Is there a market for the UltraVision glider?

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Abstract: The UltraVision glider represents a change of paradigm in glider design from maximising the gliding performance to maximising the flying experience. It prioritizes an unobstructed cockpit view over traditional performance-focused considerations. Historically, gliders have been meticulously designed to maximize performance within specified limitations such as material selection, dimensions, weight, manufacturing processes, and cost per unit. The UltraVision challenges this norm by intentionally sacrificing certain performance aspects to elevate the overall flying experience, recognizing that exceptional sightlines are a key driver for attracting pilots to the sport. However, as far as the author knows, this approach has never been followed, raising the question of whether there is a market for a glider that sacrifices performance. To address this question, a series of high-quality renders were created and made viral within the gliding community, generating many reactions. Here, we will systematically analyze these reactions and address the objections to try to answer the question: Is there a market for the UltraVision glider?

Keywords**:** Cockpit design, gliding market, glider design, canopy.

Introduction

The performance of gliders has historically been a critical factor in their use and enjoyment. Gliders with superior performance have a higher likelihood of maintaining flight on weak days, staying aloft in poor conditions, or successfully returning to the airfield. However, glider performance has seen significant advancements over the past century. Today, many regions around the world offer conditions that allow any modern glider to fly for hours or cover hundreds of kilometers. Additionally, most gliders currently being sold are equipped with convenient electric sustainers or self-launchers.

As a result, top-tier performance is no longer a critical requirement for enjoying many hours of flight. Moreover, the majority of flights conducted by the gliding community are recreational rather than competitive, focused on record-breaking, or achieving maximum performance. This shift highlights that the joy of gliding often lies in the experience itself, rather than in performance metrics alone.

Methodology

Several high-quality renders, some of them shown in Figure 1 and 2, were made viral within the gliding community using various forms of social media. These include Facebook forums such as “Glider Forever”, “Soaring forum Group”, “Gliding and Soaring”, “Fédération des Clubs Francophones de Vol à Voile (FCFVV)” and “Soaring news by Paul Remde of Cumulus Soaring”; Linkedin groups such as “RAeS Community Network” and a Youtube interview by “Pure Glide”. These generated more than 2170 likes and more than 840 comments. The information from the comments is going to be analyzed here, addressing the objections presented.

Figure 1. Render of UltraVision 18m glider

Figure 2. Render of UltraVision 18m glider

The comments are classified, grouped, and paraphrased to protect the anonymity of the social media users who made them. They are presented in groups and addressed accordingly. First, we will discuss the negative comments, which primarily represent objections. Next, we will examine the positive comments or endorsements. Finally, several concluding thoughts are provided. This analysis will offer valuable information for the future market launch of the glider, helping to inform communication strategies.

Negative comments, objections

The following comments represent the main objections the gliding community has regarding the UltraVision glider. Each new objection or group of objections is presented in a new paragraph, followed by an addressed and discussed response in the subsequent paragraph. The first objections listed are more predominant, while the latter ones are more anecdotal.

> Objection 1: Crashworthiness. "*There is insufficient frontal protection in the event of a crash, especially against fences, trees, or bird strikes. Additionally, there is no protection for nose-down impacts. An upward acceleration during a crash would heavily impact a spine that is in a more vertical position. The cockpit survivability is compromised in the event of a crash landing, with the risk of dangerous fragments from the canopy. The design also loses the advantage of the legs absorbing part of the impact, as they would in a more traditional glider configuration*".

The design allows for ample room to include a protective cage around the pilot. There is additional space beneath the pilot's spine to incorporate a crushable structure that can absorb energy in the event of an impact. Potentially, the cockpit cage could be designed to detach or break away from the rest of the fuselage, functioning as a survivable capsule. An alternative canopy design, featuring a "halo" structure as shown in Figure 3, would provide frontal protection. Additionally, although this can only be validated through experience and extensive flight hours, increased situational awareness due to better visibility could potentially lead to a reduction in accidents.

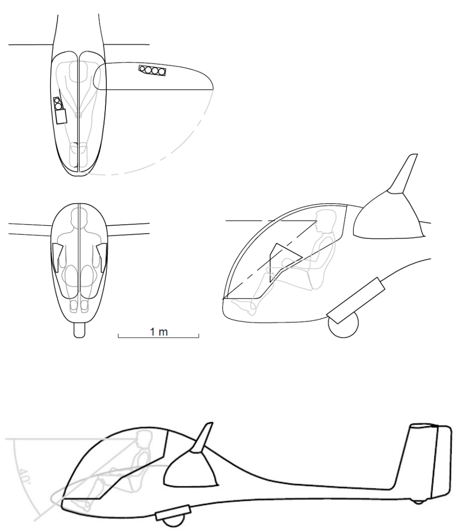

Figure 3. Top, canopy design with "halo" structure and jettisonable canopy. Bottom, suggested modification of existing glider as a proof-of-concept prototype.

