

The following information expands upon SAFO 09013.

Safety Alerts for Operators (SAFO) are posted at:

[http://www.faa.gov/other\\_visit/aviation\\_industry/airline\\_operators/airline\\_safety/safo/all\\_safos/](http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo/all_safos/)

**Lithium Battery Fires.** Although lithium is a metal, do not treat a fire involving a small number of lithium batteries as a Class D fire. Halon, Halon replacement and/or water fire extinguishers can be used to control fires involving a small number of lithium batteries, such as found in common portable electronic devices (PED) or a laptop computer.

Lithium batteries are capable of ignition and subsequent explosion due to overheating. Overheating may be caused by shorting, rapid discharge or overcharging. Overheating results in thermal runaway, which is a chemical reaction within the battery causing the internal temperature and pressure to rise. The result is the release of flammable electrolyte from the battery and, in the case of disposable lithium batteries, the release of molten burning lithium. Once one battery cell goes into thermal runaway, it produces enough heat to cause adjacent battery cells to also go into thermal runaway. This produces a fire that repeatedly flares up as each battery cell in turn ruptures and releases its contents.

Fighting a fire that contains either disposable or rechargeable lithium battery cells requires extinguishment of the fire and cooling of the remaining cells to stop the thermal runaway. Water is the most effective coolant. Halon, Halon replacement and/or water fire extinguishers should be used for initial knockdown of these fires, followed by immediate dousing with water from any available source.

**WARNING:** Do not use fire resistant burn bags to isolate burning lithium-type batteries. 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.

## Specific Types of Lithium Batteries

### (1) AA Sized Lithium Batteries.

**Disposable.** Lithium (non-rechargeable) cells are constructed with metallic lithium. Metallic lithium is extremely flammable and cannot be extinguished with the typical hand-held extinguishers found on board transport aircraft. However, the amount of metallic lithium in each AA sized lithium battery is very small and will consume itself in less than one minute. Lithium cells will spray molten lithium as they burn, which can cause severe bodily harm and spread the fire.

Do not treat a fire involving a small number of lithium batteries as a Class D fire.

**Rechargeable.** Lithium-ion (rechargeable) cells are constructed with a flammable electrolyte and have the same fire hazard as non-rechargeable cells.

**(2) Battery Pack (Multiple Larger) Lithium-ion Cells.** Laptop computers and other battery operated devices are often powered by battery packs using multiple larger lithium-ion battery cells. The individual cells are not visible and are encased in a plastic housing.

### **Fighting a Fire Involving Lithium Batteries**

The technique for fighting a fire involving lithium batteries is the same, regardless if the battery is a disposable or rechargeable lithium battery or battery pack.

- Relocate passengers away from the device.
- Utilize a Halon, Halon replacement, or water fire extinguisher to prevent the spread of the fire to adjacent battery cells and materials.
- Pour water, or other non-alcoholic liquid, from any available source over the cells immediately after knockdown or extinguishment of the fire.

*Only water or other non-alcoholic liquid can provide sufficient cooling to prevent re-ignition and/or propagation of the fire to adjacent batteries. Water, though it may react with the tiny amount of lithium metal found in a disposable battery, is most effective at cooling remaining cells, stopping thermal runaway and preventing additional flare-ups. Significant cooling is needed to prevent the spread of fire to additional cells in a battery pack.*