

# ED-305

## INFORMATION SECURITY GUIDANCE FOR VTOL

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## CHAPTER 1

### INTRODUCTION

#### 1.1 CONTEXT

EUROCAE WG-112 aims to establish guidance for acceptable means of compliance with the Special Condition VTOL. This document addresses airworthiness security aspects while considering special condition and means of compliance issued by EASA for small category enhanced VTOL aircraft.

EASA SC-VTOL-01 (Issue 1, dated 2 July 2019) includes the following airworthiness performance-based requirement:

##### 1.1.1 VTOL.2500 General requirements on systems and equipment function

(a) Requirements SC-VTOL.2500, SC-VTOL.2505 and SC-VTOL.2510 are general requirements applicable to systems and equipment installed in the aircraft, and should not be used to supersede any other specific SC-VTOL requirement.

(b) Equipment and systems required to comply with type certification requirements, airspace requirements or operating rules, or whose improper functioning would lead to a hazard, must be designed and installed so that they perform their intended function throughout the operating and environmental limits for which the aircraft is certified.

EASA MOC-SC-VTOL (Means of Compliance with the Special Condition VTOL) Issue 2 (dated 12 May 2021) establishes standard means of compliance to VTOL.2500 (b), including airworthiness security aspects as follows:

##### 1.1.2 MOC 3 VTOL.2500(b) Airworthiness Security in the Category Enhanced

Airworthiness Security is the protection of the airworthiness of an aircraft from intentional unauthorised electronic interaction: harm due to human action (intentional or unintentional) using access, use, disclosure, disruption, modification, or destruction of data and/or data interfaces. This also includes the consequences of malware and forged data and of access of aircraft systems from ground systems but does not include physical attacks or electromagnetic disturbance.

Improper functioning of equipment and systems can be caused by intentional unauthorised electronic interaction (IUEI). The applicant should consider cybersecurity threats as possible sources of 'improper functioning' of equipment and systems:

(a) The equipment, systems and networks of Category Enhanced VTOL aircraft, considered separately and in relation to other systems, should be protected from intentional unauthorised electronic interactions that may result in catastrophic or hazardous effects on the safety of the aircraft. Protection should be ensured by showing that the security risks have been identified, assessed and mitigated as necessary.

(b) When required by paragraph (a), the applicant should make procedures and instructions for continued airworthiness (ICA) available that ensure that the security protections of the aircraft equipment, systems and networks are maintained.

AMC 20-42 – Airworthiness Information Security Risk Assessment is an accepted means of compliance with VTOL.2500 (b) for Airworthiness Security aspects.

#### 1.2 PURPOSE AND SCOPE

In this context where means of compliance with the special condition VTOL are issued for airworthiness security aspects, this document provides a set of complementary methods and guidelines while following AMC 20-42 with tailoring for VTOL. This document is intended to guide applicant in its airworthiness security activities considering specificities of VTOL systems and relying on ED-202A, ED-203A, ED-204A and ED-206 guidance with adequate adaptation and tailoring.

As SC VTOL is limited to manned VTOL, this guidance is as well limited to manned VTOL. Unmanned VTOL is out of scope of this document.

Since the EASA means of compliance to VTOL.2500 are limited to category enhanced VTOL the guidance in this document is intended to that category of VTOL. Security risks on category basic VTOL are not managed in the frame of airworthiness security.

While unmanned VTOL is out of scope of this document, it is generally understood that the development of unmanned VTOL will require the development of Collaborative Systems. Collaborative Systems are not part of the SC-VTOL and associated MOC at the time of this document issue, thus this is currently out of scope of this document as well. In the future, when VTOL starts autonomous operation, collaborative systems should be included. Security considerations will become even more critical in the context of autonomous VTOL operation.

MOC 3 VTOL.2500 (b) and VTOL.2500 are applicable to small category enhanced VTOL aircraft.

### 1.3

#### APPLICATIONS

Compliance with this standard by manufacturers, installers and users is recommended as a means of assuring that the equipment will satisfactorily perform its intended function(s) under all conditions normally encountered in routine aircraft operations.

Any regulatory application of this document in whole or in part is the sole responsibility of appropriate government agencies.

As the measured values of equipment performance characteristics may be a function of the method of measurement, standard test conditions and methods of test are recommended in this document.

