



# Global Urban & Advanced Air Summit

2-3 March 2022

SHAPING THE FUTURE OF AIR TRAVEL



## **EVTOL – A LEGAL AND REGULATORY OVERVIEW, PUBLIC INTEREST OPERATIONS AND SAFETY**

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# EASA Study on Societal Acceptance of Urban Air Mobility in Europe May 2021

- “We are not planning to certify the entire eco-system and local decisions need to be taken by local actors.

So what we intend to do is certify the aircraft ,to provide our views on the constraints on the operational environments in which this aircraft is certified to operate safely and ,then it will be up to local authorities to take those constraints into account for certifying the vertiports and landing sites also the highways.”

**Patrick Ky, EASA Executive Director Patrick Ky, introducing the results of the survey at a press conference on 19 May 2021**

- Conclusion : all regulatory authorities must work together at all levels



# Regulatory Framework for EVTOL

Three Core Regulatory Approvals in most jurisdictions

- Type Certification
- Production Certification
- Operational Certification



# Regulatory Framework for EVTOL – EASA

- European Union approach EASA
- New EVTOL Type Certification Framework through a series of building blocks
- EASA Special Condition for Small Category VTOL Aircraft (SCVTOL ) July 2019 May 2020 /May 2021 and phase three Means of Compliance
- Means of Compliance provide clarity to EVTOL manufacturers for issuing EVTOL **Type Certificates** by EASA
- Ongoing process as EVTOL models are developed through EASA Certification Review Items and SCVTOL regulation is developed by EASA on ongoing basis
- Production Certification is by way of **EASA Production Organisation Approval (POA)**
- Operational Certification –**EASA Air Operators Certificate**
- Ongoing rule making process. Look at EASA’s Notice of Proposed Amendment and apply to conform



# Regulatory Framework for EVTOL – EASA

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- Distinction and Overlap between EVTOL and Unmanned Aircraft Systems UAS/Drones
- Overview of UAS Regulation Europe
- Delegated Regulation (EU) 2019/945 March 2019 and Implementing Regulation (EU) 2019/947 May 2019
- Seek to address safety but also privacy, security and data protection product safety and design requirements
- Member States free to define "zones" within their respective airspace to restrict drone operations regulated by respective national legislation. Registrations or authorisations are implemented at the national level
- Heaviest regulatory burden at the areas of highest perceived risk so three categories





# Regulatory Framework for EVTOL – EASA

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- Open-low-risk operations not requiring authorisation or declaration before flight.
- Specific-medium-risk operation requiring authorisation by the competent authority pre-flight, taking into account the mitigation measures identified in an operational risk assessment; or a pre-flight declaration for certain standard scenarios; or when the operator holds a light UAS operator certificate with the appropriate privileges; or under the auspices of a model aircraft club/association.
- Certified-high-risk operation requiring a certification process consisting of: (i) the certification of the UAS, (ii) a licenced remote pilot and (iii) an operator approved by the national competent authority.
- Note EASA's development of Acceptable Means of Compliance (AMC) and Guide Material (GM) for operations in the "Open" and "Specific" categories and publication on 17 December 2020 EASA published Special Condition Light Unmanned Aircraft Systems-Medium Risk.
- Special Condition prescribes detailed airworthiness standards covering structures, design and construction, lift/thrust/power system installation, and systems and installation and are broadly applicable to unmanned aircraft under 600kg, with most drones currently under certification in EASA anticipated to adopt this certification basis.



# Regulatory Framework for EVTOL – FAA/USA

- United States' approach: Utilise Existing FAA Regulations
- Type Certificate for EVTOL involves airworthiness approval of aircraft and components according to type design
- FAA address EVTOL **Type Certification** by applying one of two existing processes 14 C.F.R. Part 21.17(a) and (b)
- 14 C.F.R. Part 21.17(a) involves the designation of applicable airworthiness standards when the **aircraft closely matches the characteristics of a particular airplane or rotorcraft class**, along with special conditions to address any differences
- 14 C.F.R. Part 21.17(b) is used for **special classes of aircraft**, and the FAA will apply airworthiness requirements derived from other regulations as appropriate, in addition to other airworthiness criteria that the FAA may find **to provide an equivalent level of safety to existing airworthiness requirements**
- Note FAA is currently dealing with policy and guidance for EVTOL type certification and has indicated that it is deciding whether the process under Part 21.17(a), using the airworthiness standards for Normal Category Airplanes under 14 C.F.R. Part 23, or the process under Part 21.17(b) will apply to EVTOLs





# Regulatory Framework for EVTOL – FAA/USA

- USA **Production Certification** by way of **FAA Production Certificate** which is an approval to manufacture the EVTOL product under an **FAA approved type design**
- Operational Certification –**FAA Air Carrier Certificate** under 14 C.F.R Part 135
- Economic authority from the DOT to operate commercially and subject to associated US ownership and control requirements



# Regulatory Framework for EVTOL – Other Jurisdictions

- Singapore
- KSA/NEOM
- Korea
- China
- ..... and beyond!



