Enhancing Lithium Battery Safety in the Skies

Recommendations based on the work of the Lithium Battery Air Safety Advisory Committee

June 2025

Background

The Lithium Battery Air Safety Advisory Committee (LiBASAC) was established by Congress in 2018 to provide expert guidance on the safe transport of lithium batteries aboard aircraft. The committee aimed to facilitate communication concerning the safe transportation of lithium batteries by air among manufacturers of the batteries, manufacturers of lithium battery-powered products, air carriers, retailers, and the federal government.

The committee, which formally began its work in 2019, was established to provide the Secretary of Transportation, the Federal Aviation Administration (FAA), and the Pipeline and Hazardous Materials Safety Administration (PHMSA) with information about lithium battery technology and transportation safety practices and methods. Another critical remit of LiBASAC was to provide Congress with recommendations to mitigate the risk of transporting batteries on aircraft.

The committee was notified to pause its activities on April 2, 2025. The LiBASAC charter expired on May 9, 2025, before the formal report to Congress was finalized and transmitted. In the absence of that final report, some of the non-government representatives from the committee developed this summary of recommendations based on the unfinished draft that was close to completion and the discourse of the committee's six years of work on the issue.

The following recommendations are based on the work of LiBASAC; however, this report does not include official input of all the former members of the committee (for a list of the members of LiBASAC, please see appendix). It was developed by a subset of the committee that includes 12 former members representing airlines, flight attendants, pilots, nonprofits, industry organizations, and more, listed at the conclusion of the report.

The report is further grounded in recommendations in publicly available data from the FAA and information from UL Standards & Engagement's Thermal Runaway Incident Program (TRIP). TRIP is a voluntary reporting system for the aviation industry to better understand the extent of the problem and prepare for — or, ideally, prevent — future incidents. Participants from 37 passenger and cargo airlines provide detailed information on incidents within their operation.

Lithium Battery Concerns

FAA data and independent studies show that there are now more than two thermal runaway incidents per week in the aviation ecosystem. Lithium batteries — if damaged, overcharged, mishandled, poorly manufactured, or counterfeit — can enter a state of thermal runaway, a chemical reaction that generates extreme heat, fire, and even explosion. In the confined environment of an aircraft, thermal runaway events can be, and in very rare circumstances have been, catastrophic.

While there has not been a commercial passenger flight that crashed from thermal runaway, it has happened to cargo aircraft. A call to action began in 2010 when UPS Airlines Flight 6 crashed near Dubai after cargo — which included more than 81,000 lithium batteries — caught fire in the cargo hold during flight. Additional factors exacerbated the situation, and the plane crashed, killing its two pilots, the only crew on board.

More recently, several incidents on passenger jets have made the news. An Air France plane was recently forced to turn around mid-flight over the ocean after a passenger dropped a phone, a Hawaiian Airlines flight was forced to make an emergency landing in Tokyo when a passenger's device was damaged in the seat, and a Southwest Airlines flight was forced to return to the gate in El Paso after a passenger's phone was damaged and caught fire.

> **There are now more than two thermal runaway incidents per week in the aviation ecosystem.**

In January, a power bank was suspected to have gone into thermal runaway, causing catastrophic damage to an Air Busan plane in South Korea. The power bank was compressed in the overhead bin and caught fire. The 169 passengers and seven crew members on board were able to escape, as the plane was awaiting takeoff when the fire broke out. The plane was a total loss.

Lithium battery fires are particularly challenging due to their speed and intensity. They are also prone to reignite if not properly extinguished. These challenges are even more difficult to deal with in aviation due to factors including the following:

