

ED-278A

CONCEPT OF OPERATIONS FOR VTOL AIRCRAFT VOLUME 1: GENERAL CONSIDERATIONS

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SUPERSEDES ED-278

FOREWORD

1. This document was prepared by EUROCAE Working Group 112 “Vertical Take Off and Landing (VTOL)” and was approved by the Secretariat of EUROCAE on 7 February 2022.
2. This document was prepared following a lean development process, as per Council decision 304/3.
3. This document supersedes ED-278 Concept of Operations for VTOL Aircraft Volume 1: General Considerations (September 2020).

The document has been updated to align the ED-278 document with the relevant modifications as applied in ED-293 Concept of Operations for VTOL Aircraft – Volume 2: Commercial Passenger Air Taxi Transport (August 2021).

As compared with the previous version, the main changes are:

- Replaced reference of 'piloted and unpiloted' to 'manned and unmanned' regarding the scope of the ConOps
 - Replaced the terms "manufacturer" and “design holder” to the more applicable "Type Certificate Holder"
 - Radio aid, ILS and GNSS navigation and approach capabilities were added to the operational characteristics list (Chapter 3.1.1)
 - Scope of aircraft performance characteristics was extended and rephrased (Chapter 4.2)
 - Updated references to the latest version and removed [8] and [14] as not considered applicable
 - 'Standard scenarios' definition was added to the Terms, Definitions and Abbreviations list
 - Reference text regarding the illegal UAS use was expanded to include other safety and security threats (Chapter 3.2.11)
 - Other editorial comments (e.g. remove full terms and only use abbreviations, include 'VTOL' when mentioning the aircraft operation, etc.)
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CHAPTER 1

INTRODUCTION

1.1 PURPOSE AND SCOPE OF THE DOCUMENT

This document specifies the structure and information expected to be provided by a Concept of Operations (ConOps) for VTOL aircraft.

Volume 1 of this document shall serve as guidance to structure an individual ConOps for VTOL aircraft operations. It is a first EUROCAE standard in this area and is expected to be complemented by additional Volumes that describe specific standard scenarios in more detail.

The ConOps can be established by a VTOL aircraft operator or any other interested party and shall be tailored to the individual operations.

Compliance with this document is recommended as one means of assuring that the requirements for a comprehensive overview of intended VTOL aircraft operations are fulfilled under all conditions normally encountered in approval processes.

While ED-278 is valid for all manned and unmanned VTOL aircraft, the current focus will be on manned VTOL operations to support EASA SC-VTOL [1]. Moreover, the ConOps is intended to be used as a guidance and broad template. Where certain sections are deemed as not applicable to a specific operation, the operator may indicate this with a remark under the relevant section.

1.2 SCOPE OF THE CONOPS

This guidance for a ConOps applies to and can be used for VTOL aircraft regardless of the certification category (e.g. basic and enhanced according to [1]).

The ConOps identifies all relevant quantitative and qualitative aspects of the operation such as procedures, roles and infrastructure to be described and communicated to and agreed with stakeholders in general or for specific use cases.

1.3 KEY ASSUMPTIONS AND CONSIDERATIONS

New VTOL aircraft have different concepts and configuration, which cannot be categorised as conventional aeroplane or classical rotorcraft. Therefore, a need to specify a new ConOps for VTOL aircraft is given to discuss air transport operations in a defined airspace and urban, suburban or rural environments. At a later stage, unmanned, respectively remotely piloted or autonomous operations are expected to be discussed.

1.4 TERMS, DEFINITIONS AND ABBREVIATIONS

Term	Description/Meaning
Aircraft operator	A person, organization or enterprise engaged in or offering to engage in an aircraft operation.
Air taxiing	Movement of a VTOL aircraft for taxiing above a surface at a height normally associated with ground effect and a ground speed specified by the flight manual or vertiport operator, whichever is lower.
(Acceptable) Means of compliance	A non-binding standard adopted by EASA to illustrate means to establish compliance with the Basic Regulation [2] and its Implementing Rules. (Acceptable) Means of compliance are either promulgated by the competent Aviation Authority, or issued by SDOs and accepted by the Authority, which illustrate means to establish compliance with applicable Regulations.
Automated flight	No pilot is involved in controlling the aircraft during flight under normal conditions. A pilot could, however, still exert

