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SAILPLANE & GLIDING

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FLYING SCHLEICHER'S OPEN CLASS ASH 30 MI

IS THE FES THE FUTURE OF CROSS-COUNTRY GLIDING?

TOP TIPS ON HOW TO USE, NOT ABUSE, YOUR RADIO

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FES: THE FUTURE?

With his LAK 17A returned from Slovenia, Chris Nicholas wonders if the Front Electric Sustainer is the future of cross-country gliding

THE bottom line is that I am really pleased I had the Front Electric Sustainer (FES) fitted. It has saved me from one real field landing in Competition Enterprise. In another more recent flight, trying out a mixture of mostly level cruise but some climbing with the motor, I ran it for about 45 minutes and still had some battery capacity remaining. I expect it would give a full hour of level cruise, as advertised, under suitable conditions.

I did have some technical difficulties, I thought, during the competition, but it turned out that most, if not all, were due to a safety interlock that I did not fully understand at the time, and which will be explained clearly in a revised version of the flying manual.

Chris Nicholas' LAK 17A, fitted with FES, pictured at this year's Competition Enterprise

THE RADIO IS AUDIBLE OVER THE MOTOR/ PROPELLER NOISE, AND NO HEADSET IS NEEDED FOR TRANSMISSION OR RECEIVING

In use, having prepared the control unit and power switch beforehand, it is only a matter of a second or two to turn the throttle control knob and obtain the desired power. No drama, no delay, and if it should not work for some reason, you do what you would do in a pure glider anyway, but with no increase in drag or workload that can occur with the motor-on-a-pylon, and/or internal combustion engines.

Having successfully turned it on, if you then don't need it any more because you encounter another thermal or are back on a glide slope and about to land, you simply turn the throttle knob anticlockwise to stop it. It is a matter of trial and error to get the propeller blades to stop roughly horizontal, but it is easily done. When stationary, the airflow folds them back against the fuselage.

Care is needed when exiting the glider after flight. Unless the blades are exactly horizontal, they could be caught when the canopy is closed, so that is best done by hand.

Noise and vibration in the cockpit

Subjectively, it is quite tolerable. The radio is audible over the motor/propeller noise, and no headset is needed for transmission or receiving. There is a very small amount of vibration detectable via the rudder pedals. The motor is mounted on the front bulkhead, and so is the rudder pedal mounting. I could detect no other vibration.

Charging

Charging the batteries needs special equipment, which was provided with the modified glider, and careful attention to how to connect and initiate the process. It takes five to six hours to completely recharge the pair of battery packs, one at a time with a changeover. Normally, of course, they are only partly discharged and need less.

Paperwork

Sorting out the paperwork proved fairly difficult and time-consuming, with the issue of an EASA Permit to Fly taking much longer than expected.

I will not write too much detail here, because anybody following on will not have the same problems. A supplemental type certificate (STC) has been applied for by the LAK factory, and is expected to be granted before the end of this year.

Consequently, any new orders are likely to be delivered with a normal Certificate of Airworthiness, and will go on to a normal ARC process.

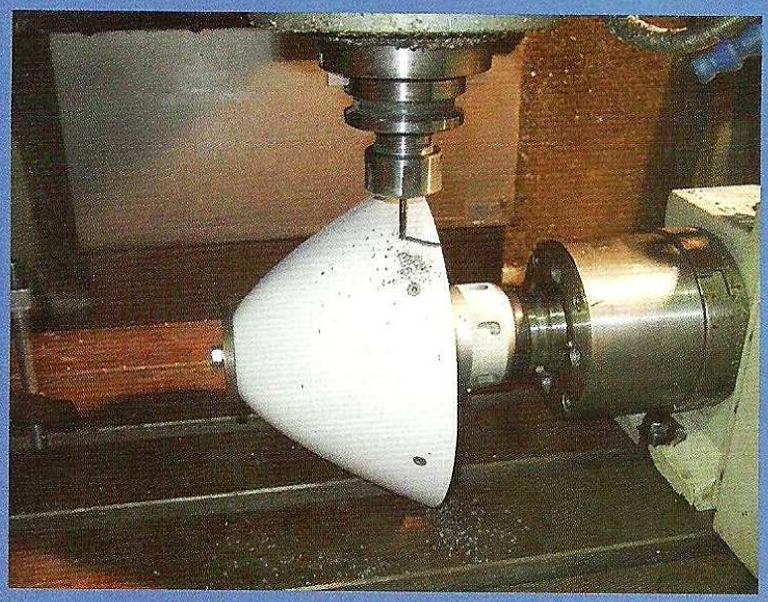
If there are any more completed with a Permit to Fly, as mine was, the process is now relatively straightforward.