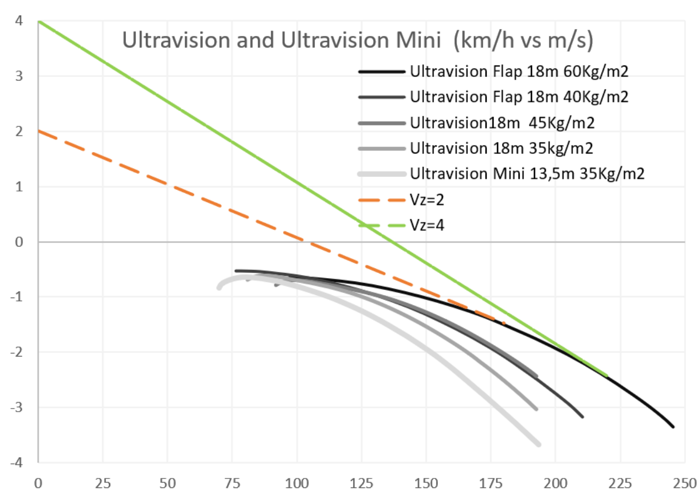

Figure 4. Estimated polars for various versions of the UltraVision and calculation of speed to fly

> Objection 2: Drag. *"A glide ratio of 46:1 seems overly optimistic. The performance would likely be worse than an SGS 1-26. The frontal area is huge, and taller pilots would require an even larger frontal area. Flight time will be limited by poor aerodynamics. It will experience substantial drag at high speeds, making it a slow flyer akin to a foot-launched glider or a floater."*

The 46:1 glide ratio has been calculated based on a glider with an initial 56:1 glide ratio, 18m wingspan, and flaps. In the calculation of the drag polar, it is assumed that the reference aircraft has a $C_{D_{fuse}} = 0.0300$ and a frontal area of 0.4 m², then the contribution of the fusealage to drag is swapped by de drag created with a conservative $C_{D_{fuse}} = 0.0550$ and a generous frontal area of 0.83 m² . This adjustment reduces the performance from 56:1 to 46:1. The high-speed additional drag is accounted for by using the real drag polar of a reference aircraft. I believe 46:1 is a conservative estimate and could be higher if the aerodynamics are highly optimized. A remaining question is whether there is bubble separation and how to avoid it. The discussion of the actual performance of the glider is beyond the scope of this presentation as it is addressed in another article [1]. Anyways, this will be the easiest objection to rebut when data from real flights are disseminated to the gliding community, should this performance be achieved in reality. Figure 4 shows a speed to fly of 210 km/h in between thermals of vertical climb 4 m/s when fully ballasted. It is clearly not a floater.

> Objection 3: Comfort "*The recline position offers physiological and ergonomic benefits, and it helps to endure acceleration. Sitting upright will be uncomfortable and exhausting, and upright sitting may cause dizziness in turns*."

While the reclined position does offer certain physiological and ergonomic advantages, especially when turning, it's worth noting that many vehicles subject their occupants to prolonged periods of sitting in a similar upright position to that of the UltraVision. For instance, truck drivers, rally car drivers, and commercial airliner pilots often maintain an upright sitting position for extended durations. However, what sets the UltraVision cockpit apart is its ability to accommodate a variety of postures. The seat can be reclined, and the pilot has the flexibility to reach their own feet, providing additional comfort and adaptability during long flights.

> Objection 4: Cockpit Layout. "*The instrument panel is tricky to fit. You would need to look away to read the instruments, and this is critical during launch. Flight controls are missing. The airspeed indicator (ASI), compass, and altimeter should be within the pilot's direct line of sight. There's a lack of attitude reference.*"

The instrument panel is positioned on the sides, with the control stick situated between the legs and the flaps, landing gear, and brakes located on the sides. To address concerns regarding attitude reference, a horizontal tape could be added below the horizon line, with a digital indicator ASI positioned there, especially in the "halo" configurations.

> Objection 5: Financial Strategy and Purchase. "*The buying decision is typically influenced by factors such as best glide ratio and performance. Paying hundreds of thousands for a glider with lower performance may seem unreasonable. Additionally, the uncertainty surrounding the resale value in the future makes it challenging to attract buyers at present. There's lack of market, as individuals with financial means prioritize top performance, while others seek affordability."*

Addressing this objection presents a significant challenge. However, the author believes that many pilots would choose to fly with the UltraVision over a top-of-the-range modern glider if given the option. To shed light on this assertion, a potential approach could involve modifying an existing glider by removing its cockpit and replacing it with one like the design presented in Figure 3 bottom. This modified glider could then be flown in flight tests under favourable conditions as a proof-of-concept prototype. It's important to note that this modified glider will not have a sustainer and will not be certified. Additionally, for stability, considering the use of a smaller wingspan, possibly from a glider with a two-wingspan configuration, may help mitigate the additional lateral area and fuselage downwash on a tail designed for a larger wingspan.

