

# **Electric and Hybrid Propulsion System (EHPS) Certification requirements**

## **Special condition and associated AMCs**

**Your safety is our mission.**

# SC EHPS

## → Motivation

- Consistency between projects that all look different. Up to now: SC on a case by case

## → Objectives

- Promote innovation
- Provide the safety requirements for any kind of propulsion
- Be harmonized with other authorities

## → SC Propulsion format

- Technology agnostic
- Non-prescriptive Objective based design specifications for propulsion (electric, hybrid,...) provided in a special condition (same framework as SC VTOL).



# EHPS definition

→ “An Electric / Hybrid Propulsion System may include, but is not limited to, electric motors, inverters, turbine engines, piston engines, generators, electrical wiring interconnection systems, electrical power generation, energy storage devices, integrated fans, cooling systems and power management system. An EHPS is intended to produce lift or thrust.”

# SC EHPS: scope?



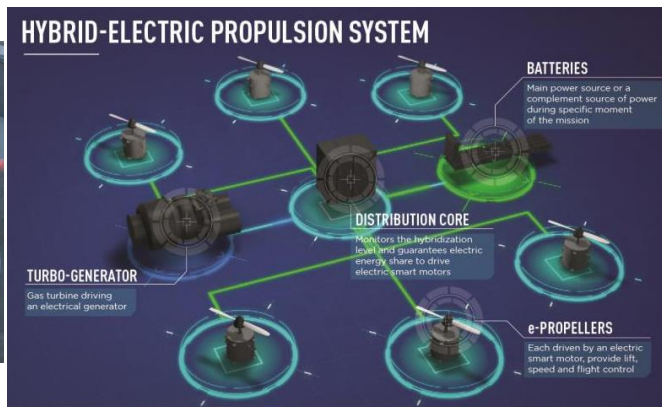
EMRAX



Rolls-Royce



Airbus - Vahana

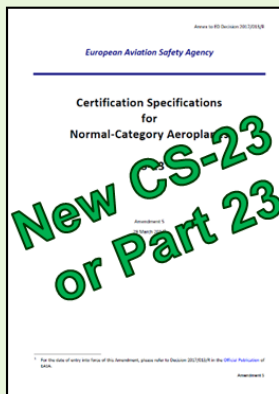


- Propellers/rotors are out of the scope
- Powerplant requirements are at aircraft level and are therefore out of the scope
- Valid for any aircraft (except CS-25 aircrafts)

# Framework – focus on CS23 and VTOL

CS-E / Part 33

RULE

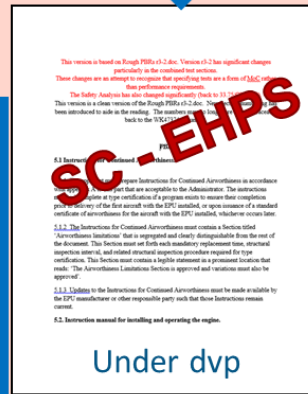


Aircraft

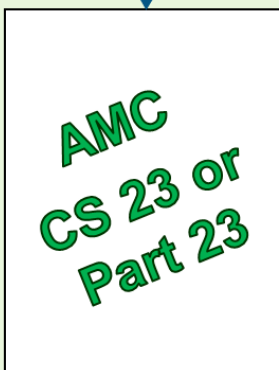
Propulsion  
system

SC-VTOL 2400 (b) or §23  
2400(b):

« Each aircraft engine,  
propeller and APU must be  
type certified, or meet  
accepted specifications »



AMC



	SA number	PSR 5.1	PSR 5.2
	Safety Aspect (SA) titles	Continued Airworthiness	Manual for installing and operating the engine
	Associated PSR		
	Rationale		
TA number	Technical Aspect		
TA1	Electrical engine		
TA2	Turbine engines		
TA3	Piston engines		
TA4	Generators		
TA5			
TA6			

# How to ensure proportionality?

## → Safety objectives: EHPS.80

- “(3) It must be shown that EHPS design and construction allows the intended aircraft application to meet the qualitative and quantitative safety objectives defined in the type-certification basis of the intended aircraft application.”

