
Unmanned aircraft systems —

Part 2:

**Operation of vertiports for vertical
take-off and landing (VTOL)
unmanned aircraft (UA)**

Aéronefs sans pilote —

*Partie 2: Exploitation des vertiports pour les aéronefs télépilotes (UA)
à décollage et atterrissage vertical (VTOL)*

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Contents

	Page
Foreword.....	iv
Introduction.....	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Abbreviated terms	3
5 Privacy and data protection requirements	3
6 Security	4
6.1 Requirements for all vertiport operators.....	4
6.2 Additional requirements for operators of type B vertiports.....	4
6.3 Additional requirements for operators of type C vertiports.....	5
7 Insurance	6
8 Vertiport operations	6
8.1 Safety-related requirements for operation of vertiports.....	6
8.2 Additional requirements for type B and C vertiports.....	7
8.3 Interfaces and interoperability.....	7
8.4 Sub-contracts.....	7
9 Personnel competence	7
9.1 Requirements for all vertiport operators.....	7
9.2 Additional requirements for operators of type B and C vertiports.....	8
10 Maintenance	9
10.1 Requirements for all vertiport operators.....	9
10.2 Additional requirements for operators of type B vertiports.....	9
10.3 Additional requirements for operators of type C vertiports.....	10
11 Software safety assurance	10
11.1 Requirements for all vertiport operators.....	10
11.2 Additional requirements for operators of type B vertiports.....	10
11.3 Additional requirements for operators of type C vertiports.....	10
12 Management of abnormal situations	11
12.1 Contingency plan.....	11
12.2 Emergency response plan.....	11
13 Safety	11
13.1 Requirements for all vertiport operators.....	11
13.2 Additional requirements for operators of type B vertiports.....	12
13.3 Additional requirements for operators of type C vertiports.....	13
13.4 Tasks of the compliance monitoring officer (COMO).....	13
13.5 Tasks of the safety officer (SAFO).....	14
14 Manuals, procedures and records	15
14.1 Requirements for all vertiport operators.....	15
14.2 Additional requirements for operators of type B vertiports.....	16
14.3 Additional requirements for operators of type C vertiports.....	16
14.4 Vertiport operations manual.....	16
Annex A (informative) International regulation of aerodromes (including heliports)	18
Bibliography	20

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

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.

Introduction

0.1 General

This document belongs to a series of International Standards related to vertiport infrastructures and operations, developed by ISO/TC 20, SC 16 and SC 17.

A related standard under development by TC 20 is ISO 5491¹⁾[1].

0.2 Background

Vertiport operations relate to landing, ground movement, parking, and subsequent take-off and departure of vertical take-off and landing (VTOL) aircraft, electrically powered (eVTOL) or equipped with other propulsion systems. In this document, the abbreviated term VTOL encompasses eVTOL.

Vertiport operations also comprise ground handling and servicing, including energy replenishment.

Maintenance and operations of VTOL unmanned aircraft (UA), as well as UAS traffic management (UTM) services, are not covered by this document, although the vertiport operator often needs to exchange information with both the unmanned aircraft system (UAS) or operators of VTOL aircraft and UTM service providers (UTM SPs).

UTM SP are also called, in different regions of the world, “providers of services for UAM (PSU)” or “U-space service providers (USSP)”. These terms are equivalent in this document.

This document hence focuses on the requirements applicable to the vertiport operator for the safety, security and compliance of the provided services, as well as protection of related data and information. These requirements include organizational structure, accountabilities, policies and procedures.

A vertiport operator contributes to the safety, security and efficiency of operations of UAS or other VTOL aircraft suitable for operations over urban areas, supporting the fulfilment of the responsibilities of the UAS or VTOL aircraft operator. Operational procedures and requirements for the UAS operator are contained in ISO 21384-3²⁾. Although vertiport operations are established considering the needs of VTOL UA, these services can also support operations of properly equipped manned VTOL aircraft.

These VTOL aircraft can be employed for aerial work or transport, including of passengers.

One organization can operate several vertiports at different locations.

0.3 Types of vertiports

Vertiport operations relate to landing, ground movement, parking and subsequent take-off and departure of VTOL aircraft, electrically powered or equipped with other propulsion systems.

Vertiport operations also comprise cargo and passenger ground handling and aircraft servicing (e.g. power supply), including energy replenishment (e.g. battery recharging or refuelling).

The vertiports can be open to international or domestic public use or for private use.

The vertiports can be certified or licensed by the competent authority, based on applicable legislation.

Vertiports can be distinguished as type A (micro, used for logistics or for energy replenishment) and type B [small vertiports, including for urban air mobility (UAM) mainly of passengers], both serving aircraft capable of VTOL, including electrically powered, with a maximum take-off mass (MTOM) of up to 150 kg and 3 175 kg, respectively (i.e. 7 000 lbs.).