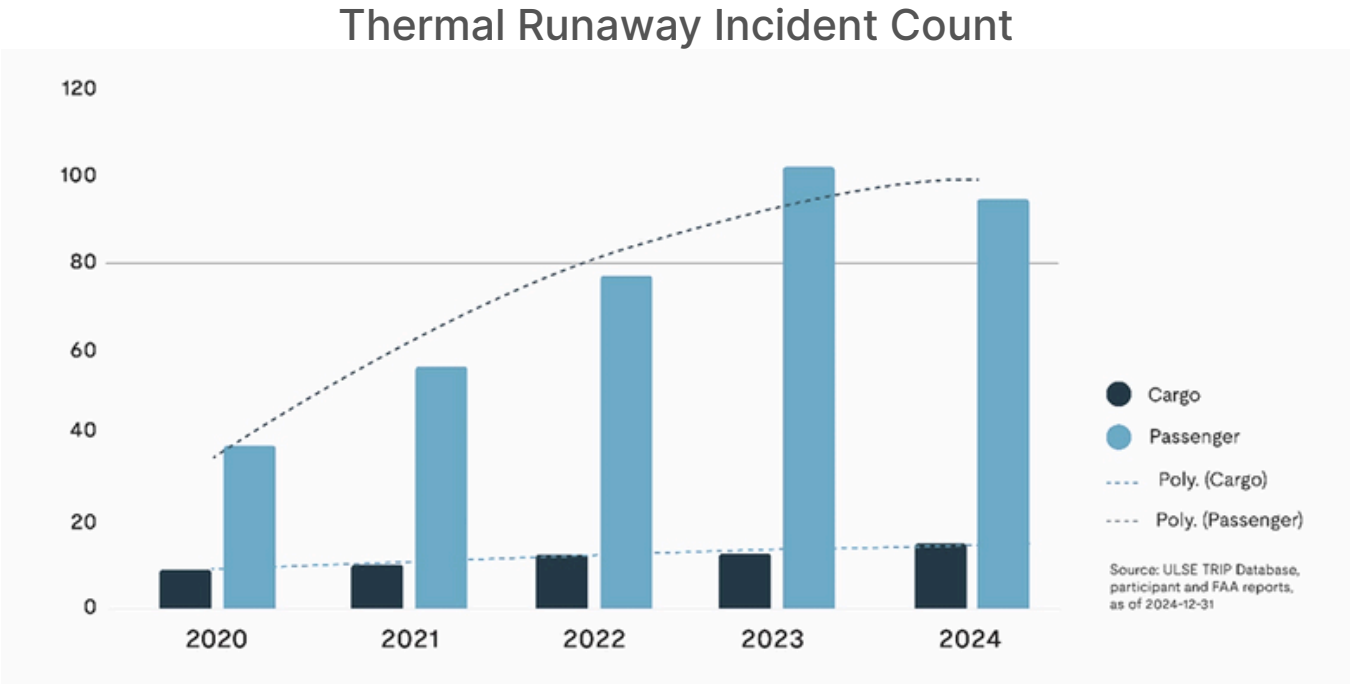
- If a fire occurs in the cabin, the confined space and the presence of many passengers make accessing the battery or device difficult.
- If a fire occurs in the cargo or baggage compartment, the crew's options to fight the fire are limited due to accessibility issues and inadequate suppression systems.[1]

Incident Trends

Data from both industry and government sources confirm that the number and rate of lithium battery thermal incidents is trending upward. In its 2021 report to Congress, LiBASAC included preliminary findings from the newly established TRIP. In addition to including preliminary findings, the report to Congress recommended bolstering information-sharing efforts through TRIP or an alternative program with similar objectives.

UL Standards & Engagement took the lead in investing and growing TRIP and, today, the program has matured significantly, offering more robust insights from the data it collects from its 37 participating airlines and its twice-annual summits for members of the aviation community to learn from one another.

Between January 1, 2019, and December 31, 2024, a total of 501 thermal runaway incidents were reported to the TRIP database. These events occurred across 31 commercial air carriers and at numerous TSA security checkpoints. While the number of reported incidents temporarily declined in 2020 and 2021, mirroring a dip in travel related to the COVID-19 pandemic, incident rates rose sharply in subsequent years with a marginal decrease in 2024.[2]



In 2024, TRIP data shows an average of two flights per week experienced a thermal runaway incident.

Similar data from the Federal Aviation Administration shows an increase in the number of lithium-ion battery fires in 2024: 12 more incidents than in 2023, a 16% increase.

TRIP and FAA data sets include slightly different inputs. FAA data is taken from mandatory federal reporting, while TRIP includes additional reports from every stage of the travel process by factoring in incidents in the terminal, bag checking, security checkpoints, and leaving baggage claim.

Addressing the Risk

Throughout LiBASAC's six-year history, some of the biggest challenges that emerged resulted in recommendations for how to solve them.

1 Inadequate Performance of Fire Containment Products

Thermal containment products, typically called fire or battery containment bags, are designed to contain and suppress fires that may occur in electronic devices, such as laptops or tablets, especially with lithium-ion batteries prone to thermal runaway.

A variety products are marketed to air carriers to mitigate the risk of thermal runaway on aircraft, but not all products perform well. Substandard safety equipment in critical environments creates an illusion of safety. With high stakes, the aviation industry needs to ensure they have reliable products for the safety of crews and passengers. A published consensus-based U.S. National Standard for safety, *The Standard for Safety for Battery Fire Containment Products* (ANSI/CAN/UL 5800), was developed to help the airline industry reduce the safety risk posed by lithium batteries. UL 5800 is a safety standard developed by 47 experts on aviation and fire safety and sets a benchmark for fire containment devices.

In December 2024, the FAA Hughes Technical Center released a report summarizing its testing of several devices.[3] The report abstract states, "Testing suggests that some containment products cannot currently meet the airlines' present expectations for product performance." Testing findings demonstrate that certain fire containment bags used on aircraft do not meet performance standards. Testing showed that products certified to UL 5800 performed adequately. Moving a device in thermal runaway can be hazardous, but some carriers are using these products proactively, isolating a device when there is reason to believe it is damaged or failed prior to thermal runaway.