# TABULATED WORKING EXAMPLE OF APPLICATION OF EASA REGULATORY FRAMEWORK FOR EVTOL PRODUCT

## Abbreviations

STS	Standard Scenario
LUC	Light UAS Operator Certificate
SAIL	Specific Assurance and Integrity Level
GRC	Ground Risk Class
ARC	Air Risk Class
OSO	Operational Safety Objectives
(R)TC	Restricted Type Certificate
TC	Type Certificate





# TECHNICAL REQUIREMENTS

Category	Characteristics	Technical Requirements	Source	Type
Open	Amongst others: up to 25 kg MTOM	Conformity assessment CE Marking C0 – C4	947: Art. 3(a), 4 and 10 945: Art. 2(1)a), 4(1), 6(1-10), 10, 12-17 plus Annex, Parts 1-5 and 7-13	n/a
Specific	STS-01: VLOS  Up to 25 kg MTOM	Conformity assessment CE Marking C5 plus Operational Declaration pursuant UAS.SPEC.020	947: Art. 3(b), 5(5), 10 and Appendix 1 Chapter 1 945: Art. 2(1)a) and b), 4(1), 6(1-11), 10, 12 – 17 plus Annex, Parts 16 and 7-13	n/a
	STS-02: BVLOS  Up to 25 kg MTOM	Conformity assessment CE Marking C6 plus Operational Declaration pursuant UAS.SPEC.020	947: Art. 3(b), 5(5), 10 and Appendix 1 Chapter II 945: Art. 2(1)a) 4(1), 6(1-11), 10, 12 – 17 plus Annex, Parts 17 and 7-13	n/a



# TECHNICAL REQUIREMENTS

Category	Characteristics	Technical Requirements	Source	Type
	Other for one specified type of operation (Non-STS)	<ul style="list-style-type: none"> <li>· Operations Manual</li> <li>· Risk Assessment (PDRA or SORA)</li> <li>· Technical capabilities of UAS set out in Operational Authorization</li> </ul> or <ul style="list-style-type: none"> <li>· EASA requirements approval/design verification (SAIL V and VI) with (R)TC or TC</li> </ul>	947: Art. 3(b), 5(1) and (4)a), 10 and 12(4)b)iii) 945: Art. 2(2) and 40(3)	Recommended as initial approach  New application when significant changes (e.g.: operational area or UAS)



