

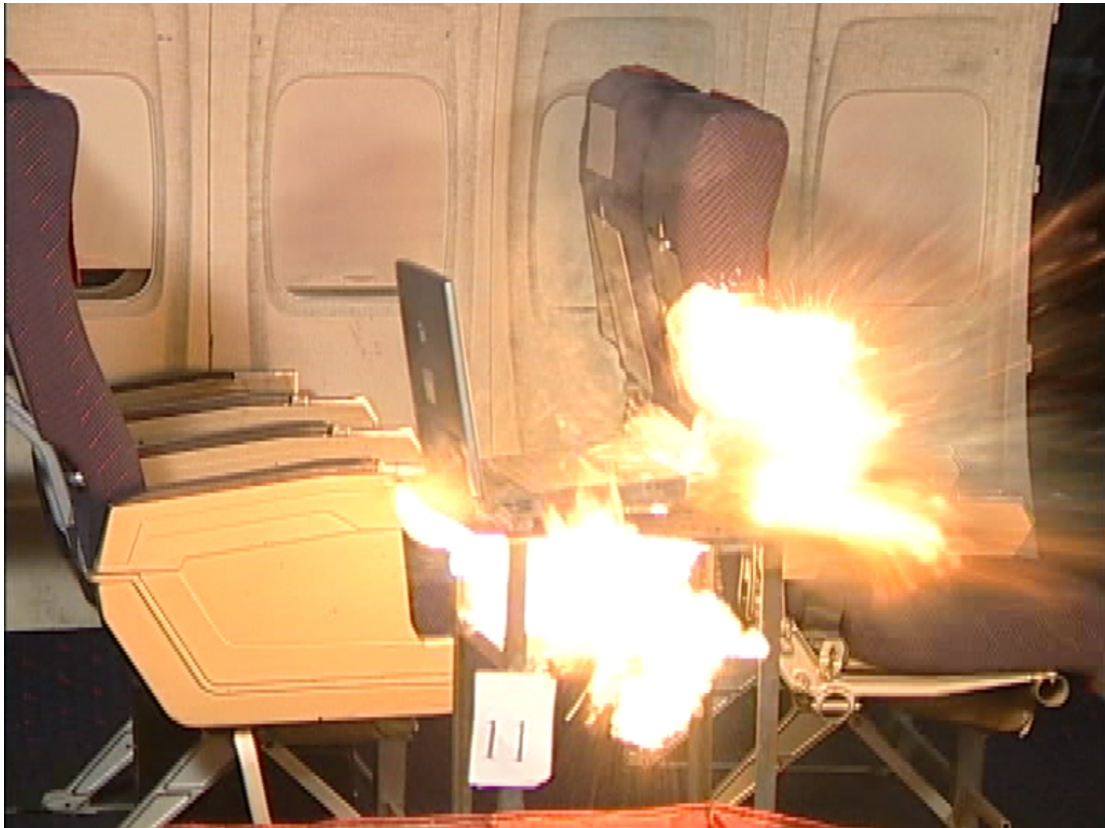
LAPTOP COMPUTER FIRE EXTINGUISHMENT

Laptop computers and other battery powered electronic devices can pose a significant fire hazard when carried aboard passenger aircraft. The lithium-ion batteries may malfunction and overheat, often during the charging process. This can cause the battery pack to catch fire. Laptop computer batteries contain up to nine lithium-ion cells. These cells become dangerous when the internal temperature reaches 350 degrees Fahrenheit. At that temperature the cell goes into thermal runaway. The cell gets extremely hot, then overpressures, releasing flammable liquid electrolyte and may explode. A single cell in thermal runaway generates enough heat to cause adjacent cells to also go into thermal runaway, a chain reaction process.

The FAA, in conjunction with the airline industry, embarked on a series of tests to determine the optimum procedure for fighting a laptop computer fire on board an aircraft. Halon 1211, the typical fire extinguisher installed in passenger aircraft, was effective in extinguishing the burning electrolyte, but did not prevent adjacent cells from going into thermal runaway and catching on fire. It was determined that water was the most effective agent in cooling the remaining cells and stopping the chain reaction. A training video was developed by the Fire Safety Team, which illustrates effective and practical methods of extinguishing a cabin fire involving lithium batteries in a laptop computer. The video, "Extinguishing In-Flight Laptop Computer Fires," may be viewed at the Fire Safety Team website: www.fire.tc.faa.gov.

The FAA issued a Safety Alert for Operators (SAFO 09013, June 23, 2009) entitled, "Fighting Fires Caused by Lithium Type Batteries in Portable Electronic Devices". The purpose of the SAFO is to recommend procedures for fighting fires caused by lithium type batteries in portable electronic devices. Based on testing by the Fire Safety Team of the FAA William J Hughes Technical Center, the SAFO recommends a two phase procedure: (1) extinguishment of the fire, and (2) cooling the remaining cells to stop thermal runaway. Halon 1211 or water fire extinguishers are effective at extinguishing the fire and preventing its spread to additional flammable materials. After extinguishing the fire, dousing the electronic device with water or other non-alcoholic liquids cools the device and prevents additional battery cells from reaching thermal runaway. The SAFO references the FAA training video, "Extinguishing In-Flight Laptop Computer Fires," for additional information and demonstration of the fire fighting techniques.

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Laptop lithium battery fire extinguishment test