Using these products proactively can provide additional options for managing the potential for a thermal runaway event. While there is room for improvement, devices certified to UL 5800 are the best option available today. ULSE has identified variations in flight crew training provided by carriers for using battery-powered device containment products. Flight crews should be provided with standardized guidance and training on the use and limitations of such devices.

Recommendation: Fire containment devices that meet UL 5800 performance standards should be on U.S. passenger and cargo carriers (those classified as Part 121 aircraft) and flight crew should receive applicable guidance and training.

2 Noncompliance in Battery Shipments

Due to safety concerns, the International Air Transport Association (IATA), the International Civil Aviation Organization (ICAO), and U.S. Department of Transportation regulations (via 49 CFR 172) require the transportation of batteries not contained in equipment to be at no more than a 30% state-of-charge. An FAA report highlighted that 65% of lithium battery shipments from e-commerce sources violate shipping regulations, including breaches of the state-of-charge requirement.[4]

New state-of-charge recommendations and requirements from ICAO for batteries packed with and contained in equipment go into effect in 2025-2026.[5] Batteries, especially lithium-ion batteries, are more susceptible to thermal runaway at higher states of charge.[6] [7]

Furthermore, a guest speaker at a past LiBASAC committee meeting shared troubling cases of batteries being removed from compliant packaging and sent via unmarked postal shipments on passenger aircraft. These actions introduce extreme risk to commercial aviation.

Recommendation: Provide greater surveillance and enforcement of the existing and soon-to-be-implemented state of charge requirements for battery shipments.

3 Lack of Public Awareness Increases the Risk of Continued Incidents

The traveling public remains largely unaware of the hazards associated with lithium-ion batteries. Some of the most concerning statistics from airline passenger surveys from UL Standards & Engagement show that while the typical passenger carries an average of four rechargeable devices and spare batteries, 50% of Americans know nothing about the power source of these products.

Nearly 2 in 5 (38%) are packing a lithium-ion battery-powered device in their checked luggage.[8] While some of these items are prohibited by regulation because firefighting capabilities are limited in the cargo hold, the lack of awareness and the volume of devices being checked poses a clear safety risk.

Reducing the risk in passenger flight is achievable through improved communication, education, and outreach. UL Standards & Engagement has begun the process of convening a coalition of stakeholders to develop an airline passenger awareness campaign, with the expectation of sharing educational materials and messages at the end of 2025. Building on this effort and finding opportunities across the air travel continuum to share safety messages about traveling with rechargeable products will help educate passengers and support solving what can be a largely avoidable problem.

Recommendation: Collaborate with airlines, UL Standards & Engagement, TSA, FAA, and other stakeholders to improve passenger communications and education with respect to lithium battery risks and thermal runaway prevention measures.

Additional Recommendations for Consideration

Beyond the primary concerns and recommendations outlined above, LiBASAC's work addressed a range of interrelated topics and had further recommendations to put forward for consideration.

- **Deploy enhanced screening and detection systems for luggage:** Implementation of advanced imaging and AI-based algorithms improves the identification of lithium batteries and other hazardous materials hidden in passenger luggage and cargo.

- **Adopt advancements in fire suppression and containment technologies:** Next-generation containment devices and fire-retardant materials now offer longer-duration thermal protection and safer mitigation of battery fires aboard aircraft.

- **Protect supply chain safety and integrity:** Strengthening oversight and traceability throughout the global battery supply chain helps prevent the distribution of counterfeit, poorly manufactured, substandard, or defective lithium-ion products that pose elevated fire risks. In addition to supporting greater aviation safety, it would also protect American consumers who would otherwise bring these products into their homes.

- **Develop consistent protocols for the transport of mobility devices:** Special handling protocols and compliant packaging are critical to safely transporting high-capacity lithium batteries in wheelchairs and scooters. Today, aviation and accessibility regulations are inconsistent with each other.

- **Employ hazard modeling and regulatory gap analysis:** Data-driven risk models and comprehensive reviews of existing standards reveal where current regulations fall short in addressing emerging lithium battery threats across various transport sectors.

The risks associated with lithium-ion batteries are real, recurring, and growing.

The authors of this report, listed below, thank Congress for establishing LiBASAC and are open and ready to advance the committee's purpose. The goal remains the same: to consider and support opportunities to safeguard the traveling public, airline crews, and national infrastructure.