The only remaining things I have to do are to undertake some flight tests, and report back to the factory. I have yet to find out what will be required to move from the Permit to Fly to a normal Certificate of Airworthiness when the STC is granted. I do not expect it to be a major hurdle.

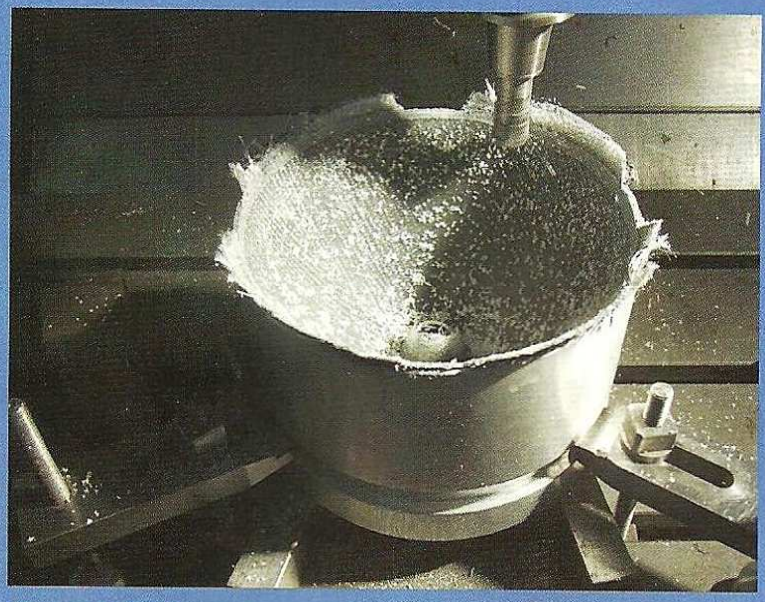
IGC-approved Flight Recorders

A suitable IGC-approved Flight Recorder is necessary to detect FES use at low or intermediate power levels for badge, competition, or record flights. A brief summary by Ian Strachan (Chairman of the IGC GNSS Flight Recorder Approval Committee, GFAC) in relation to electric propulsion was that:

"So far, in tests by the IGC GFAC no motor glider with a rear-mounted electric or jet engine has produced high enough ENL (Engine Noise Level) values on the IGC file used for a claim with the recorder mounted in the cockpit, to differentiate between low engine power and other conditions of climbing in lift without the engine. The FES system is being tested at the moment and



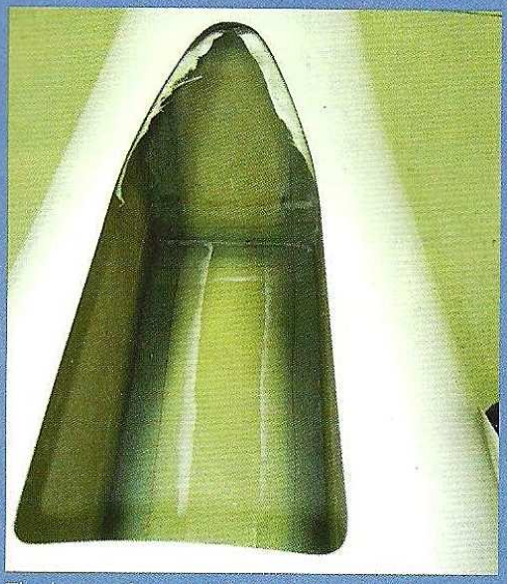
New nose cone/spinner, drilled for fixing to motor