Large vertiports in type C are essentially heliports designed primarily to serve large rotorcraft equipped with internal combustion engines. But, when complemented by additional specific equipment or provisions, type C vertiports can also serve electrically powered manned or unmanned VTOL aircraft.

1) Under preparation. Stage at the time of publication: ISO/DIS 5491:2022.

These three types are summarized in [Table 1](#).

Table 1 — Types of vertiports

Vertiport type	A (micro)	B (small)	C (large)
Serving unmanned VTOL aircraft with features			
MTOM	150 kg	3 175 kg (7 000 lbs)	unlimited
Maximum passenger number	0	9	unlimited
Normal (Vno) or maximum operating Vmo) speed	80 km/h (80 kn calibrated airspeed (KCAS))	460 km/h (250 KCAS) during horizontal cruise	unlimited
Pressurized cabin or compartment	No	No	possibly
Related vertiport infrastructure and equipment standards	ISO 5491 ^[1]	TBD	Several standards produced by ISO TC 20, in particular for ground support equipment (GSE)
NOTE 1 Type A vertiports can be portable or fixed.			
NOTE 2 Type A vertiports are intended for logistics applications including inside urban areas. Type B vertiports can also serve passenger-carrying VTOL aircraft, including traditional rotorcraft specified in EASA/FAA CS/FAR 27 ^{[3][4]} . Type C vertiports are intended to serve VTOL aircraft of any mass, including large rotorcraft. Limitations for users can derive from environmental regulations (e.g. noise) or from decisions by the vertiport operator (e.g. provide or not refuelling facilities).			
NOTE 3 Type A vertiports are intended to serve UA of MTOM up to level V in paragraph 6 of ISO 21895 ^[5] .			
NOTE 4 3 175 kg MTOM is consistent with the threshold separating small rotorcraft from large rotorcraft, the former in FAR/CS 27 ^{[3][4]} and the latter in FAR/CS 29 ^{[6][2]} . Furthermore, nine is the maximum number of passengers allowed under FAR/CS-27 ^{[3][4]} .			
NOTE 5 ISO 5491 ^[1] provides standards for the exchange of digital information between the vertiport and the UA.			

0.5 Content of this document

This document contains requirements that can be used by an organization to provide safe, secure and efficient vertiport operations.

This document includes requirements on qualification and training of personnel, vertiport operation, maintenance, and competence of vertiport maintenance and of ground handling staff as well as noise around the vertiport and organizational requirements including occurrence reporting and safety, security and privacy.

This document does not include requirements specific to other topics, such as those for quality, occupational health and safety (OH&S), social responsibility, environmental matters beyond noise or financial management, or use of the electro-magnetic spectrum, though its elements can be aligned or integrated with those of other management systems.

In this document, the following verbal forms are used:

- a) “shall” indicates a requirement;
- b) “should” indicates a recommendation;
- c) “may” indicates a permission;
- d) “can” indicates a possibility or a capability.

Information marked as “NOTE” is for guidance in understanding or clarifying the associated requirement.

Unmanned aircraft systems —

Part 2:

Operation of vertiports for vertical take-off and landing (VTOL) unmanned aircraft (UA)

1 Scope

This document specifies the requirements for vertiport operations (e.g. removal of contaminants, noise) and interface with an unmanned aircraft system (UAS) or vertical take-off and landing (VTOL) aircraft operators and with UAS traffic management (UTM) service providers (SPs).

This document is applicable to operations of vertiports belonging to any type, supporting:

- a) demonstration of compliance with applicable regulations of vertiport operations to aviation authorities or other public authorities, as a possible acceptable means of compliance (AMC), when applicable regulations require such involvement from the authority and when the authority considers this document acceptable;
- b) attestation of compliance of vertiport operations by qualified entities or other accredited, competent and independent third parties, supporting the safety risk assessment of the UAS operations required by regulations, in particular when high level of assurance robustness is required;
- c) attestation of compliance of vertiport operations by qualified entities or other accredited, competent and independent third parties even in the absence of any applicable regulation.

This document also covers safety of the vertiport operator and quality of data provided by the vertiport operator to other entities (e.g. UAS operators, service providers of aeronautical information, providers of UTM services).

Aspects that are not covered by this document are:

- requirements for operational procedures of UAS;
- requirements for physical characteristics and equipment for vertiports;
- requirements for UTM SPs.

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 21384-4, *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

heliport

aerodrome or defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters

Note 1 to entry: The definition is taken from Reference [8]. Type B vertiports can also be heliports, if intended to support, in addition to electrically powered vertical take-off and landing (VTOL) aircraft, also helicopters powered by internal combustion engines. Conversely, type C heliports can be complemented by specific equipment (e.g. battery chargers) to also serve electrically powered VTOL aircraft.

Note 2 to entry: Helicopters belong to the VTOL family. VTOL aircraft or rotorcraft of unlimited mass and performance can operate at type C vertiports.