- Marc Boolish, Director, Portable Rechargeable Battery Association
- Captain Bob Brown, Vice President, Coalition of Airline Pilots Association
- Doug Carr, Senior Vice President of Safety, Security, Sustainability and International Operations, National Business Aviation Association
- Jim Davis, President of AccuFleet Testing, CEO of AccuFleet International
- Jennifer Littenberg, Manager, Environmental and Dangerous Goods Compliance, Hawaiian Airlines
- Brandon Martin, Vice President of Battery and Electronic Products and Industry Affairs, Outdoor Power Equipment Institute
- Dinkar Mokadam, OSHA Specialist, Association of Flight Attendants-Communications Workers of America
- Paul Rogers, Subject Matter Expert, International Association of Fire Fighters Foundation
- Mike Tobin, Dangerous Goods Program Director, Alaska Airlines
- Veronica Wilson, Director of Hazardous Materials Transportation, Walmart
- David Wroth, Thermal Runaway Incident Program Lead, UL Standards & Engagement
- Eva Ames, Former LiBASAC Member
- Captain Scott Schwartz, Former LiBASAC Member

Endnotes

1. DOT/FAA/TC-16/37, *Summary of FAA Studies Related to the Hazards Produced by Lithium Cells in Thermal Runaway in Aircraft Cargo Compartments*. June 2016.
2. UL Standards & Engagement, *Lithium-ion Battery Incidents and Their Impact on Aviation Safety*. June 2025.
3. DOT/FAA/TC-24/39, *An Evaluation of Fire Containment Products for Inflight Fires Resulting from Portable Electronic Devices*. December 2024.
4. Keslar, Dan. *A Study of the SOC of Lithium-ion Batteries in Transportation*. 2023.
5. ICAO Doc 9284, *Technical Instructions for the Safe Transport of Dangerous Goods by Air*. 2025-2026.
6. DOT/FAA/TC-16/37, *Summary of FAA Studies Related to the Hazards Produced by Lithium Cells in Thermal Runaway in Aircraft Cargo Compartments*. June 2016.
7. Joshi, Tapesh & Azam, Saad & Lopez, Carlos & Kinyon, Steven & Jeevarajan, J. *Safety of Lithium-Ion Cells and Batteries at Different States-of-Charge*. Journal of The Electrochemical Society. 167. 140547. 10.1149/1945-7111/abc8c4. 2020.
8. UL Standards & Engagement. *Lithium-Ion Battery Incidents in Aviation: 2024 Data Review*. June 2025.

Appendix

Former Members of LiBASAC the Lithium-Ion Battery Air Safety Advisory Council

The most recent roster for LiBASAC, which includes individuals who have retired or recently left roles, included:

- Eva Ames, Vice President of Electrification & Mobility Competence Center, DSV
- Marc Boolish, Director, Portable Rechargeable Battery Association
- Bob Brown, Vice President, Coalition of Airline Pilots Association
- Doug Carr, Senior Vice President of Safety, Security, Sustainability and International Operations, National Business Aviation Association
- Jim Davis, President of AccuFleet Testing and CEO of AccuFleet International
- Doug Ferguson, Associate Technical Fellow, Boeing
- Mike Henisse, Principal Program Manager, World Wide Dangerous Goods Engagement, Amazon
- Jennifer Littenberg, Manager, Environmental and Dangerous Goods Compliance, Hawaiian Airlines
- Todd Mackintosh, Technical Fellow Rechargeable Energy Storage Systems, General Motors
- Brandon Martin, Vice President of Battery and Electronic Products and Industry Affairs, Outdoor Power Equipment Institute
- Dinkar Mokadam, OSHA Specialist, Association of Flight Attendants-Communications Workers of America
- Kathleen O'Shei, Senior Director of Environmental, Health, Safety, and Security, Integer
- Bill Reese, Director of Hazardous Materials Programs, Commercial Vehicle Safety Alliance

Former Members of LiBASAC the Lithium-Ion Battery Air Safety Advisory Council (cont.)

- Paul Rogers, Subject Matter Expert, International Association of Fire Fighters Foundation
- Tim Rogers, Director of Air Dangerous Goods, UPS Airlines
- Stephanie Rossetti, Senior Program Manager of International Trade & Dangerous Goods Compliance, Medtronic
- Alicia Saenz, Program Manager, Apple
- Scott Schwartz, Director of the Dangerous Goods Program, Air Line Pilots Association
- Tim Sheppard, Vice President of Supply Chain and Logistics, Samsung Electronics America
- Mike Tobin, Dangerous Goods Program Director, Alaska Airlines
- Veronica Wilson, Director of Hazardous Materials Transportation, Walmart
- David Wroth, Thermal Runaway Incident Program Lead, UL Standards & Engagement

Designated federal officers for committee:

- *Duane Pfund, International Program Coordinator, U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration*
- *Dick Hill, Chief Scientific & Technical Advisor for Fire Safety Aircraft Fire Safety, Federal Aviation Administration (alternate)*