
DEPARTMENT OF TRANSPORTATION

**Pipeline and Hazardous Materials
Safety Administration**

[Docket No. PHMSA-2007-27493; Notice
No. 07-02]

**Advisory Guidance; Transportation of
Batteries and Battery-Powered Devices
by Airline Passengers and Crew
Members**

AGENCY: Pipeline and Hazardous
Materials Safety Administration
(PHMSA), DOT.

ACTION: Safety advisory.

SUMMARY: The Pipeline and Hazardous
Materials Safety Administration is
issuing this advisory to inform the
traveling public and airline employees
about the importance of properly
packing and handling batteries and
battery-powered devices when they are
carried aboard aircraft. Thousands of
batteries and battery-powered devices
are safely carried aboard passenger
aircraft each day, but several recent
incidents involving batteries in checked
or carry-on baggage illustrate the risks of
overheating and fire that can occur
when the regulations are not followed.
Federal regulations require that

electrical storage batteries or battery-powered devices carried aboard passenger aircraft be properly packaged or protected to avoid short-circuiting or overheating. In this safety advisory, we suggest various practical measures for complying with the regulations and minimizing transportation risks. Recommended practices include keeping batteries installed in electronic devices; packing spare batteries in carry-on baggage; keeping spare batteries in their original retail packaging; separating batteries from other metallic objects such as keys, coins and jewelry by packing individual batteries in a sturdy plastic bag; securely packing battery-powered equipment in a manner to prevent accidental activation; and ensuring batteries are undamaged and purchased from reputable sources.

FOR FURTHER INFORMATION CONTACT: Hazardous Materials Information Center, Office of Hazardous Materials Standards, PHMSA, Department of Transportation, 400 Seventh Street, SW., Washington, DC, 20590-0001. Telephone: (800) 467-4922 or (202) 366-4488.

I. Introduction

Technological advances and the demands of a mobile society have made the use of portable electronic equipment and other battery-powered devices an established part of the modern American lifestyle. Americans increasingly own—and travel with—portable telephones, computers, cameras, camcorders, entertainment devices, and medical equipment—even cordless power tools. The batteries that power these devices are increasingly as varied as the products themselves: they are manufactured by many different companies, foreign and domestic, rely on a variety of power-generating technologies, established and newer; and come in all manner of shapes and sizes.

Portable battery-powered devices and batteries are safe for transportation when packed properly. But like many other materials that are part of daily consumer use, they must be handled and packaged appropriately to prevent unsafe conditions. A power tool that can be safely used for its intended purpose can cause damage if it is unintentionally activated inside a closed suitcase. Similarly, a battery can cause damage if it is improperly charged, abused, or short-circuited.

II. Safe Transportation of Electronic Devices and Spare Batteries

As the Federal regulatory agency with responsibility for the safe movement of hazardous materials by all modes of

transportation, it is PHMSA's job to establish safety standards for the safe transportation of batteries and battery-powered devices. Our goal is to minimize risks to persons, property, and the environment, while keeping these materials moving in commerce. We apply the highest standards to transportation by air, recognizing that any fire aboard a passenger flight is unacceptable.

A. Passenger Regulations

PHMSA's regulations (Hazardous Materials Regulations (HMR; Title 49, Code of Federal Regulations, parts 171-180)) prohibit the transportation of electrical devices, unless the devices are packed in a manner to prevent sparks or overheating (see § 173.21(c)). Airline passengers who carry batteries or electrical devices in carry-on or checked baggage are responsible for ensuring appropriate steps are taken to protect against dangerous levels of heat that can be generated by inadvertent activation or short-circuiting of these devices while in transportation.

B. Recent Transportation Incidents

Over the past several years, we have received a number of reports of transportation incidents involving various kinds of batteries and battery-powered devices, including incidents involving passenger airline operations. The most recent incident occurred on February 10, 2007, aboard a flight originating at JFK International Airport. Shortly after takeoff, a fire ignited in a passenger bag stowed in an overhead bin. Fast and appropriate action by the crew brought the fire under control and prevented injury to passengers and crew. The flight crew promptly extinguished the fire and the flight returned to JFK for an emergency landing. Although the fire is still under investigation by PHMSA, the Federal Aviation Administration (FAA), and the National Transportation Safety Board (NTSB), preliminary reports indicate batteries were involved in the incident.

Other incidents have occurred on the ground. Last May, we received a report of a fire involving a spare lithium ion battery that had been stowed in a passenger's notebook computer carrying case. A flight attendant removed the burning case from the passenger cabin, and tossed it onto the ramp, where the fire was extinguished by ground personnel.

On April 18, 2004, at Chicago's Midway Airport, a power drill with an installed nickel cadmium battery activated while in checked luggage. This caused a fire that spread to other bags

on a luggage cart waiting to be loaded onto a passenger aircraft.