Note 3 to entry: European Aviation Safety Agency (EASA) Special Condition SC-VTOL-01²⁾ defines a vertiport as an area on land, water, or structure used or intended to be used for the landing and take-off of VTOL aircraft.

3.2

instrument approach

approach and landing operation using instruments for navigation guidance based on airborne, ground-based or satellite-based equipment or combination thereof

Note 1 to entry: The definition is adapted from Reference [10].

3.3

international vertiport

vertiport designated by a state in whose territory it is situated, as a vertiport of entry and departure for international air traffic, where the formalities incident to customs, immigration, public health, animal and plant quarantine, and similar procedures are carried out

Note 1 to entry: The definition is adapted from Reference [11].

Note 2 to entry: Vertiports can be international.

3.4

open to public use

<vertiport> accessible on equal terms and conditions to use by civil operators of vertical take-off and landing (VTOL) aircraft

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

Note 2 to entry: Formalities incident to customs, immigration, public health, animal and plant quarantine and similar procedures are not normally available.

Note 3 to entry: Vertiports can be open to public use, but use can be limited to certain operations or types of users, and a prior permission or approval by the *vertiport operator* (3.6) can also be required.

3.5

for private use

<vertiport> accessible only to one particular person (e.g. the owner) or a restricted group of users, authorized by the *vertiport operator* (3.6)

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

Note 2 to entry: Vertiports can be reserved to private use.

3.6**vertiport operator**

legal or natural person operating or proposing to operate one or more vertiports

Note 1 to entry: The definition is adapted from Reference [13].

4 Abbreviated terms

AMC	acceptable means of compliance
COMO	compliance monitoring officer
DAL	design assurance level
eVTOL	electrically powered VTOL
HT	head of training
IUEI	intentional unauthorized electronic interaction
MTOM	maximum take-off mass
SAFO	safety officer
SECO	security officer
SLA	service-level agreement
SP	service provider
UA	unmanned aircraft
UAM	urban air mobility
UAS	unmanned aircraft system
UTM	UAS traffic management
UTM SP	UTM service provider
VTOL	vertical take-off and landing

5 Privacy and data protection requirements

All vertiport operators shall ensure that:

- a) the relevant data privacy regulations and laws have been taken into consideration;
- b) suitable procedures are in place to securely store or dispose of all data gathered during service provision and to avoid that data are distributed to non-eligible entities.

NOTE This data can include, for example, the identity of passengers, addressees of cargo or intentions of operators of VTOL aircraft.

6 Security

6.1 Requirements for all vertiport operators

Taking relevant security regulations into consideration, all vertiport operators shall:

- a) ensure that their facilities, systems and procedures take into account applicable security requirements, including personnel reliability and security;
- b) prevent access of unauthorized persons to vertiport facilities, systems and equipment, including when no personnel are inside the facilities;
- c) establish systems and procedures to permit access and egress by authorized persons, including operational staff and customers delivering or retrieving cargo;
- d) ensure that all equipment for vertiport operation, when not in use, is stored in a secure place;
- e) ensure that any communication link supporting vertiport operations is secured and ensured as sufficient to:
 - 1) achieve and maintain the required safety for UAS operations;
 - 2) if applicable, be consistent with the security requirements of the UTM SPs with which the vertiport operator exchanges data.

NOTE Systems and procedures for customers to deliver or retrieve cargo can be covered by a service-level agreement (SLA) with the UAS cargo operator.

6.2 Additional requirements for operators of type B vertiports

In addition to [6.1](#), all operators of type B vertiports shall:

- a) address the structure, responsibilities, processes and procedures that promote and establish an environment and culture of continuing improvement and enhancement of operation security;
- b) appoint a person as security officer (SECO);
- c) designate the SECO based on professional qualities and, in particular, expert knowledge of laws, regulations and practices on national security, aviation security and cybersecurity and the ability to fulfil the assigned tasks;
- d) train and qualify personnel to effectively recognize and respond to possible acts of unlawful interference against provided services;
- e) ensure that personnel involved in vertiport operations or handling of sensitive data are suitably vetted;
- f) establish procedures for checking identity of passengers before allowing them to access the facilities;
- g) establish procedures to report to the competent authority any information on observed security occurrences, in a manner that would allow a further impact analysis by the authority, if appropriate.

NOTE 1 The SECO can be or not be an employee of the vertiport operator.

NOTE 2 A single SECO can perform such a function on behalf of several vertiports or several vertiport operators, providing that no conflict of interest would arise.

NOTE 3 The SECO can fulfil other tasks and duties in the organization, providing that any such tasks and duties do not result in a conflict of interest. Therefore, the SECO can be responsible, for example, for data protection or safety management, but not for service provision, maintenance or other activities related to production or operations.

NOTE 4 Various types of civil aviation operations present different levels of security threats. Unless any other action (such as screening of a passenger or their baggage) is required by any security regulation, checking the identity of passengers before boarding is sufficient to conform to this document at type B vertiports.

