**Contrasting Lithium Iron and Lithium Ion batteries – Izzy Briggs**

Marc Z Wrote:

"According to what documentation? The EarthX manual states that their batteries can operate to 60C (140F) and can be stored to 70C (158F). So it would be a pretty piss poor battery that can only be stored/used to 90F."

You may be misunderstanding that I'm focused on Lithium Ion (LiB) as opposed to Lithium Iron (LiFePo4). Kalid stated his unit was Lithium Ion. EarthX batteries are not Lithium Ion. They are Lithium Iron and as a consequence they have different properties than LiB.

As for manuals....see the Garmin G5 Electronic Flight Instrument Part 23 AML STC Maintenance Manual Including Instructions for Continued Airworthiness - Page 5 which states:

*"If these guidelines are not followed, the* **lithium-ion***battery may experience a shortened life span or may present a risk of damage to the device, fire, chemical burn, electrolyte leak, and/or injury. Do not leave the battery exposed to a heat source or in a high temperature environment. To help prevent damage, store the battery out of direct sunlight.  For maximum battery longevity, store within a temperature range of 32° to 77°F (from 0° to 25°C). Do not use a sharp object to remove the battery."*

Now, I will agree that Garmin is vague on what constitutes a high temperature environment, but it does call out 32 F degrees to 77 F degrees (NOT Celcius) in adjacent sentences.

"Garmin states that the G5 operating limitation is 60C (140F) and won't operate on the backup battery if it's over that temp. "

Yes, it does. The use case here is not about flying the G5 in normal flight conditions, but rather operating the G5 on standby battery power AFTER the Lithium **Ion** battery was damaged (likely unbeknownst to me) in that Arizona hanger by ambient heat in excess of the temperatures highlighted in the Garmin document quoted above. And to avoid that scenario......what do we do?

"Just fine, because how often is it over 158F (or even 140F) in your plane while you're flying?"

Again, maybe I failed to communicate clearly.....This isn't about flying, it's about storing, as in parking in a hot hanger in Arizona, and then only in the context of Lithium Ion batteries....which do exist in our aviation ecosystem in iPads, tablets, cordless cowling removal tools and standby instrument batteries.

"You know how explosive gasoline is?"

Ok, I get it, that sounds suspiciously like sarcasm. But in case it's not, it's important to point out that Gasoline does not lose it's performance or change it's chemical makeup if exposed to ambient heat in excess of 130 degrees such as in a hot Arizona hangar in summer.  The autoignition temperature for gasoline is around 495° F (232° C) according to Google, which is never wrong :P

"I would, of course, NOT use a lithium battery that didn't have a Battery Management System built in, as the EarthX battery does. "

Agreed, and if we were talking about Lithium Iron batteries again, which I'm not, I think (and apologize for not being more clear in the beginning on that point)....then this would be relevant. But we don't have a choice about the standby batteries used in our aircraft since they are provided by the manufacturer (i.e. Garmin or Dynon). From what I've been reading, and in my experience with cellphones in the Desert, LiB batteries DO degrade after being exposed to high ambient heat (greater than 100 F), and that damage or degradation can't always be measured or seen, except maybe as a shorter life. Kalid was able to both see and measure the damage caused to his unit. If that damage was caused by ambient heat, then it's relevant to any battery that uses LiB technology. (Interesting to note, I've also experienced LiB charging issues with my iPad in flight in the VariEze when temperatures are below 25 degrees F. The iPad stops being able to charge and it starts to discharge faster.)

Standby batteries present a particularly difficult situation because if the standby batteries are supposed to keep these instruments (or electronic ignitions) alive in flight in the event of an engine driven electrical system failure. If you ever needed it, it might not be there for you if you parked in Arizona.

We need to just make Arizona cooler and this whole problem would just go away.