

08SAB02

2 May 2007

In flight fire risk from portable electronic equipment batteries

The following Safety Alert has been issued by US ALPA concerning the in flight fire risk of certain types of batteries found in portable electronic devices.

Airline passengers are increasingly carrying portable electronic devices and other equipment powered by batteries into the cabins of aircraft. These devices normally pose little danger, but when the batteries are damaged, abused, or have been subject to a manufacturing or design defect, they have the potential to overheat or cause fire. Once ignited, a battery fire may be difficult to extinguish, reigniting several times before being fully controlled. While the percentage of batteries involved in incidents is small, the recent incidents listed below illustrate the potential danger. As the energy density and numbers of batteries in aircraft cabins increases, the likelihood of additional encounters also increases. The Air Line Pilots Association, International, is issuing this safety alert to educate its members as to the characteristics of a fire involving a portable electronic device and to provide recommended crew actions should an incident occur.



Once ignited, a battery fire may be difficult to extinguish, reigniting several times before being fully controlled.

Incidents involving passenger electronic equipment

* A fire in a bag in the overhead bin of a 747 aircraft in Chicago in May 2006. The fire was detected during boarding and was determined to have originated in an external lithium ion battery pack in a passenger's bag.

* A lithium ion battery fire in a laptop during passenger boarding of a 777 in Los Angeles in September 2006. The laptop was not in use at the time and was stowed in a compartment in the first class section of the aircraft.

* A lithium metal battery fire aboard a Portland, Oregon bound flight in December 2006. The battery was powering a passenger's personal air filter in flight; the crew successfully extinguished the fire, diverted the aircraft and made an uneventful landing.

* A battery or batteries caught fire in the overhead bin of an aircraft that had departed from New York's John F. Kennedy airport in February 2007, generating smoke that entered the passenger cabin. The Flight Attendants successfully suppressed the fire and the Flight Crew made an uneventful diversion.

Characteristics of battery fires

A battery fire may differ significantly from a flammable material fire, and have many characteristics that are not traditionally covered in fire fighting training for crewmembers. This safety alert is intended to address those differences and provide operators and crewmembers a method to successfully combat an in flight passenger electronic equipment fire. Additional information concerning battery fires and battery safety can be found in the FAA's Advisory Circular AC 120-80 and the US Department of Transportation's Safety Advisory for Passengers and Crewmembers (PHMSA 2007-27493; Notice No. 07-02).

The following are characteristics specific to a battery fire:

- * A battery has a higher likelihood of catching fire through thermal runaway during or immediately following a charging cycle, although the effects of thermal runaway may be delayed for some period of time.
- * A battery may catch fire while not in use and stowed in a bag, if exposed contacts are connected by a conductive material (e.g. a coin or set of keys).
- * A device with a battery fire may emit sparks or flames from the battery that are several feet high. Following the incident in Los Angeles, eyewitnesses described flames between 2 and 8 feet above the device.
- * A burning battery may emit flammable gasses or molten material.
- * Halon may have no effect on some battery fires, although the Halon will suppress a fire of surrounding flammable material, or prevent its ignition. (Halon has been shown to be ineffective against lithium metal battery fires in testing conducted by the FAA's Technical Center.) Lithium metal batteries differ from the lithium ion batteries found in laptops and cell phones, are typically non-rechargeable, and power passenger and crew devices such as digital cameras and flashlights.
- * A fire that appears to be extinguished may re-ignite some time later.

Conclusion:

Passenger electronic equipment fires represent a real and significant risk to aviation safety. By following procedures appropriate to a battery fire, this risk can be mitigated and the likelihood of a safe outcome to an incident increased.



Lithium metal batteries differ from the lithium ion batteries found in laptops and cell phones, are typically non-rechargeable, and power passenger and crew devices such as digital cameras and flashlights.

Recommendations and considerations:

Crew Actions for Combating an In flight Fire

If a fire is discovered involving a passenger electronic device, it is recommended that the Flight Crew direct the Cabin Crew to take the following steps, while considering an immediate diversion if the fire is not quickly contained:

- * Immediately fight the fire using the closest extinguishing device, while avoiding water extinguishers.
- * Maintain communication between the cabin crew and cockpit in order to relate the effectiveness of the fire fighting effort.



Airline passengers are increasingly carrying portable electronic devices and other equipment powered by batteries into the cabins of aircraft. These devices normally pose little danger, but when the batteries are damaged, abused, or have been subject to a manufacturing or design defect, they have the potential to over-heat or cause fire. In this case, a battery power drill in a passenger's checked baggage overheated and caused a baggage fire thankfully before loading onto an aircraft.

* Remove any external power from the device.

Note: If two or more Flight Attendants are available, the above steps should occur simultaneously

- * Don Protective Breathing Equipment (PBE) and continue fighting the fire with a Halon extinguisher, if available.
- * Move passengers away from the area to protect them from the large amount of smoke likely to be produced.
- * Consider moving therapeutic oxygen installations away from affected area.
- * Once the fire appears to have been extinguished, consider moving the device to an area without flammable material, such as a galley oven (if not adjacent to the cockpit). The device should not be moved if it is still on fire, or if it is too hot to be moved safely.
- * Remove power to remaining passenger outlets until the aircraft's system can be determined to be free from faults, if device was previously plugged in.



IFALPA provides this data for information only, In all cases pilots should follow their company's guidance and procedures.

In the interests of flight safety, reproduction of this bulletin in whole or in part is encouraged. It may not be offered for sale or used commercially. All reprints must credit IFALPA.