

Business jet will have sturdier batteries than Boeing 787

A lithium-ion battery for Cessna Citation business jets is designed to contain an overcharge explosion within an armored casing - unlike the Boeing 787 batteries that led to the plane's grounding.



A 38-pound lithium-ion battery newly designed and built by EaglePicher Technologies of Joplin, Mo., which is slated to be certified by year's end for use as a main battery in Cessna's Citation business jets. Tests show the design can contain a battery overcharge explosion entirely within the box.

While Boeing and federal safety regulators ponder why flames and hot electrolytes shot out of lithium-ion batteries on the company's flagship 787, prompting a grounding order that's now in its third week, business jet-maker Cessna is testing a new design for such batteries - one that can contain a worst-case explosion within an armored box.

The new battery for Cessna's Citation jets is scheduled to fly within months and to be certified by the Federal Aviation Administration (FAA) this year.

A video shows what happened when engineers disabled all the battery's protective systems, overcharged it and then deliberately ignited the hot chemicals: Nothing more than a few wisps of smoke puffed out of the battery box.

"You are basically intentionally creating a fire that will simulate a thermal event within an individual cell, then you have to contain

that within the battery enclosure," said Ron Nowlin, vice president of aerospace systems at EaglePicher Technologies of Joplin, Mo., which designed and built the battery.

In contrast, during the recent battery fire on a 787 parked at Boston's Logan Airport, hot electrolytes sprayed out and flames engulfed the box, damaging structure and components around it in the electronics bay.

And even when it works as planned, Boeing's approach to battery-fire protection on the Dreamliner does not envisage the fire being entirely contained within the battery box.

With the 787 grounded worldwide, Boeing is struggling to understand why its multiple safety systems failed to prevent that Boston fire, and a later incident where a 787 had to make an emergency landing in Tokyo after its battery began to smolder during flight.

It's not known if a redesign of the 787 battery similar to Cessna's battery would have prevented the two incidents, which have plunged Boeing into crisis.

Yet such an approach might allow Boeing to stick with lithium-ion technology while controlling its volatility.

Mike Sinnett, vice president of 787 systems, said the company chose lithium-ion batteries because they are light, compact and can deliver a large amount of power in a short period of time, then recharge quickly.

Cessna, based in Wichita, Kan., declined to confirm information from industry sources that it will use the EaglePicher battery, saying only that "any future lithium ion battery usage" will be vetted by a thorough FAA certification process.

Cessna adopted the beefed-up battery design after being burned once before by the lithium-ion technology.

In 2011, a lithium-ion battery fire destroyed a Citation jet on the ground. Cessna and the FAA required the batteries on all planes of that particular model to be replaced by conventional batteries.

EaglePicher's Nowlin said he expects the battery to be certified for the airplane this year.

The company's website shows a video of the battery being tested

for FAA certification.

But this is not a quick fix for Boeing.

Nowlin said the battery-certification process with the FAA, starting from scratch, typically takes 18 months.

A Wall Street analyst, whose firm doesn't allow him to be quoted, estimated that it would take Boeing 12 to 15 months to update the 787 battery design to the EaglePicher standard and get it certified.

How Boeing and Cessna took different paths to testing and certification is partly a matter of timing.

The FAA has mandated that any aircraft using high-capacity lithium-ion main batteries - whether built by Boeing, Cessna, or any other manufacturer - must satisfy certain "special conditions."

All possible dangers

To do so, the manufacturers and the FAA agree in advance exactly what tests will satisfy them that all possible dangers from overheating are prevented.

EaglePicher's key test - proving that a battery explosion is contained within the box - is one such certification test pre-agreed as satisfying the FAA's conditions.

The company's website contends that overcharge explosion tests on its battery were repeated successfully multiple times and concludes that "even during this worst-case scenario, the (battery) is able to contain a thermal event."

It's among a set of standard tests that were agreed to in 2008 by an aviation-industry committee that included senior Boeing electronics engineers and that the FAA approved in a 2010 draft policy memo as one way to comply with its certification conditions.

But by 2008, Boeing's Dreamliner had already gone down a different test path toward satisfying the FAA.

Boeing spokesman Marc Birtel said the industry committee's test standards "were published after we had completed our certification plans and begun our testing efforts."

Boeing did its own extensive testing and analysis to meet the FAA requirements, he said. The precise tests Boeing used to meet the FAA's certification conditions are proprietary.

Containment plan

However, according to a detailed account of the 787's battery-fire protection system provided by Sinnett, Boeing's containment plan did not envisage confining the accident entirely inside the battery box.

Sinnett said Boeing had to demonstrate to the FAA that it had multiple redundant safety mechanisms that ruled out the worst-case scenario that EaglePicher's test simulates: an overcharged battery explosion.

In addition, Boeing says it had to show that if an internal cell malfunctioned and overheated, that any hot, flammable chemicals that sprayed out of the battery into the electronics bay wouldn't damage surrounding equipment "in such a way as to cause a major or more severe failure."

Sinnett said Boeing's design solution was to contain damage within the electronics bay until the cell burned out and to vent any smoke overboard, not into the passenger cabin or cockpit.

Birtel said FAA certification testing validated the "robust Boeing requirements and specific 787 design features."

Clearly though, the two recent 787 battery incidents bring into question the efficacy of Boeing's battery safety system.

And before the 787s can fly again, Boeing has to find a way to bolster those safety measures.

http://seattletimes.com/html/business/technology/2020241162_787_battery29xml.html