quality of service

QoS

totality of the characteristics of an entity that bear on its ability to satisfy stated and implied needs

2

2

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Note 1 to entry: The definition is adapted from Reference [16].

3.9
quality of service delivered
QoSD

statement of the *QoS* [3.8(3-7)] achieved or delivered to the UAS operator by the *C2* [linkLink](#) *communications service provider (C2CSP)* [3.1(3-1)]

Note 1 to entry: The definition is adapted from Reference [16-16].

3.9.10
quality of service experienced
QoSE

statement expressing the *QoS* [3.8(3-7)] that remote pilots believe they have experienced

Note 1 to entry: The definition is adapted from Reference [16-16].

3.10.11
quality of service required
QoSR

statement of the *QoS* [3.8(3-7)] requirements of the UAS operator to the *C2* [linkLink](#) *communications service provider (C2CSP)* [3.1(3-1)]

Note 1 to entry: The definition is adapted from Reference [16-16].

3.11.12
remain-well-clear

ability to detect, analyse and manoeuvre in order to ensure that a UA is not being operated in such proximity to other aircraft as to create a collision hazard

3.12.13
remote pilot in command
RPIC

pilot designated by the operator as being in command and charged with the safe conduct of a flight

3.13.14
safety assurance

set of activities providing for system monitoring, measuring, assessment, and corrective action to assure the effectiveness of risk controls

3.14.15
safety management system
SMS

systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures

Note 1 to entry: The definition is adapted from Reference [12-12].

3.1516

safety promotion

set of activities providing guidance for training and communication to promote safety as a core value in the organization

3.1617

safety risk management

SRM

set of activities using task analysis, hazard identification, risk analysis, and risk assessment to develop risk controls

3.1718

separation provision

second layer of conflict management and tactical process of keeping aircraft away from hazards by at least the appropriate separation minima which is only used when *strategic conflict management* (3.20(3.19)) (i.e. airspace organization and management, demand and capacity balancing and traffic synchronization) cannot be used efficiently

Note 1 to entry: The definition is adapted from Reference [17 [17]].

3.1819

service level agreement

SLA

enforceable agreement between the C2 ~~Link~~ *communications service provider (C2CSP)* (3.1(3.1)) and the UAS operator covering the safety, performance, coverage and security of the C2 *Link* (3.4(3.4)) provision as required for the RPAS operator's intended operations

Note 1 to entry: The definition is adapted from Reference [16 [16]].

3.1920

strategic conflict management

first layer of conflict management that is achieved through the airspace organization and management, demand and capacity balancing and traffic synchronization components 21384-3

Note 1 to entry: The definition is adapted from Reference [17 [17]].

3.2021

unmanned aircraft accident

occurrence associated with the operation of an unmanned aircraft which takes place between the time the aircraft is ready to move with the purpose of flight until it comes to rest at the end of the flight and the primary propulsion system is shut down, in which:

- a) ~~a)~~ a person is fatally or seriously injured as a result of direct contact with any part or exposure to any emission of the UA or other component of the UAS, including parts which have become detached from the aircraft; or
- b) ~~b)~~ the aircraft sustains damage or structural failure which prevents safe operation

4

4

3.21**unmanned aircraft incident**

occurrence, other than an *unmanned aircraft accident* (3.21(3.20)), associated with the operation of an aircraft which affects or can affect the safety of operation, including the loss of unmanned aircraft

3.22**VLL**

very low level

VLL

airspace below the minimum heights for VFR traffic as established by the competent authority

4 Abbreviated terms

AIS aeronautical information service

ANSP [air navigation service provider](#)

ATS air traffic service

BVLOS beyond visual line-of-sight

CofA [certificate of airworthiness](#)

CofA ~~certificate of airworthiness~~ compliance monitoring officer

COMO ~~detect and avoid~~

DAA

DAL design assurance level

EVLOS extended visual line-of-sight

FW firmware

FOD foreign object debris

GNSS global navigation satellite system

IFR [instrument flight rules](#)

IFR ~~instrument flight rules~~ information security management system

ISMS

MCM maintenance control manual

MEL minimum equipment list

NOTAM notice to airmen

OEM original equipment manufacturer

PIC pilot in command

RF radio frequency

RPS [remote pilot station](#)

RPS ~~remote pilot station~~ safety officer ~~security officer~~

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SAFO ~~safety management system~~

~~SECO~~

~~SMS~~

~~SECO~~ security officer

SW software

UA unmanned aircraft

UAS unmanned aircraft system

UTM UAS traffic management

VLOS visual line-of-sight

VO visual observer

5 Safety and security

5.1 General

UAS operators and providers of safety critical external services shall implement ~~an~~ SMS and an ISMS as standard practice regardless of the type of UAS operated or size of operation. Both SMS and ISMS are comprehensive, process-oriented approaches to managing safety and security throughout an organization.

Any machine or equipment used at the UAS operator's or service provider's premises, facilities or workshops, shall be designed according to ISO 12100 or equivalent, to be safe for their intended use by involved personnel.

NOTE 1 Safety management systems for occupational health and safety of the personnel are defined in ISO 45001.

NOTE 2 Information security management systems are described in ISO ~~IEC~~ 27001.

NOTE 3 Aviation safety management, as defined in Reference ~~[12]~~ ~~[12]~~, has instead the purpose of protecting the safety of third parties, in the air or on the ground, during UAS operations.

5.2 ~~Safety management system requirements~~

5.2.1 Safety policy

~~Management systems of~~ ~~A safety policy shall be defined for~~ UAS ~~operator~~ operators and ~~of~~ providers of external services ~~shall define a safety policy~~, to accomplish their goals. Human error in UA operation and supporting system management can be controlled by a safety policy.

The policy shall be complemented by procedures and organizational structures for safety risk management, safety assurance and safety promotion.

5.2.2 Requirements for operators conducting UAS operations in VLOS or EVLOS

All operators conducting UAS operations in VLOS or EVLOS shall:

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