COMMENT RESPONSE DOCUMENT

EASA CRD of Equivalent Safety Finding CRD - ESF-F22.925-01 - propeller Clearance”
[Published on 12 February 2020 and officially closed for comments on 04 March 2020]

Commenter 1: Prof. Dr.-Ing. Rainer Klein

Comment # 1 on Justification

The requirements in CS 22.925 are likely to be based on experience and safety requirements with normal powered aircraft with two-wheel/tail wheel and three-wheel landing gears and a fixed Propeller at the nose of the fuselage.
However, powered sailplanes differ considerably in construktion of propulsion, landing gear and real use. The powerplant is used exclusively for taxiing and take-off. In cruising and landing mode the propulsion/propeller is aerodynamically optimized and retracted into the fuselage or, in the case of propulsion in the tip of the fuselage, the propeller is folded to the fuselage contour with low resistance.
The only realistic possibility for ground contact with the propeller would be during taxiing and take-off.
Pilots of gliders with retractable engines in the fuselage are used to taxi and take off with full elevator rudder. This is the way they are instructed and it is also required by most flight manuals. The reason for this is to compensate the increased front-loaded moment due to the force of propeller tower. Tailwheel on ground also increase directional stability in crosswind situation.
The glider pilots are also used to and are instructed to reduce the elevator after take-off to maintain a safe climb angle according to speed. This is also stated in the flight manuals.
Foldable propellers in the fuselage nose are currently preferred for electric propulsion systems, as they have aerodynamic advantages over retractable engines and are technically less complex, resulting increased safety.
There is a lot of experience in the UL area where more than 100 ultra light self-launching gliders with electric propulsion and foldable propellers are already flying (Silent by Alisport). These UL-gliders currently do not have to meet the ground clearance of 230mm as required by CS 22.925, but there are still no known problems or accidents that occur in connection with ground contact of the propeller

The electric drives with folding propellers offer an innovative alternative to the classic drives. They offer an inherently higher safety potential. Compared to the CS 22.925, the reduced ground clearance requirements for the propeller do not represent a safety risk in practice, taking into account the proposed alternative regulations

EASA response: *Noted*

Commenter 2: LZ design, d.o.o., Luka Žnidaršič

Comment # 2 on point 1 *For front (FES) powered self-launching sailplanes it is suitable to perform take-off from both wheels, so to comply with point 1 also in level attitude is not required.. My self-launch testing of gliders with standard arrangment of landing gear (LAK17A FES, Ventus 2cxa FES, ASW27 FES) proved that even 160 mm (with the landing gear statically deflected) is suficient propeller clearence for safe selflaunch from hard runway surface.* *I propose to include into CS.22.925 also minimal requirement of clearence, when self-launch is intended to be performed only from hard runway.*
EASA response: *Not agreed* *EASA is not in favour of introducing different requirement for different runway surfaces.*
Comment # 3 on point 3 *At typical 1,9m distance at single-seat sailplane between front propeller and landing gear, 7 deg angle represent 230mm, so it is identical like required clearance. However, for longer fuselages (for instance in case of tandem two-seater), 7 deg angle requirement is more suitable.*
EASA response: *Noted*
Comment # 4 on point 5 *It was never intended to land FES equipped sailplane with engine in operation, so it is suitable to write in AFM that landing should be always with engine stopped, propeller blades horizontally aligned and folded.*
EASA response: *Noted*
Comment # 5 on point 6 *In my experience, to self-launch powered sailplane with electric engine located in the nose is much easier compared to retractable systems. There is no nocicable additional moments, like pitcing to the nose, and there is very good directional control with rudder and attitude controll with elevator. Take-off is just natural.*
EASA response: *Noted*
Comment # 6 on point 7 *Agree with this point.*
EASA response: *Noted*
Comment # 7 on point 8 *Comment: Agree with this point*

EASA response: *Noted*
Comment # 8 on point 9 *Comment: Agree with this point.*
EASA response: *Noted*
Comment # 9 on point 10 *Comment: Agree with this point.*
EASA response: *Noted*

Commenter 3: AdvanTec GmbH, Stefan Senger

Comment # 10

The requirements in CS 22.925 are likely to be based on experience and safety requirements to TMG with two-wheel/tail wheel and three-wheel landing gears and a fixed Propeller at the nose oft the fuselage.