# TECHNICAL REQUIREMENTS

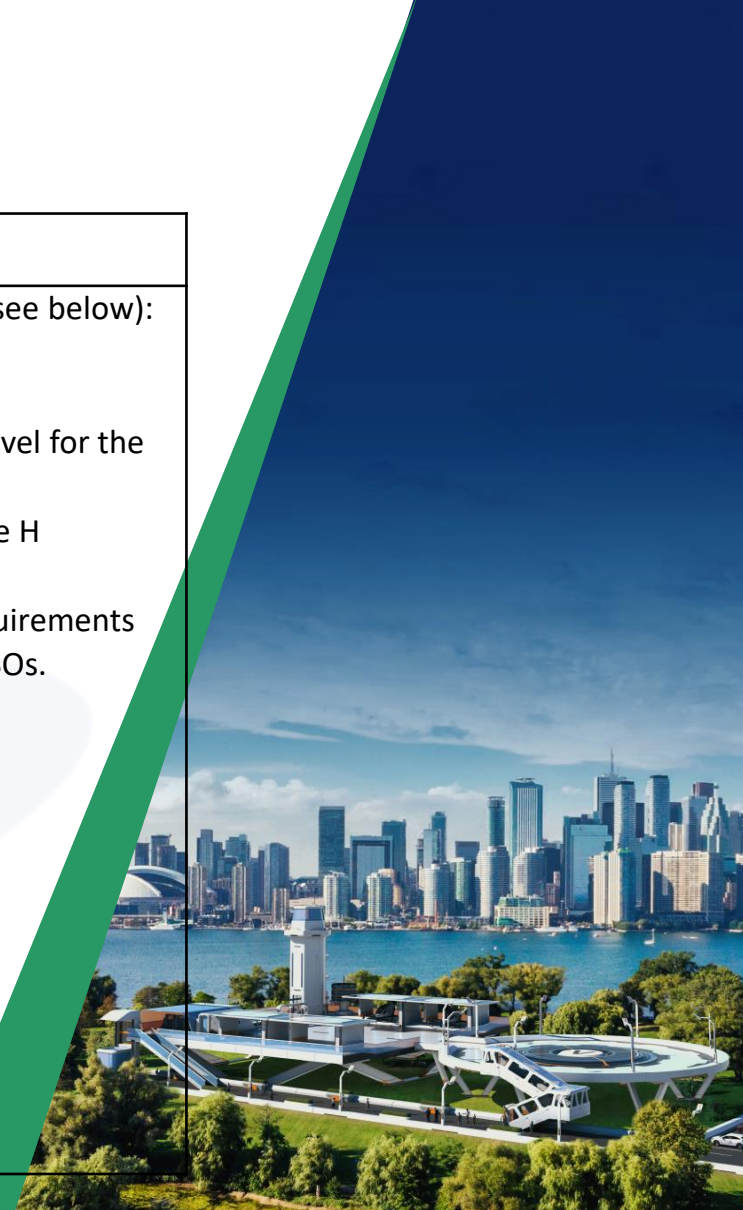
Category	Characteristics	Technical Requirements	Source	Type
		PDRA S01+S02 Up to 3 m Dimension and up to 25 kg MTOM	947: Art.11 and AMC4+AMC5 to Art. 11	n/a
		PDRA G01+G02 Up to 3 m Dimension and up to 34 kJ kinetic energy	947: Art. 11 and AMC2+AMC3 to Art. 11	n/a





# TECHNICAL REQUIREMENTS

Category	Characteristics	Technical Requirements	Source	Type
		<p>SORA</p> <p>Determination of the following parameters:</p> <ul style="list-style-type: none"> <li>· Intrinsic GRC</li> <li>· Mitigations for GR</li> <li>· Final GRC</li> <li>· ARC</li> <li>· SAIL: Combination of Final GRC and Residual ARC</li> <li>· Allocation of a SAIL-number: Decides on robustness levels of the required 24 OSOs:</li> </ul> <p>O = Optional                      L = Low                      M = Medium                      H = High</p> <p>Particularly 10 technical OSOs</p>	<p>947: Art. 11 and AMC1 to 947 Art. 11</p>	<p>SORA check (see below):</p> <p>SAIL IV                      SAIL IV</p> <p>Robustness level for the OSOs:</p> <p>Most M, some H</p> <p>Technical requirements to UAS: 10 OSOs.</p>



# TECHNICAL REQUIREMENTS

Category	Characteristics	Technical Requirements	Source	Type
	LUC	Operator's management system Operations Manual Risk Assessment Technical capabilities of UAS set out in Operational Authorization for LUC or EASA requirements approval/design verification (SAIL V and VI) with (R)TC or TC (Generic description of flights. Will only be issued after good experiences with the operator's conduct under usual SORA operations)	947: Art. 3(b), 5(4)(b) and (6)a), 10 and Annex Part C 945: Art. 2(2) and 40(3)	Recommended in the medium or long run



# TECHNICAL REQUIREMENTS

Category	Characteristics	Technical Requirements	Source	Type
Certified	i.e. Transport of people	Airworthiness approval by EASA Type Certificate	947: Art 3(c), 6(1)b ii) and 10 945: Art. 2(2) and 40(1)	

## SORA METHODOLOGY (SAIL DETERMINATION)

Considering the EVTOL model 1 and EVTOL model 2 in question

EAR EASA Easy Access Rules

ERP Emergency Response Plan

## SORA METHODOLOGY





# TECHNICAL REQUIRMENTS

Parameters	Determining criteria	EVTOL model 1	EVTOL model 2
		MTOM 570 kg	MTOM 900 kg
		Ops-height AGL < 150m	Ops-height AGL < 150 m
<b>Intrinsic GRC</b>	Maximum dimension: (cf. table 2 on page 45 EAR)	30 ft	37 ft
	Typical kinetic energy expected	884 kJ	1325 kJ
	Operational scenarios (assumption)	BVLOS over a sparsely populated area	BVLOS over a sparsely populated area
Code Number		5	6
<b>Mitigations ground risk</b>	M3 – An ERP is in place, the UAS operator is validated and effective. (assumption)	-1	-1



