Motorgliding
Twelve Years Later – Part 5

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Looking back on 12 years of experience with motorgliders and rounding up most of the presently available motor systems.

This article on motorgliders is being published as a 5 part series:

Part 1 – Introduction & Finding a Motorglider (January 2017)

Part 2 – Turbogliders (February 2017)

Part 3 – Classic Engines & Various Engine Systems (March 2017)

Part 4 – Electric and Other Motorized 2 Seaters & What's New on the Market (April 2017)

Part 5 – Comparing Various Scenarios & Conclusion (May 2017)

Comparing Various Scenarios

To understand the decision-making involved with a glider with an engine, let's compare 3 types of motorization. Let's assume that we have three gliders of the exact same model:

- Glider A has a Turbo engine. *(In these articles, "Turbo" refers to a two-stroke sustainer engine, not a jet turbine. — Editor.)*
- Glider B has no engine but water ballast that amounts to the same weight as the Turbo glider.
- Glider C has the FES and has an identical weight to the other two gliders.

Our three gliders are side by side 100 km away from their home base, which we will call Sweethome. 50 km away, right in between where they are and Sweethome, is an airport called Midway. Prior to Midway there are only woods, thus no possible landing. After Midway there are many possible landing fields.

We are at the end of the day; the remaining thermals are weak and far apart. All three gliders are at the same altitude, and have the same onboard computer. They are directly above the only airport in this unfriendly area, which is called Faraway airport (100 km away from Sweethome). They all are very high and have a final glide to Midway airport plus 300 ft.

> **"... the only glider that will be able to go back home is the FES!"**

The Turbo (Glider A) has to make an important and painful decision right now. He cannot allow himself to risk a startup in between Faraway and Midway because he has to consider that the engine might not start. Worse, the engine could be stuck in full or partial extension (which happened to me and a friend of mine). If the engine does not start, and even if it is retracted successfully, he will consume 150-300 ft for one single attempt, and much more if he tries more than once to start the engine (which will happen at times) – not to mention the glide ratio will be cut by half. He will thus lose the final and land in the woods! I was forced to take this decision more than once when I was operating a Turbo. The obvious drawback is that we all want to log as much as possible, and if we start the engine, then OLC scoring stops there.

If the Turbo glider does not use his engine right above (or within gliding distance) of the Faraway airport and if there are no thermals between Faraway and Midway, the gliding computer will bring him to about the final +300 ft above the ground, which is 800 ft AGL and too low to attempt a startup. Therefore, he will be forced to land in Midway and call for a retrieve. So if there are no thermals and the Turbo glider doesn't use its engine above Faraway, he is bound to land in Midway and OLC will stop there.

Glider B (no engine) is loaded with water to be equal in weight to Glider A and C. In his case his option is to head for Midway because he has no

other choices. He can only hope (like the two others) that he will encounter a thermal, and if he doesn't then he will land in Midway. But there is a chance that he encounters a small thermal somewhere between Faraway and Midway or even sometime just about to enter the circuit of Midway. How many times have we heard a fellow pilot experience a low save prior to a possible landout? Thus if Glider B finds a small thermal with a 0 vario climbing rate, he will dump his water and hope this 0 will turn into a +1. If he is lucky, he will slowly gain enough altitude to make it back home and log on OLC. Glider A in the same weak thermal doesn't have this possibility because he cannot dump his extra weight (the engine). The engine in these circumstances is not helpful.

Now what about Glider C (FES)? The situation here is somewhat different because he can choose to activate his engine at any time between Faraway and Midway without losing altitude, as the glider configuration doesn't change and thus the glide ratio stays identical. If Glider C takes the same small thermal that Glider B took, he will not climb due to the fact that he has the weight of the engine/batteries. The only inconvenience is that he will log OLC up to Midway, but he will be able to go back to Sweethome and brag about his hardship with friends around a beer.

Now, if there are absolutely no thermals from Faraway to Midway, then the only glider that will be able to go back home is the FES! (Assuming that Glider A did not use his engine over Faraway.) In this last case all three gliders will log up to Midway, but only the FES will go back home. Isn't this a strange paradox, to have an engine (Turbo), and be less fortunate than a glider without an engine? I will cite what I said in an article in 2003: "Don't forget what you wanted the engine for in the first place! It's to avoid tedious retrieves."[1]

This lengthy and simple example is just one of the situations that involve complicated decision-making when you have an engine onboard. In the last scenario we can assume that having a jet turbine would be somewhat similar to having an FES, as the jet turbine hardly changes the glider configuration.