However, powered sailplanes differ considerably in design of propulsion, landing gear and real use. The powerplant is used seldom for taxiing and most only for take-off. In cruising and landing mode the propulsion/propeller is aerodynamically optimized and retracted into the fuselage or, in the case of propulsion in the nose of the fuselage, the propeller is folded to the fuselage contour with low resistance.

The only realistic possibility for ground contact with the propeller would be during taxiing and take-off. Touch and go´s are not part of the flight procedures.

Pilots of gliders with retractable engines in the fuselage are used to taxi and take off with full elevator rudder. This is the way they are instructed and it is also required by most flight manuals. The reason for this is to compensate the increased front-loaded moment due to the force of propeller tower. Tailwheel on ground also increases directional stability in crosswind situation.

The glider pilots are also used to and are instructed to reduce the elevator after take-off to maintain a safe climb angle according to speed. This is also stated in the flight manuals.

Foldable propellers in the fuselage nose are currently preferred for electric propulsion systems, as they have aerodynamic advantages over retractable engines and are technically less complex, resulting increased safety.

There is a lot of experience in the UL area where more than 100 ultra light self-launching gliders with electric propulsion and foldable propellers are already flying (Silent by Alisport). These UL-gliders currently do not have to meet the ground clearance of 230mm as required by CS 22.925, but there are no known problems or accidents that occur in connection with ground contact of the propeller

The electric drives with folding propellers offer an innovative alternative to the classic drives. They offer an inherently higher safety potential. Compared to the CS 22.925, the reduced ground clearance requirements for the propeller do not represent a safety risk in practice, taking into account the proposed alternative regulations *Based on own experiences on Antares 20E (self launcher with retractable engine) and Discus FES (self launcher with electric propulsion and foldable Propeller in the nose) it is absolutely no problem to follow the take off procedures recommended in the flight manuals.* *In the Antares 20E flight manual the take off procedure is to pull the elevator fully until take off, then release the elevator until the speed of best climb is 100km/h.* *It is absolutely no problem to meet these requirements safely.* *For the Mini LAK FES, similar specifications are given in the flight manual, which are also easy and safe to follow.* *Most of self sustaining gliders with retractable propulsion I know, have similar takeoff procedures !!*
EASA response: *Noted, except comment on Discus FES, which is not agreed* *The powered sailplane Discus FES is not certified for self-launch.*

Commenter 4: Derek Bennett

Comment # 11 on point 1 *1. The glider sits on it’s tail in a near horizontal attitude and takes off easily in this same attitude. There is no benefit in raising the tail until normal pitch attitude is used to rotate into the climb. On rough ground a slight rearward stick pressure may be applied to keep the tail wheel down until near take off speed is reached and full pitch control is available thus maintaining propeller clearance in adverse conditions.*
EASA response: *Noted*
Comment # 12 on point 2 *The take off attitude is addressed in the above comments. ie there is no need to raise the tail during the take off run until near lift off when normal pitch control is available.*
EASA response: *Noted*
Comment # 13 on point 3

3. To assess the pitch angle that would cause a ground strike it is possible to demonstrate this to an inexperienced pilot while static. However this glider is of such a configuration, flaps, water ballast, power, retractable wheel etc that only experienced pilots are likely to be flying it.
EASA response: *1 sentence noted; 2. sentence not agreed* *1. sentence: n/a; 2. sentence: CS 22.143 has to be complied with.*
Comment # 14 on point 4 *4. Take off procedure is already covered as above.*
EASA response: *Noted*
Comment # 15 on point 5 *5. Landing with the engine running is not allowed but a glider pilot would have no need to do this. In fact the exact opposite is the normal practice which is to use spoilers to increase the approach angle of the final approach. In the event of a developing undershoot the standard practice is the reduce the spoiler (air brake) deployment. Glider pilots are trained to manage the landing without use of power and as stated above in the event of a ‘go round’ from the final approach, the power, being electric, is available at the touch of a switch; maybe 2 seconds from zero the full climb power. There is no need for power to be used on the ground so no landing under power can be placarded.*
EASA response: *Noted*
Comment # 16 on point 6 *6. Take off in the horizontal pitch attitude is normal and safe. The normal essential monitoring of speed as trained for. will allow safe acceleration from the take off to climb speed before rotation to the normal climb attitude.*
EASA response: *Noted*
Comment # 17 on point 7 *7. An aborted or rejected take off does require the power to be ‘off’ before landing like a normal glider. The power ‘off’ action is instantaneous after which without power the propeller blades will fold harmlessly should they happen touch the ground.*
EASA response: *Noted* *The purpose of the consultation is to ensure that an equivalent level of safety is established by the alternative requirements compared to the original ones, but not kind of compliance demonstration by pilot statements.*