In June 2003, we received reports that an overheated battery had been discovered in a routine baggage inspection of a flight departing from Logan Airport in Boston. The battery had been loosely packed in a toolbox, along with various metal tools. We believe the heat build-up was caused by short-circuiting when the battery's exposed terminals came in contact with metal objects in the toolbox.

C. Battery Operation and Risks

By design, all batteries operate through a controlled chemical reaction, which generates electrical energy and, in the process, some degree of heat. Batteries are designed to generate an electrical current and transmit power through terminals made of a conductive metal. It is their capacity to perform that basic function that makes them useful but, if not properly handled, designed or manufactured, poses a risk of overheating and fire.

External short-circuiting of a battery can occur from contact or close proximity of metal objects or other batteries near exposed terminals. The newest generation of batteries using lithium metal or lithium ion technology pose particular risks, based on their energy density and chemistry, and because fires involving these batteries are more difficult to extinguish or suppress. Even nickel cadmium and nickel metal-hydride batteries can generate large amounts of current and heat when short-circuited.

As with any product, manufacturing defects also can cause safety problems. Last summer, several major notebook computer manufacturers initiated recalls of their lithium ion batteries after learning of overheating and fires caused by a production defect in the batteries installed in the notebooks. According to the Consumer Product Safety Commission, manufacturers have voluntarily recalled over 10 million lithium-ion batteries in the last few years. We are also aware of risks associated with overcharging and internal short circuits that have led to battery recalls.

D. Measures for Safe Transportation of Batteries

We are aware that travelers want to take appropriate measures to ensure their safety and that of their fellow passengers and may need reminders or assistance to know how to travel safely with batteries. We recommend the following measures to ensure battery terminals are effectively insulated and

batteries and equipment are protected from damage and accidental initiation:

(1) *Keep batteries installed in portable electronic devices.* Passengers can safely carry electronic devices with installed batteries, such as, cellular phones, notebook computers, cameras, camcorders, entertainment devices, and medical equipment, in the passenger cabin of an airplane. When replacing with a spare battery during flight, handle batteries with care and pack spare batteries safely.

(2) *Pack spare batteries in carry-on baggage.* Conditions that could lead to an incident are easier to detect in the passenger compartment of an aircraft. Flight crews have access to fire extinguishers in the event of an in-flight incident involving batteries.

(3) *Keep spare batteries in the original retail packaging.* Batteries purchased from retail stores are packaged in plastic and cardboard packages intended for the transport of those batteries. This packaging prevents unintentional activation and short-circuiting by effectively isolating the batteries from contact with each other and other objects.

(4) *If original packaging is not available, effectively insulate battery terminals.* Effective insulation of battery terminals will ensure batteries do not short circuit from an external source. Travelers can effectively insulate battery terminals by isolating spare batteries from contact with other batteries and metal objects. If the original packaging is unavailable or damaged, place each battery individually in its own protective case, plastic bag or package. A sturdy, resealable plastic bag (*e.g.*, a freezer bag or sturdy resealable sandwich bag) is suitable for this purpose. Covering the battery terminals with insulating tape, such as electrical tape, is another effective method. We recommend using both measures in combination for batteries that have protruding or sharp terminals (*e.g.*, standard 9-volt batteries).

(5) *Do not carry recalled, damaged, or counterfeit batteries.*

Do not carry aboard a plane recalled, damaged or counterfeit batteries. Information about recalled batteries can be found at the manufacturer's Web site or from the Consumer Product Safety Commission (<http://www.cpsc.gov>.) Passengers should only use batteries purchased from reputable sources.

(6) *Prevent inadvertent activation of battery-powered devices.*

Leaving batteries in battery-powered devices is an effective means of insulating the terminals and protecting against internal short-circuiting. However, battery-powered devices with

installed batteries must be packaged to prevent inadvertent activation. Cordless power tools, for instance, should be packed in a protective case, with a trigger lock engaged.

E. Next Steps

The publication of this safety advisory is one of several measures PHMSA is taking, in consultation with FAA, the NTSB, manufacturers of batteries and consumer products, airlines, testing laboratories, the emergency response and law enforcement community and other stakeholders, to respond to the battery-related incidents.

The Air Line Pilots Association, in conjunction with the International Federation of Air Line Pilots Associations, plans to simultaneously publish to their members a Safety Alert and Safety Bulletin respectively, concerning the hazards associated with in-flight passenger electronic equipment fires, and steps crewmembers should take in the event of a fire.

Over the next few months, PHMSA, FAA, and other interested public and private sector organizations will move ahead with actions to enhance battery transportation safety through development and revision of safety standards and public education and outreach.

In the meantime, airline passengers and crew members are reminded of their existing obligations under PHMSA's regulations. As noted above, airline passengers are prohibited from carrying batteries and battery-powered equipment aboard an aircraft unless the device and batteries have been packaged or protected against short-circuiting and overheating.

Issued in Washington, DC, on March 22, 2007.

Theodore L. Willke,

Acting Associate Administrator for Hazardous Materials Safety.

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