Risk of Problems

People generally think that the engine makes your life safer and easier, but it can be the opposite if problem anticipation and resolution are not part of the planning. When we are talking about engines (electric or internal combustion), the only thing that you have to know is not *if* the engine system will fail but *when* – because it will let you down at some point. The pilot must incorporate this possibility into flight planning – if the engine does not perform as expected, at the time of intended use, what is my plan? This is necessary to ensure safety of flight. As with any glider, safety depends on allowing margin for loss of lift or engine. Having an engine in a glider is not a panacea for preventing landing out or PTT.

Optimizing the Engine Choices

Opinions are based on knowledge, especially in this field where knowledge comes in at a slow pace. But it is possible to have a general idea of what an engine system can do. But first we have to know what we need to do. If you absolutely need to take off on your own, then the only choice is an SLS, and you have to look at an Antares (electric), a 13.5 m FES self-launcher, or a multitude of gliders with the rotary or piston engine.

If what you need it for really is to get back home then you are looking at a Turbo, FES, or jet turbine engine. They all have their own limitations, but, generally speaking, there is more information available for the Turbo than for the FES and the jet turbine, as the latter two are fairly recent alternatives. One important factor to take into account is that the FES doesn't change the glide ratio, and the jet turbine will only make you lose the equivalent of having the landing gear down. Another factor to consider is that the FES and a Turbo, as explained earlier, will both allow you to go for about 100 km. The Turbo will last the lifetime of the glider and cost little to maintain or replace, while the batteries of the electric glider need to be taken care of, are expensive, and will need to be replaced if all goes well in 10-20 years – but they avoid the need to deal with fuel onboard.

Conclusion

We can see that since the arrival of the combustion engine in the gliding world, these engines have hardly changed except for the electronic ignition and the fuel injection. But it appears that a

[1] *Free Flight*, "Flying motorgliders," vol 6, 2003, p 13
http://www.sac.ca/website/index.php/fr/free-flight-magazine-2/2000s/2003/229-03-06/file

new era is about to open up with the arrival of electric and jet engines.

In my article from 2003, I noted that when you fly a motorglider you are not a glider pilot anymore due to all the restrictions and the decision-making involved. 12 years later this is still true. However, the new FES appears to be able to change this equation and offers the benefit of having a very safe motor onboard without changing the glider configuration, and thus not having to change the normal decision-making of flying a non-motorized glider.

Although the turbine appears to be very interesting, the FES opens up a new way of flying, or, should we say, doesn't change the pilot's habits and decision-making. The simplicity of the FES and its ease of operation are a real relief in the complicated motorglider world.

The weight supplement and the limited altitude gain of the FES are little compared to the safety of the system. The price is similar to the price of a Turbo or a jet turbine, which makes it a reasonable alternative. The main drawback is the lifespan and the price of changing the batteries.

If SH is now offering the FES on its glider, it is most likely because it has great potential, and they trust it enough to get involved. This should be an eye-opener and enough to reduce the anxiety of anyone contemplating the idea of buying an FES on an SH glider.

Aside from some special situations, the FES doesn't allow takeoff; this could change in the future. But above all, the most important factor about the FES is that the configuration doesn't change while its ease of operation places it in a class of its own, along with the ease of operation of the Antares. As of today, no piston engine system can even get close to this simplicity, not even the jet engines.

Finally, there is no perfect solution, and they all have limitations and drawbacks. But one has to consider that the decision-making process is virtually the same in an FES as in a non-motorized glider. To sum up, all pilots interested in a motorized glider but who don't need an SLS should consider the FES as an option – especially knowing that a well-established factory like SH can provide this system on a brand new glider, which means having support and service from a renowned factory.[2]

[2] *The latest information on FES is found at* ***http://www.front-electric-sustainer.com/index.php.*** *There is an increasing number of gliders being designed by several manufacturers (Schempp-Hirth, SAirKo, HpH, Alisport) with FES as an option, both sustainer and self-launch versions. Hopefully this will lead to lower costs and higher energy densities for batteries as the scale of production and lifetime usage increases. — Editor*