Comment # 18 on point 8
8. The only thing I can add here is to emphasis the recommendation to hold a little back pressure on the stick when taking off over rough ground to ensure that the tailwheel stays on the ground until full pitch control is available at take off speed. As in all flying speed monitoring is of great importance and is taught in all gliding clubs.
EASA response: *Noted*
Comment # 19 on point 9
9. Pre flight ‘Daily Inspection’ is part of all glider pilots training and this always includes tyre pressures and function of all control surfaces.
EASA response: *Not agreed* *All items necessary to be checked during the pre-flight or daily inspection have to be defined by the AFM.*
Comment # 20 on point 10
10. Annual ARC inspections normally include the landing gear function but it would be good to emphasis this for a self launcher just like any other glider with a retractable wheel
EASA response: *Noted*

Commenter 5: Roger Emms

Comment # 21 on point 2
Agreed. In my experience when operated in a normal take-off attitude with the tail wheel on the ground until after lift- off, the propeller clearance is easily maintained. This important procedure is mandated in the AFM ref: Para 4.5.5.
EASA response: *Noted* *see comment # 17*
Comment # 22 on point 3

I understand this to be compliant but am unable to comment on the accuracy of this technical aspect. However, from my instructing experience it is normal procedure when introducing a pilot to a new glider type to familiarize them with the typical flying and approach attitudes. In this case it is important when on the ground, with the pilot seated in the aircraft, to lift the tail to within the prop strike attitude to illustrate this key point to the pilot.
EASA response: *Noted*
Comment # 23 on point 4 *Agreed the AFM should emphasise the required takeoff attitude (please see AFM para 4.5.5 mentioned above) and guidance on surface condition would be useful. In the UK the BGA specifies the maximum length of grass on BGA approved gliding sites.*
EASA response: *Noted*
Comment # 24 on point 5 *Agreed.*
EASA response: *Noted*
Comment # 25 on point 6 *Agreed. Whilst I am unable to comment on the handling of the aircraft over the full range of weight and CofG positions, my personal experience has been that flying the glider according to the published AFM procedures has resulted in totally trouble-free self-launches, and easy control in all flight configurations.*
EASA response: *Noted* *see comment # 17*
Comment # 26 on point 7 to 10 *Agreed*
EASA response: *Noted*

Commenter 6: Trygve Rushfeldt

Comment # 27

I own and use the LAK 17B FES mini nr 002 (LAK’s first FES mini-LAK).

I’m an experienced pilot, 6-7000 hours on a wide varity of aircrafts, miltary and civilian. I’ve been operating the mini-LAK since 2016. I’ve performed 100 take offs on grass (dry, wet and bumpy), hard deck and snow, using the FES. The take offs have been uneventful.

There are no pilots who want a propeller to strike the ground during take offs. I know the limits for operating the FES for take offs, and I do take that into consideration every time. I feel that the prop-clearance is not a safety issue. A strike will most likely not lead into an accident. It will only lead to an extra expence for the pilot.

Conclusion:

The propeller clearance is adecuate, as long as the pilot has a feel/understanding for what the limits are.

EASA response: *Noted*

see comment # 17

Commenter 7: Lak-Aviation GmbH, Axel Reich

Comment # 28 on point 2

In my opinion, based on flight experience, it is safe to put the glider to horizontal flight immediately after the take-off (gradually, not suddenly). When the wheels lifts-off from the ground (and the shock absorbers and tire are fully extended), the glider already meets the CS.22.925 Ground Clearance requirements and can fly safely in Level Flight position.

Between April 2017 and November 2018, 33 different pilots have performed self-launches with the Lak-17 B FES mini on various grass airfileds, without problems, during evaluation flights of the Motorglider

EASA response: *Not agreed*

Due to its geometry the sailplane does not meet the original propeller ground clearance minima under the conditions of CS 22.925.

Comment # 29 on point 3

To my knowledge, this requirement is fulfilled. The increased LAK-17 FES main landing gear provides sufficient angle reserve (up to 7 degrees) between the taxying and ground-strike positions.