6.3 Additional requirements for operators of type C vertiports

In addition to 6.1 and 6.2, all operators of type C vertiports shall:

- a) ensure security through a threat-based, risk-managed approach under which to assess and reduce their own security risks, threats and impacts;
- b) ensure that the security system includes a risk policy that is transparent, predictable and controllable, focused on the largest risks and equitable;
- c) assess the information systems essential for vertiport operation, against any potential intentional unauthorized electronic interaction (IUEI) security threat and vulnerability that can result in an unsafe condition;
- d) ensure that the assessment includes as a minimum:
 - 1) determination of the security environment for the information security of the vertiport systems;
 - 2) identification of the relevant assets or systems;
 - 3) identification of the attack paths;
 - 4) assessment of the safety consequences of the security threat to the affected assets;
 - 5) evaluation, by considering the existing security protection means, of the level of threat that would have an impact on safety;
 - 6) determination of whether the risks, which are the result of the combination of the severities and the potentiality to attack (or, inversely, the difficulty of attacking), are acceptable:
 - i) if they are acceptable, preparation of a justification statement, including the means to maintain the risk at an acceptable level;
 - ii) if they are not acceptable, analysis of the proposed means of mitigation to ensure an acceptable level of safety;
 - iii) implementation of means of mitigation;
 - iv) evaluation of the effectiveness of the means of mitigation with respect to the level of risk (combination of the level of threat and severity of the threat condition);
 - 7) iteration from point 1) until all the residual risks are acceptable;
- e) establish procedures ensuring that the results of security assessments lead to a statement that the vertiport has no identifiable vulnerabilities, or to documented implementation of sufficient mitigation measures;
- f) provide, when mitigation measures were necessary, sufficient grounds for evaluating that the residual security risk is acceptable;
- g) establish procedures to make the documentation on the means of mitigation available in a timely manner to the competent authority when requested by the latter;
- h) develop instructions for personnel and users to maintain the information security risk of the vertiport operations at an acceptable level, after the entry into service of the vertiport or modification thereof.

7 Insurance

All vertiport operators, unless they can demonstrate that third-party liability related to vertiport operations is borne by public authorities, shall:

- a) hold valid insurance coverage for vertiport operations, commensurate to their services as well as types of supported UAS and types of UAS operations and covering, as a minimum, risks for third parties in the air and on the ground;
- b) ensure that the insured risks include terrorism, theft, acts of sabotage and intentional or inadvertent unauthorized electronic interaction;
- c) ensure that appropriate insurance coverage exists at all times when vertiport operations are available.

NOTE 1 For risks connected to UAS operations, the UAS operator is liable. These risks therefore do not need to be covered by the insurance of the vertiport operator.

NOTE 2 Product liability is not the responsibility of the vertiport operator, but of the equipment manufacturer.

8 Vertiport operations

8.1 Safety-related requirements for operation of vertiports

All operators of vertiports in types A, B or C, if applicable, shall establish and apply procedures for:

- a) considering the relevant regulations and laws on certification of aerodromes;

NOTE 1 A summary of the International Civil Aviation Organization (ICAO) and other regulatory provisions is given in [Annex A](#).

- b) monitoring and maintenance of landing, ground manoeuvring and take-off areas or devices, including monitoring drainage and removal of contaminants;
- c) ensuring serviceability of the ground-based systems;
- d) ensuring sufficient quality of data and information;
- e) controlling aircraft ground movement and presence of equipment on the operational areas;
- f) ground handling of aircraft and cargo;
- g) night operations;
- h) low visibility operations;
- i) operations in adverse weather, including wind, precipitations, ice or building-induced turbulence;
- j) managing abnormal situations according to [Clause 12](#);
- k) monitoring of vertiport surroundings;
- l) wildlife strike risk reduction;
- m) safety of works at vertiports.

NOTE 2 Ground-based systems can include aids for instrument approach, landing and departure operations, weather data acquisition and dissemination, exchange of data and information with UAS operators and other stakeholders, visual aids and other electric equipment, battery storage and charging equipment, fire prevention and extinction.

8.2 Additional requirements for type B and C vertiports

All operators of vertiports in types B or C, where applicable, shall establish and apply procedures for ground handling of passengers.

8.3 Interfaces and interoperability

All vertiport operators shall implement the following precautions with regards to vertiport operations:

- a) verification of suitability to serve UAS/VTOL models for which the vertiport is intended including the conditions required for operation on each take-off/landing area(s): aircraft dimensions, MTOM, available aids, available ground equipment, and specific operational procedures as appropriate (e.g. slopes, electromagnetic limitations);
- b) disseminate the information in a) to all potential users, directly or through one or several providers of UTM services;
- c) formalities incident to customs, immigration, public health, animal and plant quarantine, and similar procedures at international vertiports designated by a state as vertiport of entry and departure for international air traffic;
- d) control of the accuracy and currency of information originated by the vertiport operator or obtained from external providers;
- e) control of the interfaces with UAS operators, UTM SPs, other service providers (e.g. ATS, aerodromes) and logistic systems;
- f) as a minimum, operations and maintenance manuals for vertiport systems shall be those issued by the original equipment manufacturer;
- g) the system configuration shall not be changed without risk assessment and mitigation;
- h) radio-transmitting equipment shall not generate harmful interference with other users of the electro-magnetic spectrum;
- i) SLAs with all organizations relevant for safety of operations.

