

Special Condition – Airworthiness standard for CS 22H electrical engines to be operated in powered sailplanes (SC E-01)

Background:

The airworthiness standard applicable to CS 22 aircrafts, i.e. Subpart H of CS 22 currently does not consider electrical propulsion systems.

The Special Condition amends Subpart H of CS 22 regarding electrical engines. The installation of electrical propulsion systems including propulsion batteries is addressed by another Special Condition.



Special Condition:

Considering all above the following Special Condition is proposed:

SPECIAL CONDITION SC-E01**Electrical engine to be operated in powered sailplanes****Applicability:**

Powered sailplanes.

CS-22.1801 Applicability

to be read

Subpart H includes the requirements that are decisive for the certifications and the modification of the certification of electric engines to drive a powered sailplane.

CS-22.1807 Engine rating and operating limitations

to be read

Ratings and operating limitations of the engine to be determined are based on the operating conditions demonstrated during the bench tests prescribed in this subpart (H). They include ratings and limiting values for speed, temperatures, environmental conditions, life and stress that the applicant considers necessary to ensure the safe operation of the engine.

CS-22.1833 Vibrations

to be read

The engine must be designed and constructed to function throughout its normal operating range of engine shaft rotational speeds and engine powers without inducing excessive stress in any of the engine parts because of vibration and without imparting excessive vibration forces to the structure of the powered sailplane.

CS-22.1835 Energy and air supply system

to be read

(a) The energy system shall be designed and constructed in such a way that in the complete operating range of the engine under all starting, flight and atmospheric conditions, the required energy supply to the engine is ensured.

CS-22.1843 Vibration test

to be read

Except when the engine is of a type of construction known to exhibit no hazardous vibration, it shall undergo a vibration survey.

The torsional and bending characteristics of the engine shaft and the driving shaft shall be detected over a rotational speed range from idling to 110 % of the maximum continuous speed or 103 % of



the maximum desired take-off speed, whichever is the greater. The survey shall be carried out with a representative propeller. No hazardous conditions may arise.

CS-22.1845 Calibration tests

to be read

Each engine must be subjected to the calibration tests necessary to establish its power characteristics and the conditions for the endurance test specified in CS 22.1849(a) to (c).

The results of the power characteristics calibration tests form the basis for establishing the characteristics of the engine over its entire operating range of engine shaft rotational speeds and electrical power supply conditions. Power ratings are based on standard atmospheric conditions at sea-level.

CS 22.1847 Detonation test

Deleted

CS-22.1849 Endurance test

to be read

(a) The engine shall be subjected to an endurance test comprising a total of 6 hours of engine operation. This endurance test may be carried out with a representative propeller or with the propeller planned to be installed into the powered sailplane.

The endurance test may be conducted in a cell of a powered sailplane or in an engine test cell and consists of ground and flight tests.

(1) Ground tests are composed of at least 2 cycles specified according to CS 22.1849 (c) (see table below).

(2) Flight tests shall be conducted for a duration of 6 hours of engine operation less hours of ground operation and comprise the following elements:

- a total of at least 50 take-offs or climbs of at least 3 min with max. power for self-sustaining sailplanes.
- at least 30 climbs that discharge the energy sources from their fully charged condition to the low-level.

15 flights out of 30 should be carried out when temperatures are typical of a European summer day (ISO+10°C) in order to demonstrate the presence of sufficient energy source capacity.

(b) not changed



(c) Each cycle shall be conducted as follows:

Sequence	Duration (Minutes)	Operating Conditions
1	1	Starting Idle
2	4	Max. or Take-off power
3	2	Cooling run (idle)
4	4	Max or Take-off power
5	2	Cooling run (idle)
6	4	Max or Take-off power
7	2	Cooling run (idle)
8	5	75 % of maximum continuous power
9	2	Cooling run (idle)
10	15	Maximum continuous power
11	2	Cooling run and stop
Total:	43	

(d) During or following the endurance test the power consumption must be determined.

CS-22.1851 Operation test

to be read

The operation test must include the demonstration of starting, idling, acceleration, over-speeding and any other operational characteristics of the engine.