It is reasonable (or: In my opinion it makes sense) to:

- *Include the “propeller ground strike angle” into AFM as one of the warnings,*
- *Before operating a glider recommend the pilots to train and feel the "ground strike position/angle" to mitigate the “Human Factor” during a take-off.*

EASA response: *Noted*

Comment # 30 on point 4

Agree with this point: additional the AFM could include more detailed and strict estimation of the runway condition, based on key criteria, i.e.:

- *runway surface irregularities (pits, ditches, ruts, etc.),*
- *foreign objects (larger stones, moles, debris, etc.),*
- *soil hardness and composition (soft soil, sand, moisture, puddles, etc.),*
- *height and hardness of grass and/or other vegetation.*
- *Calculation of the C of G is important, if possible, a C of G in the middle, or in the backward half is desirable*

EASA response: *Noted, last bullet point not agreed*

EASA believes that the bullet points 1 to 4 are covered by the wording of point 4; last bullet point: safe operation has to be possible within the entire c.g. range certified.

Comment # 31 on point 5

Fully acceptable. This restriction (landing with inoperative engine) is already included in the AFM (see p. AFM 4.5.5.). I agree that it is appropriate to include this restriction into the existing placard along with other warnings.

Concerning the position of the propeller during landing: when the engine is switched off, the propeller is fixed in a horizontal position only and is retracted by airflow and secured by additional magnetic latches. Without propulsion, the propeller is unable to reach the ground at any overload.

EASA response: *Noted*

see comment # 17

Comment # 32 on point 6

In my experience, self-launching from two points does not require exceptional pilot qualification.

Between April 2017 and November 2018, 33 different pilots have performed self-launches with the Lak-17 B FES mini on various grass airfileds, without problems, during evaluation flights of the Motorglider.

I am not aware of any case that a lack of qualifications would cause any problems during the take-off.
EASA response: *Noted* *see comment # 17*
Comment # 33 on point 7 *I was informed that a special “rejected take-off” tests have been performed. I agree that the procedure for a rejected take-off should be prepared and included in the AFM.*
EASA response: *Noted* *see comment # 17*
Comment # 34 on point 8 to10 *Agree with this point*
EASA response: *Noted*

Commenter 8: Karl Pickan

Comment # 35 general **The requested „Equivalent Safety Finding ESF-F22.925-01 to CS 22.925 (a) (Amdt. 02), Propeller clearance“ is expressly supported by Karl Pickan.** Without this ESF and the specific compensation factors it would be extremely difficult, or even impossible, for glider manufacturers to develop and offer high performance self-launching gliders with electric motors and foldable propeller for multiple reasons. E.g.: 1. The space inside the fuselage behind the cockpit is very limited, since the fuselage design of high-performance gliders requires a very slim profile. 2. A very high gear would cause a high declination of the wings during the start procedure. This would cause additional risk of start operation. 3. There are good safety reasons to integrate the battery pack inside the fuselage. The position shall be closed to the gear; hence the high retractable gear would conflict with the battery-pack. Conclusion: Powered gliders with an electric motor in the front and foldable propeller will reduce many risks of glider operation due to simplification (less critical components), better ease-of-use and higher reliability. Therefore it is important to support this new technology with the requested ESF.

EASA response: *Noted*

Comment # 36 points 1 to 10

The requirements in CS 22.925 consider the hazard of standard powered aircraft, however the situation for powered gliders with a foldable front propeller (called FES drive) is very different in terms of:

1. Frequency and exposure to the hazard
2. Probability of occurrence
3. Severity
4. Possibility of avoiding the hazard

Frequency and exposure to the hazard
The glider with electric motor will typically start one time per day. E.g. the charging of the battery will need multiple hours. “Touch and Go” procedures are not feasible. The risk of a propeller strike is just for a very short moment during take-off. The landing of the glider with powered motor shall be prohibited.
Probability of Occurrence:
During taxi procedure the probability of a propeller strike is very low. A very bumpy approach end of the runway would cause a serious risk in any case, only technical measures would be not sufficient. Instead the pilot shall evaluate the runway regarding bigger cavities.
Severity:
The size of this specific FES-Propeller is between 1000mm to 1500mm, depending on the weight of the glider. All propellers will be based on very rigid carbon fiber with a low weight of the blade between 150 gram and 250 gram. In the unlikely case propeller strike the small, low weight carbon pieces would cause a risk just in a very short distance due to the bigger surface. The motor shaft and motor carrier is very rigid and robust. A break of a motor shaft/ carrier can be excluded.
Possibility of avoiding the hazard:

There are multiple measures to avoid the hazard as described in this ESF. Most important is the exclusion of landing with powered motor. Very bumpy runways shall be excluded in any case. Today glider pilots with retractable engines are used to take off with full elevator rudder, this measure will be also helpful for electric powered gliders with front motor. In opposite to the traditional powered glider there is no need to compensate the increased front-loaded moment with the front electric motor. This will simplify a rejected take-off.

