

EUROCAE WG-112

VTOL



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Inputs for Standardisation – Membership





Partners



ECSCG

EUROCAE members & partners, ...



Partners



ECA Piloting
Safety
European Cockpit Association



EUROCAE members & partners, ...



EUROCAE facts and figures

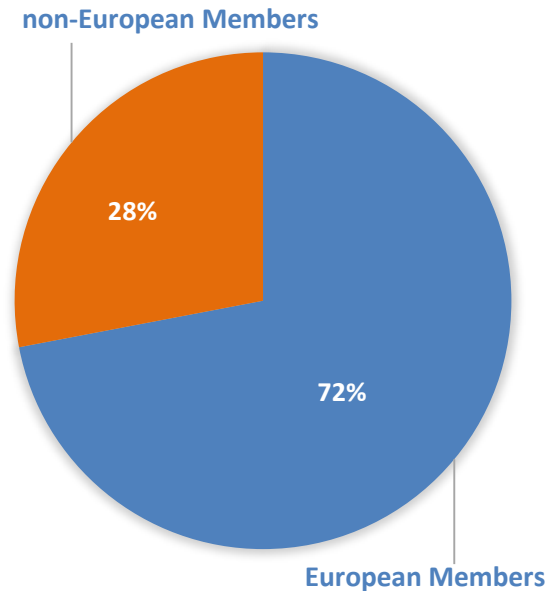
→ 300+ Members (+10% p.a.)

→ 115 in 2010, 146 in 2013

→ 40 active working groups

→ 26 in 2010

→ 2500+ experts





Domains of Activities

- **Avionics**
- **Communication**
- **Navigation**
- **Surveillance**
- **ATM Systems**
- **Airports**
- **SWIM**
- **Electric**
 - Lightning protection
 - High Voltage

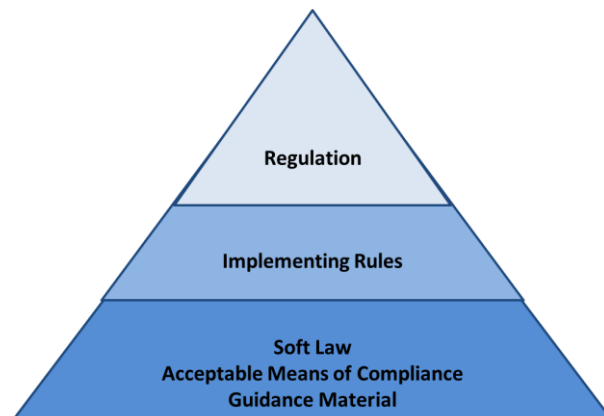


- **Security**
- **AIS / MET**
- **RPAS/VTOL & GA**
- **Miscellaneous**
 - Fuel Cells
 - Hybrid propulsion
 - Space
 - Ice detection
 - C-UAS
 - NGAP



Regulation – Standard

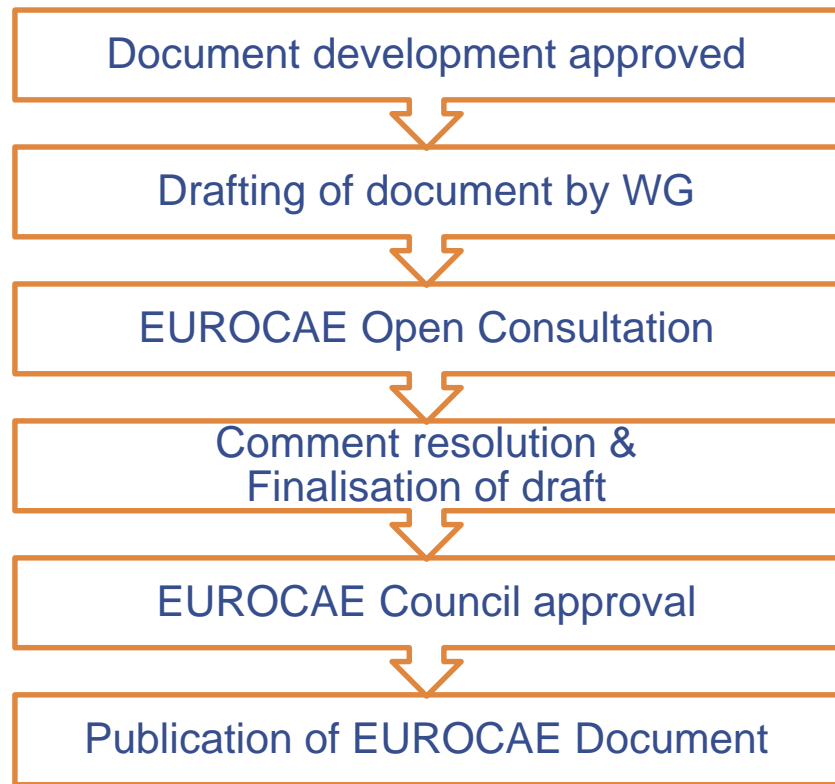
- PB & RB regulations by EASA, FAA, ICAO
 - Reference to industry standards
- Standards in reaction to regulation
- Forward looking
 - In anticipation of regulatory requirements
- Referenced by the regulator
 - EASA, EU Leg, FAA, ICAO
- ETSO – MOPS, SW, Environment