8.4 Sub-contracts

Where contracts exist with third-party organizations, the vertiport operators shall be responsible for the safety of outsourced services.

9 Personnel competence

9.1 Requirements for all vertiport operators

All vertiport operators shall:

- a) appoint an accountable manager, responsible for compliance with all applicable regulations and with this document;
- b) ensure that the quantity of personnel is commensurate with the provided services and types of UA and volume of movements at the vertiport, considering duty time of people;
- c) establish a policy and procedures to ensure that all personnel executing tasks related to safety, security or privacy within their organization are suitably trained, competent and qualified to discharge respective duties;
- d) ensure that such procedures meet or exceed applicable regulations;

- e) establish and keep up to date records of all relevant qualifications, experience and/or trainings completed by the staff involved in operation or provided services.

9.2 Additional requirements for operators of type B and C vertiports

In addition to [9.1](#), all operators of type B and C vertiports, shall:

- a) appoint a person as head of training (HT);
- b) ensure independency from the HT position and tasks and duties in the organization, to avoid any conflict of interest;
- c) establish an initial training syllabus and competency standard, including theoretical knowledge, practical skill and attitude, including for ground handling activities;
- d) include in such a syllabus, for personnel involved in vertiport operations, as a minimum:
 - 1) legislation and authority requirements on vertiport operation;
 - 2) requirements and procedures on security and data protection;
 - 3) monitoring of the infrastructure, facilities and surroundings;
 - 4) procedures to check and remove contamination from pavements, facilities or other infrastructures, including in relation to foreign object debris (FOD);
 - 5) systems being operated, functions and users;
 - 6) data sources and data quality;
 - 7) procedures, equipment and risks for refuelling or battery recharging;
 - 8) contingency and emergency procedures;
- e) include in such a syllabus, for personnel involved in vertiport and related systems and equipment, maintenance and software safety assurance, as a minimum:
 - 1) legislation and authority requirements on vertiport operation;
 - 2) requirements and procedures on security and data protection;
 - 3) systems and equipment being operated, functions and users;
 - 4) procedures to inspect, check, test or replace components in accordance with the manufacturer's instructions and as appropriate to the vertiport operations;
 - 5) tool control procedures;
 - 6) maintenance reporting procedures;
 - 7) deferred defect procedures;
 - 8) fuel supply, power supply, battery recharging and cooling;
 - 9) software safety assurance;
- f) define the duration of initial training and possible on-the-job training, commensurate with the operational tasks related to the vertiport operations;
- g) provide training directly, having established competency requirements for the instructors, or through a suitable external organization;
- h) assess the competency of personnel during ongoing training, through supervision and assessment by competent and qualified examiners or assessors, while avoiding conflict of interest;

- i) establish a programme for currency and recurrent training, appropriate to the complexity of each job position, to ensure that all personnel executing tasks related to safety, security or data protection within their organization remain competent;
- j) ensure that such programme includes procedures to evaluate the proficiency of all personnel executing tasks related to safety, security or data protection within their organization, to ensure that they would continue to meet respective competency standards.

The programme for currency, recurrent training and proficiency should be appropriate to the complexity of each job position.

NOTE 1 The HT, instructors, assessors or examiners can be or not be employees of the vertiport operator.

NOTE 2 A single HT, instructor, assessor or examiner can perform such a function on behalf of several organizations, providing that no conflict of interest would arise.

NOTE 3 The HT can have other functions connected to service provision (e.g. operations or maintenance).

10 Maintenance

10.1 Requirements for all vertiport operators

All vertiport operators shall establish procedures to implement all applicable safety, security or environmental directives.

In addition, all vertiport operators shall ensure that:

- a) maintenance instructions are available or developed for all the systems essential to provide respective services;
- b) such instructions are not contrasting the equipment manufacturer's instructions and requirements, where available;
- c) the maintenance staff use the maintenance instructions while performing maintenance.

10.2 Additional requirements for operators of type B vertiports

In addition to [10.1](#), all operators of type B vertiports shall:

- a) ensure that all maintenance or change procedures are executed only by personnel having received an authorization by the vertiport operator to carry out the specific type of maintenance or change operations;
- b) establish procedures to implement all instructions issued by the manufacturers, designers or developers, to ensure that all systems being operated are kept updated and, where necessary, returned where a recall order is active;
- c) implement all applicable safety or telecommunication directives issued by the competent authorities of the state having jurisdiction on the vertiport;
- d) organize scheduled maintenance of each system used to provide safety-related vertiport services, in accordance with a maintenance programme;
- e) use a maintenance log system to record all maintenance conducted and completed on the systems or equipment used in conjunction with vertiport operations.