EASA response: *Noted*

n/a

Commenter 9: John Bennett
Comment # 37 on point 1 and 2 *Agreed*
EASA response: *Noted*
Comment # 38 on point 3 *Estimated to be 10 degrees between the tail on ground and propeller contact with ground position. This can/should be demonstrated when introducing a new pilot to type as is practice with the introduction to any type by lifting the tail with the pilot in position.*
EASA response: *Noted* *Compliance demonstration is the next step after acceptance of the ESF as part of the certification basis.*
Comment # 39 on point 4 *Agreed. In the UK the BGA define maximum grass length. The UK CAA offer guidance on runway condition and encourage that such guidance is followed.*
EASA response: *Noted*
Comment # 40 on point 5 *Agreed. Already included in the AFM (see p. AFM 4.5.5.). Further as FES airctaft are primarily gliders, powered landings are not required.*
EASA response: *Noted*
Comment # 41 on point 6 *Unable to comment*
EASA response: *Noted*
Comment # 42 on point 7 and 8 *Agreed.*
EASA response: *Noted*

Comment # 43 on point 9
Agreed. Suggest this is common procedure and a deflated type or collapsed oleo would be immediately evident. Whilst having no experience of all runway surfaces it is doubtful if there would be sufficient power to move the a/c under its own power.
EASA response: *Noted*
Comment # 44 on point 10
Agreed. Suggest annually.
EASA response: *Noted*

Commenter 10: Luftsportverein Hohenasperg e.V., Frank FUNDER

Comment # 45 on point 1
If it is just a matter of not fulfilling CCS 22.925 in case of a flat tire (???), may be a tire filled with polyurethane foam might be a help? *No air filled main wheel, no flat tire.*
EASA response: *Noted*
Comment # 46 on point 2
Taxying is not possible due to missing steerable tail wheel. Glider is manually pushed at the end of the runway. Aligned and pilot starts after clearance.
EASA response: *Noted*
Comment # 47 on point 3
Our common main wheel air pressure is 3 bars, not as low as recommended. *=> Less friction, less bouncy main wheel.*
EASA response: *Noted* *The main wheel tire pressure indicated in the draft AFM of the LAK 17B FES mini is actually 3.5 to 4.0 bar. This is not a recommendation but binding.*

Comment # 48 on point 5

We allways landed on grass until today, even bad surfaces.

Engine is allways off. Propeller is allways blown rewards during complete landing

procedure. No trouble.

EASA response: *Noted*

Comment # 49 on point 6

take of attitude

accerleration with sligtly pushed elevator. When glider is close to take off and elevator working fine, control stick is let into neutral postion. This is done anyway to compensate cross wind with relieved tail wheel, which is not steerable. This is done intuitively by pilote. Few secons later glider takes off. Very easy to proceed. No special skills required. We recommend to use additional lead weight inside the fin and in case of higher pilot weight addintionaly usage of a heavy brass tail wheel. If no heavy tail wheel is installled, the water ballast inside fin should be used allways

(we do it like this).

Well ballanced, it is totally easy to accelerate and lift off.

EASA response: *Noted*

Commenter 11: Jürgen Eckert

Comment # 50 general

As an owner and pilot of a Silent-Electro (FES, fixed gear) I never encountered propeller ground contact, even though that there is less ground-clearance as claimed by CS22.

During flight and especially if a critical situation is encountered (such as risc of outlanding) the safety-margin is dramatically improved with the FES, because of the very fast readyness of the FES-System and the immediate availability of thrust. And even if the engine fails to start, there is no additional drag and no change of attitude. Both are huge disadvantages of the traditional system.

The trade-off that has to be made now is between

- gaining a significant additional safety-magin in critical situations as they may occur during cross-country flights

and

- gaining a small amount of additionel safety in the less critical situation during take-off

From my point of view the decission should be made to the prior one!