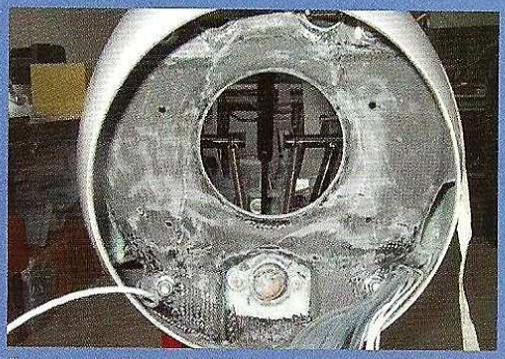
New nose cone spinner

Nose sawn off

Front Electric Sustainer motor



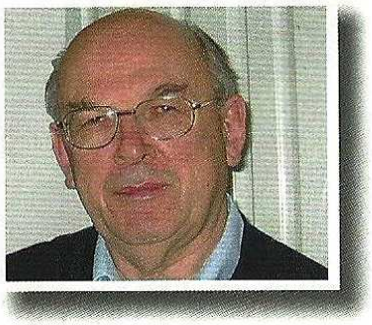
The battery box and (below) completed



Existing bulkhead/pedal mount, exposed for motor mounting

■ **The Front Electric Sustainer (FES) system is an electric motor with foldable propeller, which can be started at low altitude. It was developed by Luka Žnidaršic, director of LZ design, Slovenia. The FES received the Lindbergh prize in the category of Best Electric Propulsion System at AERO 2011, where the company also demonstrated a LAK 17A with FES capable of self-launching.**
www.front-electric-sustainer.com
www.balticsailplanes.co.uk

The original demonstrator, as seen at AERO 2010, showing propeller folded back and extended



Chris Nicholas started gliding in 1970 at Essex Gliding Club. He has a Gold and two Diamonds (500km still to do). A lapsed instructor, Chris has had three spells as deputy chair of the BGA Exec Committee, and several further spells as an exec member; he was Airspace committee chairman for several years and is currently a member of the Safety and Development committees. Chris is a regular competitor in Competition Enterprise and a very occasional (and unsuccessful) entrant in regionals

initial ENL results are better than for a rear-mounted engine, probably because the engine is within the cockpit shell in which the Flight Recorder is installed."

My tests so far confirm that. In the future, this may be handled possibly with a wired link to another IGC file field, Mop (Means of propulsion), using current drawn or RPM of the motor, but at present ENL (Environmental Noise Level) is the only choice, and it appears not to meet the FAI requirement.

In designs where ENL is low under power, an alternative might be to mount a small IGC-approved Recorder (several are available) mounted very close to the propeller, but this needs to be tested to see if ENL values are high enough when the engine is run at low power, such as just for level flight.

Otherwise, under Sporting Code rules (SC3 Annex B para 1.4.2.2), a cockpit-mounted IGC-approved recorder is required with a separate Means-of-Propulsion (MOP) sensor attached by cable, that records either electrical current to the engine (through a cable clamp) or acoustically through a microphone sensor mounted near the propeller. Both current and acoustic MOP systems are currently being tested by the IGC GFA Committee with a view to IGC-approval later in 2011 or in 2012.

My only experience is using a Volkslogger, which has ENL. The range of ENL recorded in an IGC file is from 0 to 999. Above 700, ENL produces a visible marker on a printout of the trace (I use Tasknav). The FES, in climb or level cruise mode, produced such a marker on my Volkslogger trace, the unit being mounted on the instrument coaming.

At lower power levels, for example helping out in a weak thermal, the ENL is typically 2-300. (Normal gliding and thermalling with DV panel open without use of the motor, and approaching with undercarriage and brakes deployed, is in the range of about 70-200, and so could be confused with low-power engine running.)