10.3 Additional requirements for operators of type C vertiports

In addition to [10.1](#) and [10.2](#), all operators of type C vertiports shall:

- a) establish a maintenance procedure manual that provides information and procedures relevant to the maintenance facilities, records, instructions, release, tools, material, components, defect deferral, etc.;
- b) ensure that after maintenance, modification or update, the affected safety critical system or equipment is released to service by a competent and responsible person;
- c) ensure that a maintenance release is signed only by a staff member who has received a maintenance release authorization by the vertiport operator for that particular task.

11 Software safety assurance

11.1 Requirements for all vertiport operators

All vertiport operators shall ensure that all computer software used in the operation of respective systems:

- a) comes from a verified source;
- b) is kept up to date with all security patches applied;
- c) is verified and validated through testing at software interface level;
- d) is accompanied by records of any upgrade or modification.

11.2 Additional requirements for operators of type B vertiports

In addition to [11.1](#), all operators of type B vertiports shall:

- a) where software modifications are developed without design assurance level (DAL), conduct and obtain results of regression tests, as a minimum, to ensure that the software is effective and safe for operational use;
- b) provide users forms and procedures to report any perceived software anomalies;
- c) investigate and possibly solve any reported issue;
- d) give written feedback to the author of the report;
- e) record all received defect reports and respective closure.

NOTE These software requirements are equivalent to DAL D in References [\[14\]](#) and [\[15\]](#).

11.3 Additional requirements for operators of type C vertiports

In addition to [11.1](#) and [11.2](#), all operators of type C vertiports, shall:

- a) in cases where EUROCAE/RTCA documents ED-12C /DO-178C^{[14][15]} are selected to verify and validate the computer software, determine the necessary DAL chosen among level A, level B, level C, level D and level E considering the safety implications of the involved function;
- b) alternative to a), consider the behaviour of each software procedure as described at its interface level; the behaviour of each procedure shall be verified by testing the responses to each invocation with appropriate test vectors, providing that the safety remains acceptable;
- c) establish records to document that the level (or levels) to which the computer software has been verified and validated have been achieved;

- d) if the equipment incorporates more than one software level, incorporate appropriate partitioning of different software levels.

12 Management of abnormal situations

12.1 Contingency plan

Vertiport operators shall establish a contingency plan including, as a minimum:

- a) system malfunctions;
- b) external service and power supply malfunctions;
- c) security incident;
- d) lost or degraded communications with UA or VTOL aircraft, related operators or UTM SPs;
- e) privacy breach;
- f) identification of emergency hazards;
- g) theft.

12.2 Emergency response plan

Vertiport operators shall establish an emergency response plan including, as a minimum:

- a) response to aviation accidents or incidents on ground, during take-off or landing;
- b) emergency management and restoration of normal operating conditions;
- c) emergency plan exercises;
- d) fire and other natural disasters.

13 Safety

13.1 Requirements for all vertiport operators

All vertiport operators shall:

- a) address the structure, responsibilities, processes and procedures that promote and establish an environment and culture of continuing improvement and enhancement of service provision safety, under the responsibility of the accountable manager in [9.1](#);
- b) appoint a person as compliance monitoring officer (COMO);
- c) appoint a person as safety officer (SAFO);
- d) designate the COMO and the SAFO based on professional qualities and, in particular, expert knowledge of laws, regulations and practices on the safety of unmanned aviation and the ability to fulfil the tasks respectively referred to in [13.4](#) and [13.5](#);
- e) train and qualify personnel on safety matters related to vertiport operations;
- f) establish procedures for prescriptive safety including as a minimum:
 - 1) monitoring and assessing changes to regulations which can affect vertiport operations;

- 2) establish evidence that all applicable regulations are complied with;
- g) establish procedures to support reactive safety through:
 - 1) maintaining records of any operational activity for at least one month, or longer if required by regulations or because the State authority competent for the matter has opened an accident or incident investigation;
 - 2) timely provision of any information required by such an authority;
- h) establish procedures for proactive safety including as a minimum:
 - 1) possibility for staff, users, subcontractors or other partner organizations to report any relevant and perceived safety occurrence;
 - 2) mandatory reporting of safety occurrences to the competent authority, based on applicable regulations;
 - 3) voluntary reporting to the competent authority of any additional and relevant observed safety occurrence, in a manner that would allow a further safety analysis by the authority, if deemed appropriate by the latter;
 - 4) collection of received or originated safety occurrence reports;
 - 5) timely feedback to originators of the report;
 - 6) storage of received or originated safety occurrence reports;
 - 7) protection of related information, in particular identity of the author of the report, in accordance with [Clause 5](#);
 - 8) dissemination of safety information to involved personnel and affected stakeholders;
- i) take decisions, implement and monitor the effect of corrective actions originated by received reports;
- j) establish procedures for inter-organizational safety management, allowing exchange of safety information with affected stakeholders.