EASA response: *Noted*

Commenter 12: Ghislaine Facon

Comment # 51 general

After a long experience of over 40 years of flight as owner of glider and motorgliders, I decided to no longer buy motorgliders with thermal engine, often unreliable because too often fragile and capricious.
During the World Championship in Pociunai in August 2015, a friend informed me of the flights of a new 13.5-meter FES motorized glider that was very well finished. After studying the technical characteristics on the website of the manufacturer UAB "Sportine Aviacija ir Ko", I trusted his very long experience by ordering a LAK-17B FES mini, Minilak. I opted for the FES autonomous electric drive option, to test it. Upon delivery to Pociunai, I greatly appreciated the seriousness and skills of the manufacturer. After reading the flight and maintenance manuals, the first flight was easy. Today, I have two flight seasons totaling 125 hours in 32 flights including 15 take-offs with the FES engine (other take-offs in towing because the runway was too short). My experience with the LAK-17B FES mini, Minilak, convinced me of the relevance of my choice. In addition, it allowed me to achieve very nice and safe flights, with 42 French records, 7 European records and 6 World records in both speed and distance.
On the one hand, the LAK-17B FES mini, Minilak, glider revealed excellent qualities of flight at low and high speed, generating a very great ease of steering, in particular for the detection of lift. Its flight behavior is very pleasant, and above, all very healthy in flight. This makes it a particularly secure glider, which should be recommended for novice pilots.
On the other hand, the practice reveals a great ease and above all a real reliability of operation of the autonomous electric motor FES which pleasantly surprised me. Nothing to change, it's perfect. This is an undeniable element of flight safety, for my part, very rightly praised by the flying community by the FAI price, reference https://www.facebook.com/lzdesigndoo/videos/732661446884868/). This represents a huge improvement over the thermal engine. And, in addition, it avoids the emission of CO2 for ours Earth.
Delighted with this autonomous electric glider FES built with great care and seriousness by UAB "Sportine Aviacija ir Ko" with "LZ Design d.o.o.", I consider that it is certainly the best glider I have ever owned. Many thanks to them.
So happy, I hope to have the pleasure of flying for a long time and achieving a lot of new records with such superb autonomous glider.

Best

EASA response: *Noted*

Commenter 13: Alexander Schleicher GmbH & Co, Paul Anklam
Comment # 52 *Our experience shows that the actual given limits for the propeller clearance have already no big margins. It is well known, that some designs like the Stemme S10, which by the way fulfils the existing requirements, have a quite high number of propeller ground strikes per year. This means it might be not the best idea to reduce this requirement further.*
EASA response: *Not agreed* *The propeller clearance is not reduced by the ESF (limits of 22.925 are complied with) however limited to take-off attitude.* *The Stemme S10 is a Touring Motorglider which operation includes take-off, landing, and taxiing with running engine. The ESF in question excludes landing with engine running from the operation. However, EASA has no evidence about a 'high number of propeller ground strikes per year' for the type Stemme S10.*
Comment # 53 *Reducing the ground clearance below the existing CS-22 requirements will lead to the situation that in case of an aborted take-off a propeller ground strike accident will be unavoidable in most cases. The reason is that gliders and powered gliders in tailwheel configuration have the tendency to drop the nose during harder brake manoeuvres on ground. Further, the propulsion systems in powered sailplanes are not designed on the same level of reliability as in bigger CS-23 aircraft for example. This is reasonable as in case of an engine failure the powered sailplane can be simply operated as sailplane, which is no emergency case. But, both points together lead to a situation in which two weak points are combined leading to a dangerous design. We have a not 100% safe propulsion, means a potentially higher number in aborted take-offs combined with a new design, which will very likely cause serious damage in case of an aborted take-off. Both points taken solely are no problem, but their combination lead to a dangerous design.*
EASA response: *Not agreed* *This ESF requires the applicant to establish an AFM procedure for a rejected take-off to address the main point of your comment. However, like the criticality of an engine failure is classified minor for sailplanes, a propeller ground strike after a rejected take-off would have the same classification.*
Comment # 54 *The ESF eliminates a clear technical requirement, which reduces the risk of a propeller ground strike, just by a manual procedure. This is not acceptable as further technical measures are missing. Compared to spinning this would mean, a hypothetic aircraft does not fulfil the requirements for spinning, but in the manual a procedure like "spinning is prohibited" would be given as ESF. In this case at least further technical measures would be required as for example a stall warning*

including stick-pusher or a spin chute etc. In the case of the propeller clearance the same applies. Besides of the manual procedure technical measures must be taken, for example a tire pressure monitoring system and measurement of the landing gear suspension deflection on ground.