Although these lower levels do not produce a visible marker on a printout, by clicking on any point, the ENL at that point can be seen (that is how I obtained the figures above, and on the diagram of my first test flight). A scrutineer who looks at successive points and sees a sudden jump in ENL from say 100 to 300 in a flight regime, in which use of airbrakes or lowering the undercarriage is very unlikely, should be asking why. But such diligent checking of many points is very time consuming, and I think unlikely to be conducted routinely.

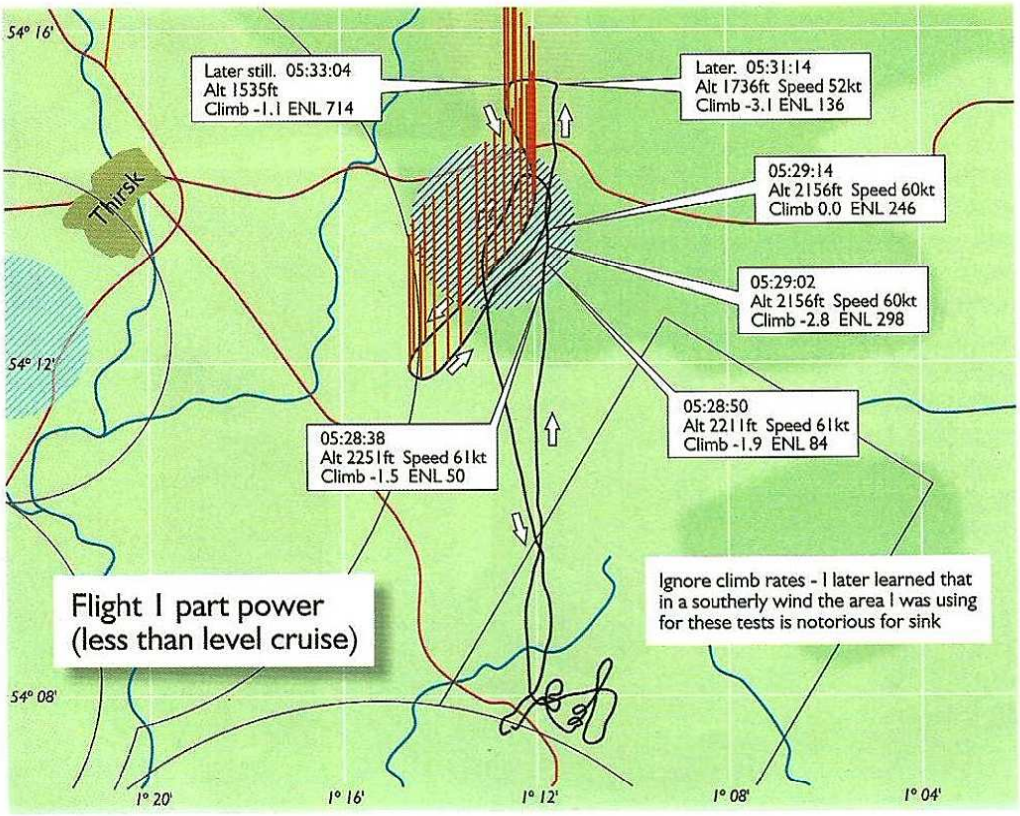
Meanwhile, Luka Žnidaršic, the developer of FES, tells me that so far they or their customers tested ENL with LX5000 FAI, Colibri, LX8080 and the new Nano logger. They did not have any problems in recognising FES running. Even at zero power setting, when the propeller was windmilling, ENL was high enough, Luka claims. They usually use SeeYou software for IGC file opening and there was a clearly visible yellow level of ENL at windmilling, or in horizontal flight. At full power there is a red level. And when you are low you usually use a high power setting at least for a few minutes to reach a safe altitude.

On all competitions, IGC flights with FES were normally accepted, including WGC2010.

Conclusions

For me, this technology is the best compromise, and I'm very pleased with it. It is, of course, more expensive than a cheap glider and road retrieves, and I am paying for the convenience. I was also able to enter a competition without any crew (and need only a small amount of help rigging and derigging because of a medical condition).

I certainly think it is a leading contender in the way forward for the future of cross-country gliding.



First FES flight and Engine Noise Level (ENL) readings