NOTE 1 The COMO or SAFO can be or not be employees of the vertiport operator.

NOTE 2 A single COMO or single SAFO can perform such a function on behalf of several organizations, providing that no conflict of interest would arise.

NOTE 3 A single physical person can perform both the function of COMO and of SAFO.

13.2 Additional requirements for operators of type B vertiports

In addition to [13.1](#), all operators of type B vertiports shall:

- a) not change configuration of the facilities, systems or equipment used for vertiport operations or the procedures thereof without prior evaluation of the related hazards, considering safety, security and privacy, and emerging risks;
- b) implement the mitigations stemming from the risk evaluation;
- c) control vertiport configuration and operational procedures and manage changes, demonstrate and document their compliance with applicable regulations, monitor actual application of such procedures and maintain related records for at least one year;
- d) establish procedures for predictive safety including as a minimum, safety assessment of any change affecting vertiport operations;

- e) such safety assessment should include:
- 1) identification of the scope of the change;
 - 2) verification that the foreseen change is taking into account applicable regulations;
 - 3) identification of related hazards;
 - 4) determination of the safety criteria applicable to the change;
 - 5) risk analysis in relation to the harmful effects or improvements in safety related to the change;
 - 6) risk evaluation and, if required, risk mitigation for the change to meet the applicable safety criteria;
 - 7) verification that the change is in accordance with the scope that was subject to safety assessment, and meets the safety criteria, before the change is put into operation;
 - 8) acquisition of prior approval to implement the change, from the competent authority, when required by regulations;
 - 9) specification of the monitoring requirements necessary to ensure that the vertiport operation will continue to meet the safety criteria after the change has been implemented.

NOTE Procedures for managing changes can include analysis, calculations, simulation, laboratory testing, regression testing for software or testing in real environment, as well as distribution of necessary information to service users and additional training for staff.

13.3 Additional requirements for operators of type C vertiports

In addition to [13.1](#) and [13.2](#), all operators of type C vertiports shall:

- a) establish a manual containing all safety management procedures and reporting lines;
- b) in the context of prescriptive safety, establish a system of periodic internal audits to ensure continuing compliance with applicable regulations and organizational procedures;
- c) in the context of reactive safety, define clear criteria by which safety occurrences should be classified as significant and establish procedures for internal safety investigations on significant safety occurrences;
- d) as part of the inter-organizational processes for safety management, establish arrangements with other relevant organizations (e.g. UAS operators, UTM SPs) to ensure continuous improvement of the safety of vertiport operations.

The arrangements with other organizations may include inter-organizational teams for joint safety investigation, safety analysis and development of joint corrective action plans.

NOTE The safety manual can be combined or not with other manuals of the organization.

13.4 Tasks of the compliance monitoring officer (COMO)

The vertiport operator shall ensure that the COMO receives any instructions regarding the exercise of the tasks in this subclause only from the vertiport top management or from the competent State authorities.

The COMO shall not be dismissed or penalized by the vertiport operator for performing allocated tasks.

The COMO shall directly report to the highest management level of the vertiport operator's organization.

The COMO shall be bound by secrecy or confidentiality concerning the performance of allocated tasks, taking into account applicable legislation.

The COMO may fulfil other tasks and duties in the organization, providing that any such tasks and duties do not result in a conflict of interest. Therefore, the COMO may be responsible, for example, for data protection or safety management, but not for service provision, maintenance or other activities related to production or operations.

The COMO shall have at least the following tasks:

- a) inform and advise the vertiport operator's top management and the employees who carry out tasks having regulatory compliance implications of their obligations pursuant to applicable regulatory provisions;
- b) monitor compliance with applicable legislation, with this document and with the policies of the vertiport operator in relation to regulatory provisions, in particular in the context of prescriptive safety management and including the assignment of responsibilities, awareness-raising and training of staff involved in relevant services;
- c) manage the related internal audits, if applicable, report the findings to the highest management level in the organization, advice on corrective action plans and monitor implementation of corrective actions;
- d) support possible audits or inspections by competent authorities and prepare responses to respective protocol questions;
- e) provide advice to the vertiport operator's top management where requested as regards regulatory compliance;
- f) act as the contact point for the authorities on issues relating to regulatory compliance;
- g) collect and analyse any information relevant for the current task, keep the necessary documentation and draw up reports on regulatory compliance.

NOTE 1 The COMO can be or not be an employee of the vertiport operator.

NOTE 2 A single COMO can perform such a function on behalf of several vertiports or several vertiport operators, providing that no conflict of interest would arise.

13.5 Tasks of the safety officer (SAFO)

The vertiport operator shall ensure that the SAFO receives any instructions regarding the exercise of the tasks in this subclause only from the vertiport operator's top management or from the competent state authorities.