EASA response: *Not agreed*

The main driver for the propeller ground clearance required by 22.925 is the landing case, which is excluded from operation by this ESF. Point 4 has to be demonstrated by the applicant while respecting CS 22.143.

Comment # 55

During the whole start procedure, a full throttle test with braked wheels at the beginning of the runway is a common practice and should be included for this design too. So due to the missing ground clearance it must be proven by test that the tail does not lift off during a full throttle test with braked wheel(s) in the most unfavourable condition (c.g. position, elevator and trim setting, wind…). Having the ground clearance in level attitude as required in CS-22, experience shows that the pilot has enough time to react on a surprisingly tail lift off during a full throttle test without risk of a propeller ground strike.

EASA response: *Not agreed*

A full throttle test before take-off is not required by CS 22. With point 2 of the ESF the same ground clearance as in the original CS 22.925 is required, hence the reaction time equals.

Nevertheless, it is common practice to verify the necessary take-off power during initial phase of the take-off run.

Comment # 56

It is usually taught during all the flight training to bring the aircraft in a fully controlled condition after ground run but immediately before lift-off. Means in case of a nose wheel configuration to lift-off the nose wheel and in case of a tail wheel configuration to lift-off the tail wheel before the main wheel lifts off. Most pilots have internalized this over years and in doubt will follow the learned procedure automatically independently of the stated AFM-procedure. This means obligatory special trainings) and limitations of the aircraft use to experienced pilots should be included as compensating factors for this ESF. *) These trainings should include flights in a double seater self-launcher to train the new launching procedure and several aerotows with the new aircraft design to get a feeling for the longitudinal dynamics of this special type of aircraft.*

EASA response: *Noted*

Some sailplanes have already been certificated for which the AFM includes a take-off procedure where the tail wheel shall be kept on ground until lift-off, e.g. Discus bM.

Comment # 57

*As stated in point 5) **(comment # 56)** the standard procedure is differently from the proposed two point lift-off. The reason is also that a two point lift-off in case of the tail wheel configuration means also a lift-off with a lot of back pressure on the control column and a resulting flight attitude near to stall. As compensation factor a flight test is proposed for the investigation of this launching procedure. In calm conditions this flight test might be uncritical, but gusty conditions will be the problem here, if the aircraft must be flown near to stall during lift-off. The gustiness is a value, which is not easy to determine and to judge, especially for flight testing. Thus a further analysis should be required here, up to which gustiness the aircraft can be flown in the most adverse conditions (mass and c.g. position). This calculation can be easily done by a simulated sudden airspeed drop by the gust value. The aircraft must not stall in this condition. As comparison: Aircraft having enough ground clearance in level attitude can be held longer in the ground run, resulting in a higher margin to stall after the lift-off. Or, if the pilot does the lift-off at minimum speed it is uncritical if a gust forces the aircraft to a further ground contact in level attitude as enough ground clearance is given.*

***EASA response:** Agreed*

EASA understands that the items that are addressed by this comment are covered by the ESF, in particular by point 6 and 8. Risks and hazards during flight test need to be addressed as per flight test procedures (FTOM). No change will be made to the text.

Comment # 58

*The propeller clearance requirement for the level attitude is eliminated completely by the ESF and as compensating factor it is stated that an angle of at least 7° between taxying attitude and propeller ground contact must be met. Why this 7° is a good value and not 10° or 15°? There is no justification given for this value. It seems this value does not result from any systematic investigation or calculation, but simply from this special aircraft design intended for certification. A better approach would be to determine this value from existing design, which are known to be uncritical. This means, the angle between taxying attitude and propeller ground contact attitude should be determined for all present designs with tailwheel configuration like Dimona, Stemme S10, Scheibe Falke, ASK 16, ASK 14 and so on. The minimum value of these present designs might be set as new reasonable safe value**.***

***EASA response:** Not agreed*

The intent of CS 22.925 is among others to ensure sufficient propeller ground clearance during landing. However, the landing case is removed from the operation by this ESF. The types listed in the comments are all certified for landing with engine running. The angle of 7° is a translation of the clearance in terms of an absolute value (current CS 22 requirement) into an object-based element independent form the geometry of the respective sailplane. A rotation of 7° is considered as sufficiently noticeable by the pilot.