EUROCAE Process

- Transparent and open process
- Consensus driven development approach
- Standards validation
- Open consultation
- Worldwide recognition
- Worldwide application
- Open for worldwide participation
- By the industry – for the industry





Lean Process

→ Pilot project for WG-112 VTOL

- Urgent need for standards, with ambitious timeframe

→ Process adapted

- gain time and minimise administrative efforts
- safeguarding high quality & main principles of EUROCAE: openness, transparency, consensus

→ Lean process

- Decision-making and tasking by WG
- Open Consultation shortened to 28 days
- Approval shortened to 7 days, Secretariat responsibility

→ Total duration

- OC to publication: 8-10 weeks



Fast
DELIVERY



EASA SC VTOL

 European Union Aviation Safety Agency	SPECIAL CONDITION Vertical Take-Off and Landing (VTOL) Aircraft	Doc. No: SC-VTOL-01 Issue: 1 Date: 2 July 2019
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→ EASA SC VTOL

- issued 2 July 2019
- Based on CS23 and CS27, but specific requirements for VTOL

Special Condition for small-category VTOL aircraft

→ Objective based certification requirements

- flexibility to certify innovative state-of-the-art designs and technology
- establish a common set of conditions for the certification of these new concepts

→ Accepted Means of Compliance

- Industry standards - EUROCAE WG-112

→ Priorities agreed between EASA and EUROCAE

- Structured list with all necessary AMC topics



Shaping the work programme

→ **EUROCAE & EASA joint workshop 6 June 2019**

- > 70 delegates from industry and various institutions

- > 10 presentations from

- EASA: SC VTOL and needs for supporting material

- EUROCAE: organisation, process, relevant activities

- Other SDOs: ASTM, SAE Aerospace

- Industry

→ **Conclusion**

- **urgent need for standards to support SC-VTOL**
confirmed following consultation with stakeholders





WG-112 VTOL

WG-112 leadership

- Co-Chairs:
 - Oliver Reinhardt (Volocopter) & Lionel Wallace (Lilium)
- Secretariat:
 - EUROCAE

WG-112 members

- 200+ international participants (rapidly growing)
- Industry, airlines, airports, ATM, R&D organizations
- Authorities: EASA, national authorities (UK, FR, NZ, FAA, CAAS)



WG-112 Structure

WG-112 Plenary

Steering Committee

EUROCAE / EASA / WG leadership / SG leadership

SG-1

Electrical

SG-2

Lift – Thrust

SG-3

Safety

SG-4

Flight

SG-5

Ground



WG-112 Steering Committee

- ➔ Consists of WG chairs, SG leaders, EUROCAE and EASA
- ➔ Convenes regularly to monitor and coordinate the work
- ➔ Maintains an overarching view of the WG, its progress and coordination with EASA activities
- ➔ Ensures awareness and coordination with other EUROCAE WGs and relevant international partners to promote global harmonisation





VTOL Concept of Operations (CONOPS) for Standard Operating Scenarios

→ Purpose

- characteristics of a VTOL operation, system aspects, procedures, roles, infrastructure

