

BATTERIES – FOLLOW MANUFACTURER INSTRUCTIONS!

The era of electric aircraft is upon us. Operators *must* follow manufacturer instructions to minimise the risk of battery fires that could end in tragedy. 

In November 2017, a glider pilot was killed in an accident near Kaikohe aerodrome after a fire broke out in one of his aircraft’s battery packs.

A CAA safety investigation¹ concluded the battery fire would have resulted in fumes and smoke filling the cockpit and “degrading the pilot’s performance and ability to control the aircraft...”.

The investigation concluded the pilot was likely trying to return to Kaikohe aerodrome for an emergency landing. But during its descent, his aircraft “exceeded speed limitations which maintain the structural integrity of the glider, leading to the structural failure of the wings and the subsequent inflight break up”.

While the safety investigation hasn’t been able to definitively conclude why the batteries failed, it identified three possibilities:

- The batteries were damaged at some stage, possibly during an earlier wheels-up landing.
- Arcing occurred between battery cells, possibly caused by penetration of one or more of the cells by metallic debris.
- During charging and discharging cycles the pilot did not follow the manufacturer battery management guidelines.

The investigation found there was no documentation provided to the CAA, maintenance provider or appropriate Part 149 organisation regarding the wheels-up landing, so there was no documented evidence of possible damage done during that landing.

The investigation was also unable to identify any evidence of inter-cell arcing, but could not, therefore, exclude it.

What the investigation did discover, however, was that the pilot did not follow manufacturer instructions regarding the battery charging regimen.

The safety investigation report states, “...while the pilot was out of the country, for periods of two to three months each year, the glider was disconnected from its charger and stored in its trailer. This practice is not consistent with the battery management guidance in the *Flight manual and maintenance manual*”.

CAA investigator David Oliver says if an operator doesn’t fly the aircraft for an extended period, they need to check manufacturer procedures as to the appropriate handling of the idle battery.

“But they may not do this for a number of reasons – they think it’s inconvenient, or costs too much. Or they don’t have the appropriate training.

“Whatever reason it was that this pilot did not follow manufacturer instructions for the care of the aircraft

¹ To read report 17/7177, go to aviation.govt.nz > safety > safety reporting > fatal accident reports.



Photo supplied by the UK AAIB (Air Accidents Investigation Branch)

// Lithium polymer battery fire on board glider G-GSGS in West Sussex, UK, August 2017.

// If a battery-related event occurs in flight it can be the smoke that's the danger – even without any fire present. //

battery in his absence, that potentially did cause it to malfunction.”

The CAA's gliding specialist Doug Hamilton also says operators of any electric-powered aircraft must be diligent about following manufacturer instructions.

“Pilots of microlight aircraft, for instance, can do their own maintenance without full oversight so they really must care properly for their aircraft batteries.

“Using the wrong charger, or the wrong process, overcharging, undercharging, wrong timing or wrong rates, or the batteries being stored or discharged not according to manufacturer instructions – these can all cause significant problems.”

In October 2020, New Zealand's first electric aircraft entered service – a Pipistrel Alpha Electro, which will be used as a trainer. There's also an electric microlight undergoing flight testing. The Part 149 organisations, the Recreational Aircraft Association of New Zealand (RAANZ) and the Sport Aircraft Corporation (SAC), are preparing for an era of battery-powered aircraft.

SAC's Operations Officer Dave Readman says with new electric aircraft propulsion technology, SAC is

re-evaluating its aircraft type rating procedures and training manuals.

“These new machines use LiPo (lithium-ion polymer) battery technology and electric motor propulsion.

“It's an advanced and generally unknown area of aviation. So we think it's very important operators have a solid understanding of manufacturer procedures regarding battery handling, charging, storage and maintenance.

“LiPo batteries are generally safer and more environmentally friendly than many other batteries like NiCd and NiMH. But if they're charged, discharged, stored, maintained, or handled improperly, they can become extremely dangerous.”

Easwaran 'Ice' Krishnaswamy, of RAANZ, agrees, telling *Vector*, “Impact/puncture and overcharging are two common causes of battery fires.

“Lithium batteries contain chemicals that break down to make oxygen. This fuels the fire and leads to a condition known as ‘thermal runaway’, making it harder to extinguish.

“A toxic, normally colourless (although sometimes seen as white smoke) gas called hydrogen fluoride is released from »