### 1.4

#### HOW TO USE THE DOCUMENT

In the specific context of category enhanced VTOL this document provides complementary guidance for the airworthiness security process specified in ED-202A/DO-326A, the airworthiness security methods and considerations established in ED-203A/DO-356A and the information security guidance for continuing airworthiness ED-204A/DO-355A.

This document is organised into the following chapters:

- Chapter 1 introduces the document.
- Chapter 2 discusses potential tailoring of current acceptable means of compliance that may be considered on AMC 20-42 in the context of category enhanced VTOL.
- Chapter 3 proposes tailoring of ED-202A for use on category enhanced VTOL.
- Chapter 4 establishes tailoring of ED-203A for use on category enhanced VTOL.
- Chapter 5 establishes tailoring of ED-204A for use on category enhanced VTOL.
- Appendix 4-A provides considerations about ED-200 documents.

### 1.5

#### CONVENTIONS OF THIS DOCUMENT

Within this document, “should” is used for recommendations, “may” and “need not” are used for permission, “can” and “might not” are used for possibility, “cannot” is used for impossibility, and “will” is used for an expectation arising from activities satisfying objectives from a referenced standard or regulation. The use of “must” and “shall” is avoided. Other terms that are not defined are intended to have their common dictionary meaning. This document recognises that the guidance herein is not mandated by law, but it represents a consensus of the aviation community. It also recognises that alternative methods to the ones described herein may be available to the applicant. For these reasons, the use of words such as “shall” and “must” is avoided.

### 1.6

#### REFERENCES

| N°      | Reference               | Document title                                                                             |
|---------|-------------------------|--------------------------------------------------------------------------------------------|
| [Ref 1] | SC-VTOL-01<br>Issue: 1  | SPECIAL CONDITION Vertical Take-Off and Landing (VTOL) Aircraft                            |
| [Ref 2] | MOC SC-VTOL<br>Issue: 2 | Means of Compliance with the Special Condition VTOL                                        |
| [Ref 3] | AMC-20<br>Amendment 18  | General Acceptable Means of Compliance for Airworthiness of Products, Parts and Appliances |

|          |         |                                                                        |
|----------|---------|------------------------------------------------------------------------|
| [Ref 4]  | ED-206  | Guidance on Security Event Management                                  |
| [Ref 5]  | ED-202A | Airworthiness Security Process Specification                           |
| [Ref 6]  | ED-203A | Airworthiness Security Methods and Considerations                      |
| [Ref 7]  | ED-204A | Information Security Guidance for Continuing Airworthiness             |
| [Ref 8]  | ER-013A | Aeronautical Information System Security Glossary                      |
| [Ref 9]  | ED-80   | Design Assurance Guidance for Airborne Electronic Hardware             |
| [Ref 10] | ED-12C  | Software Consideration in Airborne Systems and Equipment Certification |

## 1.7

### RELATIONSHIP TO SC-VTOL

Whilst this standard was developed with a particular view to the European legal framework, namely the EASA Special Condition VTOL [reference 1], it may be applied to support other regulatory frames.

In regard to EASA SC-VTOL, this standard supports the showing of compliance with the following requirements and/or complements the following related Means of Compliance:

- VTOL.2500 General requirements on systems and equipment function
- VTOL.2500 (b) Airworthiness Security in the Category Enhanced

## 1.8

### RELATIONSHIP TO OTHER DOCUMENTS

The terminology used in this document is consistent with the glossary provided in the EUROCAE Report, ER-013A Aeronautical Information System Security Glossary.

## 1.9

### GENERAL CONSIDERATIONS

VTOL present three intrinsic differences with other platforms which may require particular attention with regards to information system security:

- Battery
- Ground support stations
- Electric vehicle refuelling system.

The threat conditions associated to these assets are to be assessed. Specific consideration is expected for threat scenarios dealing with battery depletion and ground stations compromise.

Other systems that are less protected can serve as an attack vector to reach the battery and command and control systems.

## CHAPTER 2

### CONSIDERATIONS ON THE TAILORING OF MEANS OF COMPLIANCE

EASA MOC3 VTOL.2500 (b) establishes acceptable means of compliance for airworthiness security aspects with requirements VTOL.2500 of SC-VTOL.

It stipulates that security risks associated to catastrophic or hazardous effects on the safety of the aircraft should be mitigated and that AMC 20-42 is acceptable means of compliance for this risk management.