→ Operator Organisation

- Safety Management System, design, production, maintenance

→ Operations

- stakeholders, normal/abnormal procedures

→ Aircraft Segment

- registration, performance, propulsion, W&B, flight controls

→ Ground Segment, External Systems and Support

- CNS, aircraft monitoring, T/O & landing aids, ground movement equipment





Electrical Systems



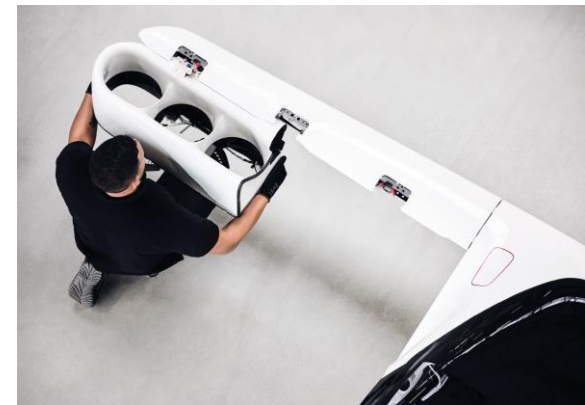
- Focus: Batteries
- Crashworthiness, Recharging, High Voltage

ID	Title	OC submission target date
WG-112 SG-1 DP001	Process Standard for crashworthiness test of battery systems for eVTOL applications	29/02/2020
WG-112 SG-1 DP002	Guidance on determination of SoC and SoH applied to the battery for eVTOL applications	29/02/2020
WG-112 SG-1 DP003	Technical Standard on Rechargeable Lithium Batteries in eVTOL applications	29/02/2020
WG-112 SG-1 DP004	Guidance on use of high-voltage electrical distribution for eVTOL applications	29/02/2020



Lift/Thrust

- Focus: Lift/Thrust unit
- Fire zone, CMA for Lift/Thrust unit,
Rotor burst analysis



ID	Title	OC submission target date
WG-112 SG-2 DP001	Guidance on designated fire zone for VTOL	31/03/2020
WG-112 SG-2 DP002	Guidance for Common mode analysis for lift - thrust system for VTOL enhanced category	TBD
WG-112 SG-2 DP003	Guidance for rotorburst analysis for VTOL enhanced category	31/03/2020



Safety

- Focus: Operational safety
- Hazard and Safety assessment, Specific Risk assessment, occupant safety, Emergency landing. Security guidance



ID	Title	OC submission target date
WG-112 SG-3 DP001	Information security guidance for VTOL and collaborative systems	31/03/2020
WG-112 SG-3 DP002	Guidance on Hazard and Safety Assessment from Aircraft down to system level for VTOL	31/03/2020
WG-112 SG-3 DP003	Specific Risks Assessments	29/02/2020
WG-112 SG-3 DP004	Guidance on the demonstration of acceptable occupant safety - injury prevention measures	29/02/2020
WG-112 SG-3 DP005	Guidance on Emergency Landing	31/01/2020



Flight

- Focus: Operational Requirements
- Flight Trajectories, Flight Control, Environmental Requirements



ID	Title	OC submission target date
WG-112 SG-4 DP001	VTOL mission profile definition	31/03/2020
WG-112 SG-4 DP002	VTOL FBW control systems	31/03/2020
WG-112 SG-4 DP003	Environmental Conditions and Test Procedures for Airborne Equipment -requirements for VTOL in Urban	31/03/2020



Ground

- ➔ Focus: Ground infrastructure
- ➔ Charging infrastructure, landing sites



ID	Title	OC submission target date
WG-112 SG-5 DP001	VTOL charging infrastructure	Q1/2020
WG-112 SG-5 DP002	VTOL landing sites	Q1/2020



WG-112 Publications

- ➔ 18 documents under development
- ➔ First publications: early 2020
 - ➔ VTOL ConOps for standard operating scenarios
 - ➔ Process Standard for crashworthiness test of battery systems for eVTOL applications
 - ➔ Guidance on designated fire zone for VTOL
 - ➔ Information security guidance for VTOL and collaborative systems
 - ➔ Guidance on Emergency Landing
 - ➔ VTOL landing sites
 - ➔ ...





WG-112 Future Outlook

- Main focus: complete current work programme
 - SG efforts to mature the draft standards
 - SC will closely monitor and manage progress
- Next steps
 - Plenary meetings 28 January & 25-26 March 2020
 - Launch of Open Consultations
- Additional standardisation activities expected





Shaping the standards together

- ➔ to develop accepted means of compliance
- ➔ by the community – for the community
- ➔ to support VTOL certification and operation in Europe and beyond





For further Information...



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