

# What's Behind the Increase in Lithium-Ion Battery Fires on Planes?

The FAA reports that, on average, one of these fires occurs every 10 days. Here's what passengers need to know.

An alarming increase in the number of smoke and fire incidents on airlines from passengers' malfunctioning lithium-ion batteries is causing concern among safety and aviation experts as summer travel season approaches.

"It's one of the few rising risks in aviation," says John Cox, a veteran pilot and an airline safety consultant with special expertise on lithium-ion batteries in aviation.

So far this year the Federal Aviation Administration has reported at least 18 incidents involving lithium-ion batteries on airplanes and in airports, and there were 31 incidents in 2016. That compares with 16 incidents in 2015, nine in 2014, and eight in 2013.

Cox says that any given flight might contain hundreds of Li-ion cells in phones and laptops and that many rechargeable devices involved in these fires—such as wireless headphones and especially e-cigarettes—weren't even on the market a few years ago.

Just last week a JetBlue flight from New York to San Francisco was diverted to Grand Rapids, Mich., for an emergency landing after an e-cigarette charger caught fire. Initial FAA reports said the culprit was a laptop computer, but the airline has told Consumer Reports that what actually caught fire was an Efest Soda charger for e-cigarettes.

The battery in that device is about the size of a AA battery that you might find in a remote control.

Last year, Li-ion battery safety was in the news after the Samsung Galaxy Note7 smartphone was recalled over [fire hazard concerns](#). The FAA subsequently banned the phones from commercial aircraft.

Though the chance of any one device igniting is slim, such fires are now occurring once every 10 or 11 days on a flight somewhere in the U.S. The unique characteristics of battery fires pose serious challenges for cabin crews.

“Battery fires are particularly dangerous because they burn very hot, they can emit toxic byproducts, and they tend to flare up even after it seems like they’ve been extinguished,” says Consumer Reports chief scientific officer James H. Dickerson, a physicist and former administrator at the Department of Energy’s Center for Functional Nanomaterials at Brookhaven National Laboratory.



The Efest Soda battery charger for an electronic cigarette caught fire on a JetBlue flight, causing it to make an emergency landing.

Photo: Grand Rapid Falls Airport

## What Passengers Can Do

Passengers have a large role to play in preventing these fires. The first step is to follow the FAA guidelines regarding the transport of spare batteries on flights. Spare Li-ion batteries should not be stored loose in checked luggage but instead packed in a carry-on bag. The electrical terminals

should be taped or otherwise protected to keep the battery from coming into contact with any stray metal devices, which could cause a short circuit.

Though the FAA doesn't require it, Cox recommends carrying any devices containing lithium-ion batteries in your carry-on luggage, as well. If a battery catches fire, the problem will be noticed and handled quickly.

What should you do if your battery-powered device begins heating up or even smoking while you are on board? Cox says you should notify the flight crew immediately. Then, if possible, calmly move away from the burning device and let the flight crew do its job.

The crew of the JetBlue plane put the backpack containing the burning battery in a metal bin and stored it in the plane's lavatory until the plane could land. A statement from the airline says, "Crewmembers took actions consistent with their training to make sure the situation was contained."

## Difficult Choices for Airlines

Though airline crews are trained to handle onboard emergencies, battery fires can be complicated, difficult, and dangerous to cope with.

A Li-ion battery contains volatile chemicals separated by a permeable membrane, explains K.M. Abraham, a professor at Northeastern University and a pioneer in Li-ion battery design. If that membrane is compromised—whether because of a defect or damage to the battery—the energy can be released in an uncontrolled manner, a condition called thermal runaway.

"The volatile gases increase the pressure in the cell," Abraham says. "This can lead to the rupture of the battery and release of volatile organic compounds, which can catch fire when they come into contact with the oxygen in the air."

Published FAA guidelines instruct flight crews to handle a Li-ion battery fire in stages. The first step is to use a Halon fire extinguisher to dampen the flames. Next, it's critical to cool the battery, which can reach temperatures of 1,000° F—more than twice as hot as the highest setting on a home oven. Otherwise, the battery is likely to reignite.

The FAA says the best way to cool a runaway battery is, believe it or not, with plain old water. "After extinguishing the fire, douse the device with water or other nonalcoholic liquids to cool the device and prevent additional battery cells from reaching thermal runaway," the FAA says in a written advisory.

But that procedure can create its own risks. "Pouring water over a device indiscriminately could pose a variety of unintended hazards, from electric shock to further spread of the toxic materials from the battery," Dickerson says. Further, "You'd need an awful lot of water to cool down a large laptop battery this way."

When dealing with a large device like a laptop, immersing it in a vessel full of water could be a better tactic, safety experts say. The problem, however, is that moving a burning battery can be dangerous. In addition to giving off intense heat, the battery could explode, spewing sticky red-hot chemicals that cling to the skin. "It's a lot like napalm," Cox says.

These dangers have prompted the FAA to recommend against using the fire-resistant pouches that some airlines—but not JetBlue—have employed to handle battery fires.

"Do not use fire resistant burn bags to isolate burning lithium-type batteries," the FAA document says. "Transferring a burning appliance into a burn bag may be extremely hazardous. Do not move the device until you are certain the fire is extinguished and the device is cool."

"It's a paradox," Dickerson says. "The device is so hot that you don't want to move it, but moving it is the best way to get the danger under control."

Some business jets and a few commercial ones—not including JetBlue—have purchased a [device called a PlaneGard](#) to handle laptop battery fires. The device, which includes gloves and goggles, acts as a shield to protect the crew member. The laptop or other device can be scooped up and enclosed in a metal shell. That shell is then sealed inside a heavy-duty aluminum case that contains the vapor emitted by the burning battery and guards against subsequent explosions. Finally, the PlaneGard can be filled with water to cool the battery.

The issue of laptops on planes has additional currency this year because of laptop policies formulated by the Department of Homeland Security. The agency banned laptops from the cabins of airliners on U.S.-bound flights originating in some airports in the Middle East and North Africa, and has considered extending the ban to other countries.

These moves are designed to counter a potential terrorism risk, but some experts have expressed concern over a [potential fire hazard](#) if the devices are transported in plane cargo holds instead. The FAA instituted regulations controlling the transport of Li-ion batteries as commercial cargo after an onboard fire caused the fatal crash of UPS Airlines Flight 6 in 2010.