# TECHNICAL REQUIREMENTS

Parameters	Determining criteria	EVTOL model 1	EVTOL model 2
<b>Final GRC</b>		4	5
<b>ARC</b>	OPS in uncontrolled airspace over urban area (cf. figure 4 on page 49 of EASA EAR)	ARC-c	ARC-c
<b>SAIL determination</b>	Final GRC and Residual ARC (cf. table 5 on page 53 of EASA EAR)	<b>SAIL IV</b>	<b>SAIL IV</b>



# UAS Public Interest Operations

## In particular: Concept of Sovereignty

### "Master in one's own house"

Article 1 Chicago Convention:

"The contracting States recognize that every State has **complete and exclusive sovereignty** over the airspace above its territory."

Article 3 (a) Chicago Convention:

"This Convention shall be **applicable only to civil aircraft**, and shall **not be applicable to state aircraft**."

### Core Areas of Statehood

Foreign Affairs – **Defence**

**Internal Affairs**– Justice

Finance

### Hence:

International Standardisation applies only to civil aircraft  
**State aircraft are governed by national law**



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# How to shape national law for state aircraft?

## Article 3 (d) Chicago Convention

The contracting States undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft.

## National Regulations

I.e. No binding specifications by

- International law (ICAO) or
- supranationales Recht (EU)

## However: certain structural elements

- Public interest/powers of a public authority
- Safety
- Particularities of the individual area of responsibility
- Considerateness to civil aviation
- Proportionality



# Comparison

## EU Basic Regulation - Article 2 para 3

This Regulation shall not apply to: (a) aircraft, and their engines, propellers, parts, non-installed equipment and equipment to control aircraft remotely, while carrying out military, customs, police, search and rescue, firefighting, border control, coastguard or similar activities or services under the control and **responsibility of a Member State**, undertaken in the public interest by or on behalf of a body vested with the powers of a public authority, and the personnel and organisations involved in the activities and services performed by those aircraft;

As regards point (a), **Member States** shall ensure that activities and services performed by the aircraft referred to in that point are carried out with due regard to the safety objectives of this Regulation.

## UK Basic Regulation - Article 2 para 3

This Regulation shall not apply to: (a) aircraft, and their engines, propellers, parts, non-installed equipment and equipment to control aircraft remotely, while carrying out military, customs, police, search and rescue, firefighting, border control, coastguard or similar activities or services under the control and **responsibility of the United Kingdom**, undertaken in the public interest by or on behalf of a body vested with the powers of a public authority, and the personnel and organisations involved in the activities and services performed by those aircraft;

As regards point (a), the **CAA** in relation to civil aviation, and the **Secretary of State** in relation to military aviation shall ensure that activities and services performed by the aircraft referred to in that point are carried out with due regard to the safety objectives of this Regulation.



# UAS

## Public Interest Operation

Specific	STS-01: VLOS  Up to 25 kg MTOM	Conformity assessment CE Marking C5 plus Operational Declaration pursuant UAS.SPEC.020
	STS-02: BVLOS  Up to 25 kg MTOM	Conformity assessment CE Marking C6 plus Operational Declaration pursuant UAS.SPEC.020
	Any other specific type of operation (Non-STS)	<ul style="list-style-type: none"><li>• Operations Manual</li><li>• Risk Assessment (PDRA or SORA)</li><li>• Technical capabilities of UAS set out in Operational Authorization</li></ul> or  PDRA S01+S02 Up to 3 m Dimension and up to 25 kg MTOM  PDRA G01+G02 Up to 3 m Dimension and up to 34 kJ kinetic energy



# Public Interest Operations and U Space

## COMMISSION IMPLEMENTING REGULATION (EU) 2021/664 of 22 April 2021 on a regulatory framework for the U-space

### Whereas 28:

This Regulation should not apply to aircraft operations carrying out military, customs, police, search and rescue, firefighting, border control and coastguard or similar activities and services undertaken in the public interest ...

### Article 1 para 3:

This Regulation shall not apply to operations of UAS conducted: ...  
(State aircraft are not mentioned)

### NPA 2021-14 (ends on 15.03.22), GM1 to Article 1 para 3:

UAS carrying out military, customs, police, search and rescue, firefighting, border control and coastguard or similar activities and services undertaken in the public interest. This exemption is not explicitly included in Article 1 as it is a general principle deriving from Article 2(3)(a) of Regulation (EU) 2018/1139.



**Thank you very much for your Attention!**



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