> Objection 6: Tail. "*The fin is subjected to turbulence and downwash from the fuselage, which can reduce its effectiveness, create unpleasant controls, blank the stall onset, and make it prone to damage in a ground loop.*"

During the detailed design phase, careful consideration of the tail is essential to address and minimize the aforementioned downsides. One approach could involve altering the size and aspect ratio of the tail, allowing for adjustments to the position of the horizontal tail relative to the fuselage and wing. Additionally, the structure should be reinforced or made flexible enough in the torsion axis to avoid damage during ground loops with care of avoiding flutter at high speeds. Existing gliders such as the Perlan II has the horizontal tail in a similar location [2].

> Objection 7: Landing gear. "*The location of the landing gear is unclear. The angle of attack of the wing in ground seem too low. It could flip over in soft ground*".

The conceptual design presented did not study the landing gear in detail. The main landing gear is located underneath and behind the pilot. The tail can be moved upwards to achieve the correct incidence angle on the ground and helping with the previous objection. An auxiliary retractable third wheel in the nose could be added to prevent flip overs.

> Objection 8: Distractions. "*At high speeds where maintaining a lookout is crucial, such a cockpit configuration could lead pilots to focus on the landscape below rather than remaining vigilant for other aircraft at their flight level.*"

Time will tell if this is a significant problem. It does not seem to be the case in helicopters. Additionally, the UltraVision cockpit may enhance safety by making it easier to maintain visual contact with other gliders, such as when following a glider along a ridge. This improved visibility could mitigate risks associated with close formation flying.

Objection 9: Canopy. "*Too expensive. Scratches on the lower parts. High risk of sunburn and greenhouse effect. Difficult to open canopy during bailout.*"

The canopy could have coatings to reduce the greenhouse effect. Its size is comparable to a two-seater canopy. Ventilation can be carefully designed. Figure 3a shows a jettisonable design, while the canopy in Figure 1 is fixed and would rely on permission to use a ballistic parachute for the whole aircraft. This is only possible if regulations change.

Objection 10: Plain rejection. "*It is ugly. For a better view fly in paraglider. To see underneath turn around. Gliding is about speed and energy management.*"

It is easy and a human tendency to reject what it is new. It is a self-defence strategy wired in our brains for survival.

Other objections and concerns are related to the transportation and storage of the glider that will require a new type of trailer; the location of control rods through the fuselage; the vertical position of the centre of gravity and its effect on stability and control; the pitching up moment while towed or winched, it could have a hook in the nose in front of the pedals or in the "halo" itself aligned with the centre of gravity; finally, people commented about concerns on difficult to obtain CS-22 certification, concern that is addressed in another article [1].

Positive comments, endorsements

The summary of the positive comments is presented here. For every negative comment suggesting it's a bad idea, there was a corresponding positive comment indicating it's worth pursuing, which is encouraging. Many people expressed interest in flying one, and some suggested that a two-seater version would be better. Many people welcomed the design because it's much easier to get in and out of, addressing a common difficulty. Some noted that the upright sitting position makes it easier to relieve oneself in flight and praised the ergonomics. One person pointed out that a 40:1 glide ratio is more than enough. A project with a similar philosophy is being communicated by Evan Byrne, featuring a five-seater aerobatic plane called Axis S-5 with a comparable canopy design where the passengers are seated in a stadium-style arrangement, ensuring that everyone has an excellent forward view as well as forward-downward visibility. The following verbatim statement from a social media user summarizes the sentiments of potential innovative customers:

"Makes a lot of sense if you are not flying in contests. That's what's so nice about flying pusher type LSAs/Ultralights: Enjoy the view. Here you will not have the horrible noise of an engine and its propeller. I've flown over a dozen types of sailplanes and even more ULs/LSAs."

Conclusions

At this point, it is difficult to definitively conclude whether there is a market for the UltraVision glider. Unexpectedly, feedback revealed that the public perceives the new cockpit layout as less safe in the event of a crash, not recognizing the potential for a stronger safety cage due to the more room. The "halo" version, similar to Formula 1, had not been published at the time and will be a welcomed addition by the public. Clear images showcasing the safety cage should be publicized before the commercial launch. Additionally, many valued the ease of getting in and out of the cockpit, an unexpected but valuable insight.

Launching a completely new product that deviates from the established trend is always challenging. To mitigate this, a proof-of-concept prototype could be created by modifying an existing pure glider without a sustainer. This would involve chopping off the current cockpit and building a modified cockpit around it, keeping weight and stability limitations in mind. This prototype should be tested by several test pilots in optimal conditions to determine if the enhanced flying experience due to improved visibility could be a strong enough selling point.

References

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