EUROCAE ED-20X series documents, which are recognized in AMC 20-42 as acceptable means of compliance were developed in the context of 14 CFR Part 25 and EASA CS-25 and they may be applicable to other regulation such as here EASA SC-VTOL. It does not assume that applicants are in compliance with these guidance materials, but that the applicant has in place a comprehensive flight safety program as part of development and continued airworthiness which is compliant with regulation, and an applicant may tailor these guidance materials appropriately in negotiation with regulatory authority.

When tailoring the process defined in ED-202A, the applicant needs to consider EASA's explanation present in SC-VTOL "Preamble - Link to type of Operations":

*"The types of operations that the Category Enhanced aircraft will perform correspond to the highest operational risk to third parties and/or to passenger transport for remuneration. For this reason, the most stringent system safety objectives are assigned regardless of the number of occupants."*

...

EASA concluded that the levels of system complexity that is introduced by the distributed propulsion and corresponding advanced flight controls is deemed sufficiently unusual and novel that the current CS-23 acceptable means of compliance are no longer considered appropriate for determining the aircraft and system safety objectives.

The second evaluation was based on the Concept of Operations that were provided by applicants and further complemented by market projection analyses. Two concepts of operations were considered: high-density deployment of urban on-demand passenger commercial air transport for intermodal connections and high-density deployment of urban and inter-urban, on-demand passenger commercial air transport.

Both evaluations confirmed that the current system safety objectives for CS-25 and CS-27/29 aircraft should be maintained as a minimum for the commercial air transport operations of passengers as well as for urban air mobility using VTOL aircraft to address the risks to persons on board and on the ground.

The following chapters discuss potential tailoring associated to dedicated applicable standard.

## CHAPTER 3

### TAILORING OF ED-202A GUIDANCE

#### 3.1 INTRODUCTION

CHAPTER 3 of this document is composed of an introduction, the tailoring presentation section, which presents ED-202A tailoring for small category enhanced VTOL and additional sections providing considerations on airworthiness security process.

Section 3.2 proposes tailoring of ED-202A chapter 2, whereas chapter 3 and 4 of ED-202A are still applicable to VTOL products.

#### 3.2 TAILORING PRESENTATION

ED-202A provides guidance for CS-25 aircraft certification to handle the threat of intentional unauthorized electronic interaction (IUEI) to aircraft safety, proposing generic security activities for aircraft development and certification to ensure that security risks are at acceptable level. It is intended to be used in conjunction, mainly, with ED-79 / SAE ARP4754 at the latest issue with which it receives data to assess the risk created by IUEI on the safety of the flight. The evaluation criteria is aligned with the advisory material associated with JAA AMJ25.1309 and EASA AMC25.1309, in the context of Part 25, CS-25, and JAA JAR-25. Tailoring of this guidance may allow it to be applicable in other contexts such as SC-VTOL.

The ED-202A proposed process acts on aircraft level and system levels as depicted in Figure 1. It is expected the VTOL aircraft architecture will be of much integrated aircraft and system architecture than CS-25 aircraft architecture so the process can be simplified by combining the aircraft and systems level activities.

ED-202A chapter 2 presents the airworthiness security process and it details in § 2.1.1 and § 2.1.2 the security risk assessment and security development related activities.

Several steps are defined in terms of spatial and temporal perspective:

- Aircraft level activities and system level activities
- Preliminary activities and final activities.

In the objective of activities simplification and considering the moderate size of the system architecture, the following adaptation is considered for VTOL:

- Replacement of two scales (aircraft and system) activities by a single level process at aircraft level for the whole VTOL perimeter. Aircraft architecture is simple enough to manage end to end threat scenario and associated risk through this single level process. This includes the security scope definition, the security risk assessment, the security architecture definition, the security verification and refutation and the security operator guidance.

Therefore, the activities are performed at the perimeter of the whole aircraft but with the granularity of system level.

The level of safety based on FHA that is considered as input for security process is the one (aircraft level, system level) the most appropriate to identify the criticality of a specific asset that may be impacted on an attack path by a threat.

This adaptation makes airworthiness security activities for VTOL simpler, including on process documentation management perspective, without detriment to the security risk management.

Prior authority agreement should be sought before replacing the two scales (aircraft and system) activities by a single level process.

The security scope characterises all VTOL interactions, while identifying the specific items interfaces or removable media and the connected devices which may be untrustworthy.

The security risk assessment establishes the set of end-to-end threat scenarios from the untrusted interactions across on-board items to the final asset with safety critical threat condition.