## → AMCs

- Ex: EHPS.420 – Endurance demonstration
  - AMC may be different between an EHPS intended for a LSA A/C and the same one for a VTOL A/C (in terms of cycling, duration...)

# AMCs: “à la carte” concept

	Safety Aspect (SA) number	EHPs.30	EHPs.40	EHPs.80	EHPs.100	EHPs.200	EHPs.230	EHPs.250	EHPs.290	EHPs.420
	Safety Aspect (SA) title	Instruction manual for installing and operating the EHPs	Ratings and operating limitations	Safety Assessment	Fire Protection	Static and Fatigue Loads	Vibration Survey	Compressor or Turbine Blade Failure Containment	Bird and Hail Strike	Endurance Demonstration
	Associated requirement	<a href="#">EHPs.30 Instruction manual for installing and operating the EHPs</a>	<a href="#">EHPs.40 Ratings and operating limitations</a>	<a href="#">EHPs.80 Safety Assessment</a>	<a href="#">EHPs.100 Fire Protection</a>	<a href="#">EHPs.200 Static and Fatigue Loads</a>	<a href="#">EHPs.230 Vibration Survey</a>	<a href="#">EHPs.250 Compressor or Turbine Blade Failure Containment</a>	<a href="#">EHPs.290 Bird and Hail Strike</a>	<a href="#">EHPs.420 Endurance Demonstration</a>
Technical Aspect (TA) number	Technical Aspect (TA) title									
TA1	Electrical engines	AMC TA1 EHPs.30	AMC TA1 EHPs.40	AMC TA1 EHPs.80	AMC TA1 EHPs.100	AMC TA1 EHPs.200	AMC TA1 EHPs.230	AMC TA1 EHPs.250	AMC TA1 EHPs.290	AMC TA1 EHPs.420
TA2	Turbine engines	AMC TA2 EHPs.30	AMC TA2 EHPs.40	AMC TA2 EHPs.80	AMC TA2 EHPs.100	AMC TA2 EHPs.200	AMC TA2 EHPs.230	AMC TA2 EHPs.250	AMC TA2 EHPs.290	AMC TA2 EHPs.420
TA3	Piston engines	AMC TA3 EHPs.30	AMC TA3 EHPs.40	AMC TA3 EHPs.80	AMC TA3 EHPs.100	AMC TA3 EHPs.200	AMC TA3 EHPs.230	AMC TA3 EHPs.250	AMC TA3 EHPs.290	AMC TA3 EHPs.420
TA4	Generator	AMC TA4 EHPs.30	AMC TA4 EHPs.40	AMC TA4 EHPs.80	AMC TA4 EHPs.100	AMC TA4 EHPs.200	AMC TA4 EHPs.230	N/A	AMC TA4 EHPs.290	AMC TA4 EHPs.420
TA5	Power distribution	AMC TA5 EHPs.30	N/A	AMC TA5 EHPs.80	AMC TA5 EHPs.100	AMC TA5 EHPs.200	AMC TA5 EHPs.230	N/A	AMC TA5 EHPs.290	AMC TA5 EHPs.420
TA6	Air induction systems protected against environment	AMC TA6 EHPs.30	N/A	AMC TA6 EHPs.80	N/A	N/A	N/A	N/A	AMC TA6 EHPs.290	N/A
TA7	Adjacent propulsion systems	AMC TA7 EHPs.30	N/A	AMC TA7 EHPs.80	AMC TA7 EHPs.100	N/A	N/A	N/A	AMC TA7 EHPs.290	N/A

List can be extended  
in the future

Means of Compliance (source: CS-E and AMC CS-E,  
already existing SC, ASTM F3338, SAE E40 & other)  
and Rationale

# Planning

- End 2019 – beginning 2020: public consultation of the SC (1 month)
- January/February/March/April 2020: review and respond to comments, amend SC text where needed, proof reading, exchanges with foreign authorities
- May 2020: final version published
- May 2020: gradually publishing AMC material (EASA + standardisation bodies)





**Thank you**  
**Any further question?**