	control during the flight if necessary because of change of plans or contingency or emergency.
Autonomous operations	Means an operation during which an unmanned aircraft operates without the remote pilot being able to intervene.
Commercial air transport (operation)	An aircraft operation to transport passengers, cargo or mail for remuneration or other valuable consideration.
Continued safe flight and landing	A VTOL aircraft (category enhanced) is capable of continued controlled flight and landing at a vertiport, possibly using emergency procedures, without requiring exceptional piloting skill or strength (as defined in [1])
Continuing airworthiness	All of the processes ensuring that, at any time in its operating life, the aircraft complies with the airworthiness requirements in force and is in a condition for safe operation (as defined in [3]).
Command unit	The equipment or system of equipments to control unmanned aircraft remotely as defined in point 32 of Article 3 of [2], with the exception of any infrastructure supporting the C2 link service, which supports the control or the monitoring of the unmanned aircraft or both during any phase of the flight.
Controlled emergency landing	A VTOL aircraft (category basic) is capable of performing a controlled landing, possibly using emergency procedures, without requiring exceptional piloting skill or strength. Upon landing, some aircraft damage may occur (as defined in [1]).
D-Value	The largest overall dimension of the VTOL aircraft projection on a horizontal plane, while the aircraft is in the parking, taxiing, take-off or landing configuration, with rotor(s) turning if applicable.
Flight crew	A crew member, working on-board or remotely, charged by the VTOL aircraft operator with duties essential to the operation of a VTOL aircraft during a flight duty period.
Ground handling	Services necessary for a VTOL aircraft's arrival and departure other than air traffic services. These services may be performed by various stakeholders.
Ground crew	Any person located on the ground not being a member of the dispatcher or flight crew but involved in the operation and required for aircraft or passenger ground operation.
Guidance material	Non-binding explanatory and interpretation material on how to achieve the requirements contained in the Basic Regulation [2], the Implementing Rules, the AMCs/MOC and the Certification Specifications.
Ground movement	The movement of the aircraft on the Vertiport surface not under its own power prior to take-off or after landing by hand or with the assistance of ground movement equipment. Ground movement is not part of the flight.
Ground taxiing	Movement of a wheeled VTOL aircraft for taxiing on a surface of a Vertiport.
Manned aircraft	Any aircraft operating or designed to operate with a pilot on board.
Remotely piloted flight	All operations under the active control of a remote human pilot. Active control means that the remote pilot is in tactical control of the aircraft and is responsible for his/her own aircraft "Remaining Well Clear" of other aircraft. Any mode of

	control not meeting this criterion is not Remotely Controlled, such as Remotely Supervised and Automated Flight.
Stand	An aircraft stand that provides for parking a VTOL aircraft and where ground taxi operations are completed or where a VTOL touches down and lifts off for operations.
Standard scenario	A standard scenario is a type of operation likely to be carried out using a VTOL aircraft and is not to be confused with operational simplifications aimed at carrying out small UAS operations, or obtaining authorisations from the regulator.
State of the operator	The State where the principal place of business (for legal entities) or permanent residence (for natural persons) of the operator is located.
Taxiing	The aircraft is moving on or above the Vertiport surface under its own power prior to take-off or after landing. Taxiing is a phase of flight.
Turnaround time	The time between the VTOL aircraft comes to rest at the final parking position and the moment it first moves under its own or external power for the purpose of taking off.
Unmanned aircraft	Any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board.
Unmanned aircraft system	An unmanned aircraft and the equipment to control it remotely. UAS are classified according to one of the categories 'open', 'specific' or 'certified'.
UTM (UAS Traffic Management)	Set of traffic management and air navigation services aiming at safe, secure and efficient integration of multiple manned and unmanned aircraft flying inside the respective DOC of each service. [4]
UTM airspace	A geographical zone designated by a State where UTM services are required.
UTM services	Result of at least one activity necessarily performed at the interface between the UTM Service Provider and the UTM User, which consist in the provisions of digital data and information, in the context of UTM. [4]
Vertiport	An area of land, water, or structure used or intended to be used for the landing and take-off of VTOL aircraft.

Abbreviation	Meaning
AFM	Aircraft Flight Manual
AIS	Aeronautical Information Service
AMC	Acceptable Means of Compliance
ANS	Air Navigation Service(s)
ANSP	Air Navigation Service Provider
AOC	Air Operator Certificate
ATC	Air Traffic Control
ATM	Air Traffic Management
ATO	Approved Training Organisation
ATS	Air Traffic Service(s)
CAA	Civil Aviation Authority
CAMO	Continuing Airworthiness Management Organisation
CAT	Commercial Air Transport
CAW	Continuing Airworthiness
CBT	Competence Based Training
CEL	Controlled Emergency Landing
CG	Centre of Gravity
CNS	Communication, Navigation and Surveillance
ConOps	Concept of Operations
CORUS	Concept of Operations for European UTM Systems
CSFL	Continued Safe Flight and Landing
CTR	Controlled Traffic Region (Control Zone)
CU	Command Unit
CUOC	Command Unit Operator Certificate
C2	Command and control
DO	Design Organisation
DOA	Design Organisation Approval
ERP	Emergency Response Plan
FATO	Final Approach and Take-Off area
FCL	Flight Crew Licensing
FCS	Flight Control System
FOD	Foreign Object Damage
FSTD	Flight Simulation Training Devices
GM	Guidance Material
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
MEL	Minimum Equipment List
MMEL	Master Minimum Equipment List
MOC	Means Of Compliance