Comment # 59

As a compensating factor, the proposed ESF states that the AFM has to define the runway condition. Especially in case of a grass runway this evaluation of the runway condition is simply not possible for the pilot prior to take-off.) The only reasonable solution in this case would be a limitation in the airworthiness limitations section of the AFM that self-launches are limited to tarmac and concrete runways.*

*) Usually pilots have no unlimited access to the runway. And even if it would be allowed to the pilot to walk up the entire runway before take-off this is no guarantee that 10 m besides him no critical hole is on the runway.

EASA response: Noted

In case the applicant decides to exclude certain runway conditions. This would indeed constitute an operational limitation. In case the pilot is unable to ensure that the sailplane is operated within the given limitations the runway cannot be used. Note: runway inspection might be part of the airfield operational procedures.

Comment # 60

As compensating factor the ESF proposes a placard stating that landing with running propeller is prohibited. More in general this placard should point out to all unusual procedures like the take-off procedure and all additional airworthiness limitations.

EASA response: Not agreed

This kind of placards is reserved for limitations.

Commenter 14: European Gliders Manufacturer association

Comment # 61

1. With increasing proliferation of electric powered sailplanes, especially those with nose-mounted propellers as exemplified by the FES system, it is very much appreciated that this ESF allows more design freedom to use such efficient and proven propeller systems also for self-launching sailplanes.

2. The main idea of the ESF, namely to allow definition of a take-off / taxying attitude which could be other than a level fuselage is supported. This is also based on positive service experience with FES-propelled selflaunching sailplanes, which are being operated under national certification rules (Annex I sailplanes) in considerable numbers.

3. The proposed compensating factors are also supported.

EASA response: Noted

Comment # 62

4. For clarification of the proposed text, following text amendments are proposed (changes are highlighted or ~~crossed out~~ accordingly):

a. in point 1.: "…normal take-off attitude or taxying attitude, whichever is most critical (this attitude is called hereafter "critical T/O-attitude").

b. in point 2.: "The applicant has to propose a ~~take-off attitude~~ the critical T/O-attitude, in which…"

c. in point 3.: "The change in pitch angle between ~~taxying attitude~~ the critical T/O-attitude and propeller ground contact…"

EASA response: *Agreed*

Text of ESF has been improved has proposed, except that the proposed abbreviation T/O is not used.

Commenter 15: Gilberto LAURENTI

Comment # 63 on point 2

based on the tests maden before the purchase, during the first part of the taxying it is necessary to keep the rear wheel on the ground: when both wheels raise from the ground with the trolley fully extended, only then it will be safe to put gradually the glider in horizontal flight. In this way the glider meets the CS.22.925 distance from the ground requirements and can fly safely.

EASA response: *Noted*

see comment # 17

Comment # 64 on point 3

As it can be seen from the drawings of the glider, the requirement is achieved when the propeller distance from the ground is 337mm., with the tires at the right pressure.

In my opinion it makes sense to:

1. Always check the tire pressure before take-off

2. Include the "propeller ground strike angle" into AFM as one of the warnings

3. Recommend to pilots to familiarize themselves with the inclined position on the ground: they will have to maintain it in the first take-off phase.

EASA response: *Noted*

Comment # 65 on point 4

I certainly agree with this point.
In the AFM should be added the requirements necessary for runway condition:

1. maximum value of surface irregularities, (holes, bumps) ***2. compactness of the soil and no presence of debris, pools of water, stones etc.*** ***3. Maximum height of grass or other vegetation***
EASA response: *Noted*
Comment # 66 on point 5 ***Definitely accepted. This restriction (landing with inoperative engine) is already included in the AFM (see p. AFM 4.5.5.). It is right to include this restriction in the existing placard along with the other warnings.*** ***When the engine is off, the propeller is fixed in a horizontal position and is retracted by the air flow and fixed by further magnetic closures. Without propulsion, the propeller is unable to reach the ground in the event of an overload.***
EASA response: *Noted*
Comment # 67 on point 6 ***in my experience, self-launching from two points does not require an exceptional qualification as a pilot. I know several drivers with different experiences who use the FES self-launchers. Most of the LAK-17 FES mini gliders (over 20 already manufactured) are used for recreational flights, for pilots with limited skills. I am not aware of any case of problems during take-off.***
EASA response: *Noted*
Comment # 68 on point 7 ***I am informed that special "rejected take-off" tests have been performed. I agree that the procedure for a rejected take-off must be described and included in the AFM.***
EASA response: *Noted*
Comment # 69 on points 8 to 10 *agreed*
EASA response: *Noted*