



NTSB 2017-2018
MOST WANTED LIST OF
 TRANSPORTATION SAFETY IMPROVEMENTS

Ensure the Safe Shipment of Hazardous Materials



AVIATION

MWL
 MOST WANTED LIST

We recognize the need to address the safety of lithium batteries on airplanes, whether they are carried on board by airline crew and passengers and stored inaccessibly or in cargo compartments, or installed as part of the airplane.

What is the issue?

The light weight and high energy density of lithium batteries, including lithium-ion batteries (LIBs), have made them the power source of choice in portable electronic devices (PEDs), power tools, and other consumer products, creating an enormous demand for their shipment. The same factors have made them an appealing choice to power certain aircraft systems. Yet, the expanded shipment and use of lithium batteries in aviation can pose a threat to flight safety. Recent accidents demonstrate that property can be damaged and lives can be lost when lithium batteries are improperly shipped via air or used in airplane operations.

Over the years, we have investigated or participated in investigations of cargo fires involving lithium batteries that destroyed three cargo transport airplanes, killing the crews of two of them. We also investigated three LIB failures in passenger airplanes in which smoke and liquid electrolyte solution were released from the battery cells. We are currently investigating an LIB fire that destroyed a delivery truck shortly after the package containing the battery was removed from an airplane.

In 2011, our Most Wanted List (MWL) targeted the safe transportation of lithium batteries on aircraft. In 2017-2018, the issue has been expanded to include other hazardous material transportation issues while recognizing the continuing importance of the topic of lithium batteries in aviation. Including this issue on the MWL highlights its continued importance and draws attention to subsequent accidents and actions that have taken place, as well as to the multimodal and multiagency efforts underway to improve the safety of hazardous materials transportation, including the shipment and use of lithium batteries in aviation.

As lithium battery use has grown, the Federal Aviation Administration (FAA) has recorded an increase in related accidents, incidents, and service difficulty reports. We recognize the need to address the safety of lithium batteries on airplanes, whether they are carried on board by airline crew and passengers and stored inaccessibly or in cargo compartments, or installed as part of the airplane. The October 15, 2016, FAA ban on traveling by air with a Samsung Galaxy Note 7 further illustrates the continued risks of onboard fires posed by such devices.

It can be assumed that almost every passenger on a commercial flight is carrying at least one lithium battery. The vast majority of minor service disruptions involving lithium batteries result from the batteries being damaged (for example, cell phones and other



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small electronics can be crushed in the pivot mechanisms of passenger seats). Additionally, many airlines have issued pilots lithium ion-powered electronic flight bags (EFBs) to replace paper aeronautical charts and other documents, or have installed EFBs in airplanes.

Catastrophic aircraft lithium battery accidents that have resulted in loss of life have so far been isolated to cargo fires. However, lithium batteries installed as part of airplane systems have resulted in the release of smoke, fumes, and flammable electrolytes. Testing has revealed that the fumes and electrolytes released in a lithium battery fire are potentially hazardous, and the fires themselves introduce a serious hazard to occupants and the aircraft.

As lithium battery use increases, so does the possibility of loss of life and property. As a result, some air carriers currently refuse to accept lithium battery cargo. The lack of a cohesive airline policy about what passengers may bring aboard has become burdensome. We have issued safety recommendations that call for regulatory and other changes with respect to installed lithium batteries.

What can be done?

Although lithium battery fires are rare, the enormous number of lithium batteries in transportation demands action. Numerous government and industry organizations are actively striving to improve lithium battery safety. On April 11 and 12, 2013, we conducted a public forum on lithium battery safety to call attention to this issue. Since then, the FAA, in conjunction with the Commercial Aviation Safety Team, has established a joint government–industry working group that is developing ways to make lithium battery fires less likely in aviation and to reduce the consequences in case they do occur.

In ground transportation, the US Department of Energy and the National Highway Traffic Safety Administration are focused on the safety of batteries installed in ground vehicles and have conducted or contracted extensive research. Research areas include less volatile chemistries, improved failure detection methods, improved internal protection devices, and safer ways to transport lithium batteries.

We have issued safety recommendations addressing lithium battery safety before and since issuance of the 2011 MWL. As a result of our aviation investigations, several lithium battery related safety recommendations were issued to the FAA and the Pipeline and Hazardous Materials Safety Administration, encouraging them to share critical safety lessons learned, implement mitigations, and conduct research to promote efficient, timely safety improvements.

We continue to share our lithium battery investigation findings and advocate safety recommendations through participation in industry safety working groups such as the UL initiated Battery Safety Council, and industry outreach events and seminars, such as the NASA battery forum and seminars from the Knowledge Foundation. ■



The NTSB Most Wanted List highlights safety issues identified from the NTSB’s accident investigations to increase awareness about the issues and promote recommended safety solutions.

The NTSB is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation – railroad, highway, marine and pipeline. The NTSB determines the probable cause of the accidents and issues safety recommendations aimed at preventing future accidents. In addition, the NTSB carries out special studies concerning transportation safety and coordinates the resources of the federal government and other organizations to provide assistance to victims and their family members impacted by major transportation disasters.

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Related Accidents*

| Date | Location | Accident ID |
|------------------------------------|--|----------------------------|
| February 7, 2006 | Philadelphia, Pennsylvania | DCA06MA022 |
| September 10, 2010 | Dubai, United Arab Emirates | DCA10RA092 |
| July 28, 2011 | Jeju Island, Republic of Korea | DCA11RA087 |
| January 7, 2013 | Boston, MA | DCA13IA037 |
| June 3, 2016 | Brampton, Ontario, Canada | DCA16SH001 |

*For detailed accident reports visit www.nts.gov

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Critical changes needed to reduce transportation accidents and save lives.

