EASA European Union Aviation Safety Agency	**Equivalent Safety Finding** **to CS 22.925 (a), Propeller clearance**	Doc. No.: ESF-F22.925-01 Issue : 2 Date : 05 Oct 2020 Proposed ☐ Final ☒ Deadline for comments: 04 Mar 2020

SUBJECT	:	**ESF to CS 22.925 (a), Propeller clearance**
REQUIREMENTS incl. Amdt.	:	**CS 22.925 Amdt. 2**
ASSOCIATED IM/AMC[1]	:	Yes☐ / No ☒
ADVISORY MATERIAL	:	

INTRODUCTORY NOTE:

The following Equivalent Safety Finding (ESF) has been classified as important and as such shall be subject to public consultation in accordance with EASA Management Board decision 12/2007 dated 11 September 2007, Article 3 (2.) which states:

"*2. Deviations from the applicable airworthiness codes, environmental protection certification specifications and/or acceptable means of compliance with Part 21, as well as important special conditions and equivalent safety findings, shall be submitted to the panel of experts and be subject to a public consultation of at least 3 weeks, except if they have been previously agreed and published in the Official Publication of the Agency. The final decision shall be published in the Official Publication of the Agency.*"

IDENTIFICATION OF ISSUE:

CS 22.925 (a) requires a propeller ground clearance of 230 mm for powered sailplanes with a tail-wheel landing gear. This clearance must be complied with in level attitude, normal take-off attitude or taxying attitude, whichever is the most critical. CS 22.925 provides also some additional conditions such as landing gear strut statically deflected or tyre deflected.

The intent of the requirement is to avoid any propeller ground strikes during taxying, take-off, and landing.

The powered sailplane type for which the ESF is requested, meets the requirement of CS 22.925 (a) only in an attitude with the tail-wheel landing gear on ground and not in level attitude. The powered sailplane lifts-off with both the main-wheel and the tail-wheel landing gear at the same time (two point lift-off). A foldable propeller is installed at the nose of the fuselage.

It is proposed by the applicant

- To limit the use of the engine to take-off, climb, and cruise but to exclude landing. This means the propeller is retracted during landing and CS 22.925 is not applicable;
- To mandate by the Aircraft Flight Manual (AFM) a take-off procedure where the pilot has to maintain an attitude where the powered sailplane meets the requirements of CS 22.925 (a).

Justification of the ESF:

The intent of the requirements CS 22.925 (a) is to ensure propeller clearance in all applicable phases of flight and related attitude conditions. By removing the landing case (propeller is retracted) and by proposing a *normal* take-off attitude (e.g. tail-wheel landing gear on ground) which provides a propeller clearance of at least 230 mm, the level attitude can be removed from the requirements.

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[1] In case of SC, the associated Interpretative Material and/or Acceptable Means of Compliance may be published for awareness only and they are not subject to public consultation.

This is acceptable as long as compliance with all other applicable requirements of CS 22 is demonstrated, in particular acceptable handling characteristics. Furthermore the AFM has to cover the procedure for a rejected take-off in order to address the event of a propeller ground strike. In addition the propeller ground clearance in terms of an absolute value is replaced by a change in pitch angle corresponding with the longitudinal controllability of a sailplane.

Considering all the above, the following alternative requirements and related compensating factors providing an Equivalent Safety Finding (ESF) are proposed:

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To compensate the non-compliance with CS 22.925 (a) *the* powered sailplane with a tail-wheel landing gear *shall comply with the following requirements.*

Alternative requirements:

1. Compliance shall be demonstrated with CS.22.925, but not in level attitude. As a consequence, the alternative requirements reads as follows:

   (a) *Ground clearance.* There must be a clearance of at least ~~180 mm (for a powered sailplane with a nose-wheel landing gear) or~~ 230 mm (for a powered sailplane with a tail-wheel landing gear) between the propeller and the ground, with the landing gear statically deflected and in the ~~level attitude~~, normal take-off attitude or taxying attitude, whichever is most critical (this attitude is called hereafter “critical Take-off attitude”).

   In addition, there must be positive clearance between the propeller and the ground in the level take-off attitude, with:

   (1) the critical tyre completely deflated and the corresponding landing gear strut statically deflected; and
   (2) the critical landing gear strut bottomed and the corresponding tyre statically deflected.

Compensating factors:

2. The applicant has to determine the critical take-off attitude, in which the requirements of point 1 are complied with.
3. The change in pitch angle between the critical take-off attitude and propeller ground contact has to be at least an angle of 7.0 degree.
4. The AFM shall require the pilot to follow a take-off procedure by which the critical take-off attitude (as determined in point 2) can be respected until lifting-off. The AFM has to define the runway condition (e.g. grass length, no big holes, etc.) in order to support this take-off procedure.
5. Landing with engine in operation shall be excluded by an AFM limitation and placarded accordantly. For landing the engine has to be stopped and the propeller in retracted position (e.g. folded).
6. It has to be demonstrated that the sailplane after lifting-off, in most critical condition (i.e. most unfavourable combination of centre of gravity position and weight); is controllable without exceptional piloting skill or tendency to wing-drop stall, in the defined flap stetting and control stick position

(elevator) for the take-off run. It has to be demonstrated that a transition to climb attitude at V_Y is possible without exceptional piloting skill.

7. The AFM shall cover the procedure for a rejected take-off.

Additional guidance for compliance demonstration:

The following points constitute no change to CS 22 but support a full picture of the ESF.

8. The AFM procedure of point 4 should be used when demonstrating compliance with the requirements of CS 22.21, 22.23, 22.51, 22.65, and 22.233.
9. The Daily and the Pre-flight inspection of the AFM should emphasise the importance to check for good condition of the tyre and minimum tyre pressure.
10. The Maintenance Manual should cover as per CS 22.1529 point (d) the tolerances and as per point (i) the frequency and extent of inspections of the main-wheel landing gear including suspension mechanism in order to ensure the required propeller ground clearance.