MTOM	Maximum Take-Off Mass
NAA	National Aviation Authority
NSA	National Supervisory Authority
OFDM	Operational Flight Data Monitoring
OM	Operational Manual
OSD	Operational Suitability Data
PiC	Pilot in Command
PO	Production Organisation
POA	Production Organisation Approval
POH	Pilot Operating Handbook
RASCI	Responsible, Accountable, Support, Consulted, Informed
RFFS	Rescue and Fire Fighting Service
SAR	Search And Rescue
SDO	Standards Developing Organization
SERA	Standardised European Rules of the Air
SMS	Safety Management System
SoO	State of Operator
SOP	Standard Operating Procedure(s)
SoR	State of Registration
STA	Scheduled Time of Arrival
STD	Scheduled Time of Departure
TCH	Type Certificate Holder
TLOF	Touch-down and Lift-Off area
TOL	Take-Off and Landing
UAS	Unmanned Aircraft System
USP	UTM Service Provider
UTM	UAS Traffic Management
VFR	Visual Flight Rules
VLL	Very Low Level
VMC	Visual Meteorological Conditions
VTOL	Vertical Take-Off and Landing

1.5 RELATIONSHIP TO SC-VTOL

Whilst this standard was developed with a particular view to the European legal framework, namely the EASA Special Condition VTOL 01, it may be applied to support other regulatory frames.

1.6 RELATIONSHIP TO OTHER DOCUMENTS

This document serves as a general baseline for VTOL aircraft operators to define their individual ConOps and will also be the guideline for further EUROCAE standards of WG-112 on VTOL aircraft.

1.7

LIST OF REFERENCES

- [1] EASA, "Special Condition for small-category VTOL aircraft; Doc. No: SC-VTOL-01, Issue 1".
- [2] Commission Regulation (EU) No 2018/1139 of 4 July 2018 on common rules in the field of civil aviation.
- [3] Commission Regulation (EU) No 1321/2014 of 26 November 2014 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these tasks.
- [4] ISO, "ISO/CD 23629-29 UAS traffic management (UTM)".
- [5] EASA, Concept for regulation of UAS 'certified' category operations of Unmanned Aircraft Systems (UAS), the certification of UAS to be operated in the 'specific' category and for the Urban Air Mobility operations; Issue 2.1.
- [6] Commission Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation.
- [7] EASA, Vertiport Design Manual (Guidance Material); in preparation.
- [8] EUROCAE, ED-xxx VTOL charging infrastructure.
- [9] SAE, AS6968 Connection Set of Conductive Charging for Electric Aircraft.
- [10] Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft.
- [11] Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations.
- [12] Commission Implementing Regulation (EU) 2016/1185 of 20 July 2016 amending Implementing Regulation (EU) No 923/2012.
- [13] ICAO; Annex 14 to the Convention on International Civil Aviation: Aerodromes, Volume II Heliports; Proposed Amendment with state letter AN 4/1.1.58-18/97.
- [14] I. 23629.

CHAPTER 2

ORGANISATION AND PARTNERS OF VTOL AIRCRAFT OPERATOR

This section shall describe the organisational set-up to support the safe VTOL aircraft operations. It should include but not be limited to:

- Structure of organisation and management,
- Responsibilities and duties of the VTOL aircraft operator,
- Relationship between the VTOL aircraft operator and organisations used for design, production, training and maintenance as applicable,
- Description of the relevant processes and procedures.

Other existing documents should be referenced as applicable.

2.1 VTOL AIRCRAFT OWNER

This section shall provide information on the registered VTOL aircraft owner meaning a natural person or a business (legal entity), with contact details to be provided.

2.2 MANAGEMENT AND NOMINATED PERSONS

This section shall provide information on the administrative role of the VTOL aircraft operator including their nominated persons, as required by applicable regulation.

2.3 COMPLIANCE MONITORING, QUALITY AND SAFETY MANAGEMENT SYSTEM

This section shall describe the VTOL aircraft operator's compliance monitoring system and cover the integration of operational, airworthiness and safety management systems (SMS). It should include, but not be limited to:

- Safety integration in the organisation,
- Details of the SMS in use,
- Applicable Safety Management Regulations and Standards,
- Applicable Cybersecurity* Regulations and Standards (whether as part of safety management or separately),
- Continued Airworthiness Reporting System and Analysis,
- Aircraft Health Monitoring and Operational Flight Data Monitoring (OFDM).

NOTE: *As rulemaking in this field becomes clearer, references may be made to the appropriate cybersecurity regulations, standards and policies as applicable.*

2.4 DESIGN AND PRODUCTION

This section shall provide a high-level description of the applicable design organisation as well as the production organisation. In addition, Design Organisations Approvals (DOA), Production Organisations Approvals (POA) and all other approvals, if any, shall be listed and described.

2.5 TRAINING

This section shall provide information on how the training is organised and conducted to ensure qualification and necessary licensing of all staff involved in operations (flight crew, dispatcher, ground crew). The VTOL aircraft operator shall distinguish between responsibilities of the VTOL aircraft operator and of the Training Organisation, e.g. ATO. This description should refer to and include, but not be limited to:

- Initial training and qualification,
- Procedures for maintenance of currency,
- Flight Simulation Training Devices (FSTD) as applicable,
- Training programme.