The SAFO shall not be dismissed or penalized by the vertiport operator for performing allocated tasks.

The SAFO shall directly report to the highest management level of the vertiport operator's organization.

The SAFO shall be bound by secrecy or confidentiality concerning the performance of allocated tasks, taking into account applicable legislation.

The SAFO may fulfil other tasks and duties in the organization, providing that any such tasks and duties do not result in a conflict of interest. Therefore, the SAFO may be responsible, for example, for data protection, compliance monitoring or security management, but not for service provision, maintenance or other activities related to production or operations.

The SAFO shall have at least the following tasks:

- a) compile, update and control the configuration of the safety manual, if applicable;
- b) inform and advise the vertiport operator's top management and the employees who carry out tasks having safety implications of their obligations pursuant to applicable safety provisions;

- c) monitor all vertiport operator activities for reactive, proactive, predictive and inter-organizational safety management, taking into account applicable legislation, this document and the policies of the vertiport operator in relation to safety, including the assignment of responsibilities, awareness-raising and training of staff involved in safety relevant services;
- d) participate to joint safety teams, where established;
- e) provide advice to the vertiport operator's top management where requested as regards any safety matters;
- f) cooperate with the national authorities on safety matters, where applicable;
- g) act as the contact point for the authorities on issues relating to safety.

NOTE 1 The SAFO can be or not be an employee of the vertiport operator.

NOTE 2 A single SAFO can perform such a function on behalf of several vertiports or several vertiport operators, providing that no conflict of interest would arise.

14 Manuals, procedures and records

14.1 Requirements for all vertiport operators

The following documents, manuals and information specific to the organization shall be available, in the authentic form, at the location of the vertiport operational management:

- a) certificate of registration of the legal entity;
- b) radio station licence(s), if applicable;
- c) third-party liability insurance certificate(s);
- d) any certificate for privacy, cybersecurity, quality, social responsibility, environment, if available;
- e) declarations of conformity, verification or validation of systems and equipment, if applicable;
- f) operations manual(s) of such systems and equipment which shall include a description of the operational limits of the vertiport and shall be checked by the vertiport operator;
- g) notices to airmen (NOTAM) and aeronautical information circulars and publications or electronic access to it, where relevant for the vertiport operations;
- h) additional geographical information for UAS operations, issued by state having jurisdiction on the airspace above the vertiport, or on behalf of that state, or electronic access to it, where relevant for the provided services;
- i) operational procedures and related checklists;
- j) contracts and SLA between the vertiport operator and other organizations contributing to service provision or maintenance of the systems, as applicable;
- k) training records and qualification of all personnel involved in service provision;
- l) records of regulatory compliance activities;
- m) occurrence or defect reports and related documents in the context of data protection, security and safety;
- n) contingency plan and emergency response plan;
- o) any other document required by applicable regulations.

As a minimum, operations and maintenance manuals for vertiport infrastructures, facilities, systems and equipment shall be those issued by the builder or original equipment manufacturer.

The documents or parts of manuals or procedures shall be made available to all relevant staff or contractors, as a function of respective duties.

The vertiport operator shall establish a system of record-keeping that allows adequate storage and reliable traceability of all activities developed, covering all the elements related to provided services.

The format of the documents or records (i.e. paper or electronic) shall be specified in the vertiport operator procedures.

Records shall be stored in a manner that ensures protection from damage, alteration and theft, for a period of three months, unless differently determined by the competent authority.

The vertiport operator shall ensure, to the extent possible, in the event an aircraft using the provided services became involved in an accident or incident, the preservation of all related records and, if necessary, their retention in safe custody pending their disposition as determined by the competent authority.

14.2 Additional requirements for operators of type B vertiports

In addition to the documents listed in [14.1](#), the following documents, manuals and information specific to the organization shall be available, in the authentic form, at the location of the vertiport operational management:

- a) vertiport operations manual based on [14.4](#);
- b) maintenance instructions and procedures;
- c) system(s) maintenance logs, including configuration and software;
- d) names, qualifications and duties of the person or persons required for vertiport operations.

14.3 Additional requirements for operators of type C vertiports

In addition to the documents listed in [14.1](#) and [14.2](#), the following documents, manuals and information specific to the organization shall be available, in the authentic form, at the location of the vertiport operational management:

- a) any approval or certification by the competent authority, if applicable, and related terms of approval, specific authorizations and privileges;
- b) maintenance manual containing a description of the maintenance procedures and the procedures for completing and signing a maintenance release;
- c) maintenance programme covering the maintenance tasks and the intervals at which these are to be performed, as well as software safety assurance;
- d) safety manual and related records.

14.4 Vertiport operations manual

Vertiport operators shall establish an operations manual containing all the policies and procedures in place.

The vertiport operations manual shall be amended or revised as necessary to ensure that the information contained therein is kept up to date.