

9th October 2017

Dear fellow glider pilots, FES owners and electric flight enthusiasts

Since its first test flight, 8 years ago, the FES system has proven itself to be very reliable and has expanded in popularity. There are presently over 140 FES systems installed in more than 6 different sailplane types and owners have successfully completed many thousands of safe flying hours with the FES. A great deal of effort went into its development and production, but we have not stopped there. We are constantly seeking ways to improve and upgrade the system, making it better, safer, and easier to use. Our business plan also includes good worldwide customer support.

Unfortunately however, two separate fires involving FES battery packs occurred recently. We are fully committed to understanding the cause(s), preventing reoccurrence, and ensuring open communication with owners, manufacturers, aviation authorities, and the gliding community at large.

The first incident occurred at the end of May in mainland Europe. The fire started outside of normal flight a few hours after the glider was disassembled and loaded into its trailer. The battery packs were left in the fuselage compartment with the power cables from the aircraft still attached to the quick-disconnect battery terminals, meaning the FES system was still under power, but with the battery management systems inactive.

After the incident, LZ Design carefully inspected the glider and its FES system, however due to many factors, including the improper operational procedure we were unable to determine the source of the problem. The manufacturer of the affected glider provided the investigation report to the European Aviation Safety Agency (EASA).

The second incident occurred in the middle of August in the United Kingdom, immediately after the pilot had landed.

After the occurrence of the second fire, EASA decided to issue an AD (Airworthiness Directive). The AD is officially valid only for the 3 types of FES equipped gliders which are currently EASA certified, but it also extends to the glider types which are still operating on a Permit to Fly. For FES equipped gliders built to other standards (sport and recreation aircraft, microlight, kit-built, etc) it is up to the manufacturers to evaluate the available information and establish recommendations for their aircraft.

We have collaborated with the BGA (UK) and the AAIB (UK). Their investigation is not completed yet, but the AAIB recently published a Special Bulletin regarding the course of the investigation so far, with some safety recommendations, which will be implemented to all FES equipped gliders.

Both incidents are described in [AAIB bulletin](#), available online:

(https://assets.publishing.service.gov.uk/media/59c8f175e5274a49c07f4704/AAIB_S3-2017_G-GSGS.pdf)

LZ DESIGN INVESTIGATION

We were informed about both incidents on the same day they occurred. We immediately responded and offered our full support and cooperation.

As the investigation is still ongoing and tests performed thus far are inconclusive, we cannot share all the details, just some basic data and summary.

Our summary for both cases:

- fortunately nobody was injured
- fires were quickly extinguished, so fuselage damage was mostly limited to the battery compartments
- fires occurred within the front battery packs only
- rear battery packs were largely undamaged
- same type of sailplane was affected, however this is likely just a coincidence
- both sailplanes had a low number of flying hours since new
- both occurrences involved improper operating procedures (based on the pilot reports and were not according to the Flight and/or FES manuals)

Our inspection revealed evidence of a short-circuit between cells in the upper central area of the pack. It is not clear yet if the short-circuit appeared in a single cell or between two cells as this is very difficult to pinpoint once damage has occurred.

After our investigations we performed a technical review of the battery pack construction and production process.

We have developed a few theories on possible failure modes, however we still cannot be fully sure of what started the fires.

We currently assume a combination of factors caused these incidents. Some of the scenarios are still being tested and the investigation is not completed yet.

While the official investigation is also still ongoing, we are fully dedicated to resolving the problem. We intend to fully understand what has occurred and why in order to offer a definitive solution, not just a "quick fix".

In the mean time we have prepared a draft of Inspection manual so that all GEN 2 battery packs in service can easily be checked. We have discussed the inspection procedure with different manufacturers and have tested the procedure on several battery packs which were readily available for inspection. The inspection manual has not as yet been confirmed by EASA.

Parallel to this we are also evaluating certain improvements to the construction and production process for future battery packs.

OBSERVATIONS

We would like to take this opportunity to express our concern over potential problems we have recognized over the years.

- We have put a huge amount of effort into the preparation of the FES manuals and updating

them continuously. They are freely available in English and German languages on our dedicated website, in the downloads section. On the other hand, it has become increasingly apparent that pilots do not use their FES system as described in manuals.

-In general, the FES system is easy to operate, but it contains powerful battery packs and power electronics, which require a basic level of understanding, which should not be underestimated. Before the first flight with the FES equipped sailplane, pilots should understand how the system works and its limitations. We will propose that before the first flight with the FES, the pilot should be asked to complete and submit a questionnaire regarding proper use of the system.

-During battery pack inspections we have found that some have clear evidence of mishandling damage to the housing walls, sometimes to the degree that nearby cells are also damaged. We are considering the required use of a rugged transport box which protects the batteries from mechanical damage during transport of the batteries by car, or trailer etc. Optionally we may offer two versions of the transport box: a plastic box for basic protection and more substantial metal version for additional safety and protection. Such battery transport box must be prevented from sliding around in the vehicle.

RECOMMENDATION

-Read and understand the manuals, especially those regarding the FES battery packs and the FES FCU instrument.

-Handle the battery packs carefully; use a transportation box for battery packs in order to protect them. Please inform us in the event that a battery pack is dropped or suffers substantial impact of any kind, so that the battery pack(s) can be checked for any possible internal damage.

FUTURE

To increase safety we will implement some improvements in accordance with the BGA, AAIB and EASA recommendations.

We are planning to introduce the improvements, including a more robust battery pack housing to better protect the cells from impact and at the same time be able to withstand higher temperatures without failure of the housing in the event of fire. Also the installation of a supplemental fire warning system will be introduced, which will provide an independent fire warning in the event that the FCU is switched off or the pilot does not observe the 3 levels of warning currently offered by the FCU.

Thank you for your support and understanding as we go through the necessary investigative and technical steps to further improve the design. I am confident, that we will make our FES system even better and safer.

Best regards,

Luka Žnidaršič, LZ design d.o.o.

