

2025 DATA REVIEW

Lithium-Ion Battery Incidents in Aviation



Table of Contents

Summary	3
Key Takeaways	4
Reversing the Trend	5
Lithium-Ion Powered Devices Stored Out of Reach by Region	6
The Thermal Runaway Incident Program	8
Thermal Runaway Incident Rates and Trends	9
What Passengers Know About Lithium-Ion Batteries	11
Packing Practices Reveal Troubling Behavior	12
Global Data Shows Differences in Awareness, Behavior, and Concern	16
How to Reverse the Trend	18
The Approach to Methodology	23

Today, we depend on an expanding ecosystem of rechargeable devices powered by lithium-ion batteries. Quietly and incrementally, we have transformed into a Rechargeable Society.

These batteries are everywhere. They are in our smartphones, fitness trackers, toothbrushes, laptops, tablets, and portable chargers. These products enhance our lives, support our productivity, and allow us to stay connected to work, friends, and family without being tethered to an outlet. As our reliance on rechargeable technology grows, so does the importance of understanding its risks. Yet, the majority of U.S. adults are unaware that most of the rechargeable devices they use every day are powered by lithium-ion batteries.

In aviation, this awareness gap presents a clear risk. Rechargeable devices like phones, laptops, tablets, and portable chargers have become essential to the air travel experience. However, the lithium-ion batteries that power them pose the risk of entering thermal runaway, an uncontrollable, self-heating state that can lead to smoke, fire, or even explosion if they are damaged, improperly charged, poorly manufactured, or counterfeit.

Lithium-ion battery fires burn with intense speed and heat, which can potentially cause significant and widespread damage within seconds.

They can also be more challenging to extinguish compared to other fires. At 30,000 feet, responding to such an event becomes significantly more complex.

To better understand and address this threat, UL Standards & Engagement has been collecting thermal runaway incident data from airline partners and surveying passengers about their experiences and awareness. Together, these insights reveal a

more complete picture of the safety challenges, the opportunities to reduce risk, and the best strategies for containing incidents when they occur.

The third annual review of findings from UL Standards & Engagement’s Thermal Runaway Incident Program (TRIP), combined with U.S. passenger survey data, shows that thermal runaway remains a serious and persistent safety concern. Data from this review shows an average of more than two (2.36) thermal runaway passenger-related incidents per week, an uptick from an average of just over two (2.05) incidents per week from 2024, with portable chargers now the leading culprit of these incidents.

Overhead bin fires have been among the most severe incidents, prompting some airlines to restrict device placement to areas where crews can respond immediately.

Airlines globally have independently implemented their own restrictions on the use and storage of portable chargers. In the past year, major carriers have also made their own changes to policies that restrict the usage, charging, or placement of portable chargers (and in some cases vapes or e-cigarettes) brought on board.

In the event of thermal runaway, having a containment solution on board that is certified to UL 5800, the Standard for Battery Fire Containment Products, can offer crew members critical time to control the incident and get the plane on the ground safely, helping to manage the event.

Even minor incidents can be disruptive to passengers and airline operations, resulting in delays, diversions, or returns to the gate — a reminder that proper storage and passenger awareness both play a major role in helping keep flights safe.

These trends underscore an urgent need for greater awareness, stronger prevention efforts, and more effective mitigation strategies as our society becomes increasingly rechargeable.

Key Takeaways

- 1

Thermal runaway incidents on passenger flights continue to rise.

There was a 15% increase in incidents from 2024 to 2025, continuing a long-term upward trend since ULSE began tracking incidents.
- 2

Portable charger incidents showed a 42% jump over last year, making them the leading device involved in incidents.

Portable chargers surpassed 2024’s top culprit, e-cigarettes, which also showed a 26% jump. Cell phones round out the third type of device linked to incidents.
- 3

Weekly average incidents rose to more than two per week.

There was an uptick in the average number of passenger incidents, reaching 2.36 per week in 2025, up from 2.05 per week in 2024.
- 4

Battery incidents in aviation cost an average of approximately \$1.8 million a year.

ULSE estimates that thermal runaway incidents on commercial passenger flights have conservatively cost about \$7.3 million in damages and loss from 2021-2024, averaging approximately \$1.8 million per year. That translates to an estimated \$96,000 per incident in damage, disruption, and associated losses.
- 5

Latin American and Asia-Pacific travelers report higher concern about thermal runaway in aviation.

In the first-ever inclusion of global data in the TRIP report, ULSE found that Latin American (79%) and Asia-Pacific (83%) travelers reported higher levels of concern about battery safety onboard and are more supportive of additional safety measures compared to Europe (74%) and North America (67%).

Reversing the Trend

With more lithium-ion battery-powered devices than ever carried on board, on average four rechargeable devices per passenger, the corresponding increase in thermal runaway incidents is unsurprising. Airlines and the flying public should be prepared for the risk thermal runaway brings. There are strategies to reduce the risk that can make a difference in passenger and crew safety across aviation:



Passenger education

ULSE surveys show an alarming lack of awareness and concerning behavior among U.S. airline passengers. However, more airlines are creating policies around portable devices alongside the ULSE Passenger Safety Awareness Campaign. Clear, repeated, and contextualized education on the issue will help passengers contribute to reducing the risk.



Cabin crew training

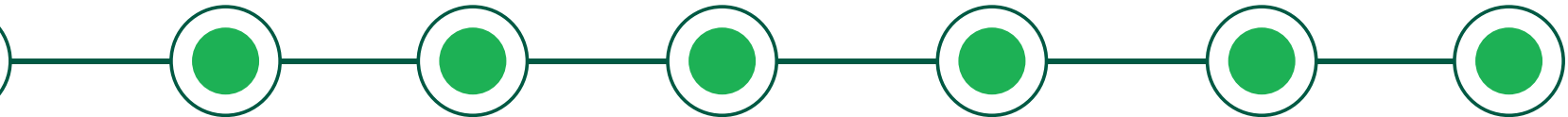
According to ULSE interviews with aviation professionals, all cabin crew are trained to respond to thermal runaway incidents on board an airplane. However, they noted that training can lag behind fast-moving technology and should be revised to mimic real-life situations. Training that is linked to available equipment, that is regularly evaluated and revised, and that replicates common, real-world scenarios will help improve training that cabin crew receive.



Standards for onboard safety equipment and baggage/cargo handling

To help mitigate potentially catastrophic incidents, ULSE publishes standards that help address the risks and hazards of thermal runaway. These standards include UL 5800, Battery Fire Containment Products; UL 5840, Electrical Systems of Battery Powered Aviation Ground Support Equipment; and the forthcoming UL 5810, Active Fire Protection for Air Cargo Containers, in addition to standards for batteries and devices themselves.

Partnerships across industry, government, and other stakeholder groups are necessary to inform and implement all three recommendations.
Diverse perspectives and experience will bolster collective efforts and help drive impactful change.



Lithium-Ion Powered Devices Stored Out of Reach by Region

30% of travelers are putting rechargeable devices out of reach. Mitigation of incidents requires quick action, therefore out-of-reach rechargeable devices pose a greater threat.

Key:


Laptop


Tablet


E-cigarette


Portable charger

West North Central

 39.2%

 32.5%

 75.4%

 43.6%

Mountain

 50%

 32.5%

 53%

 46.7%

Pacific

 51.1%

 35.5%

 52.3%

 56.1%

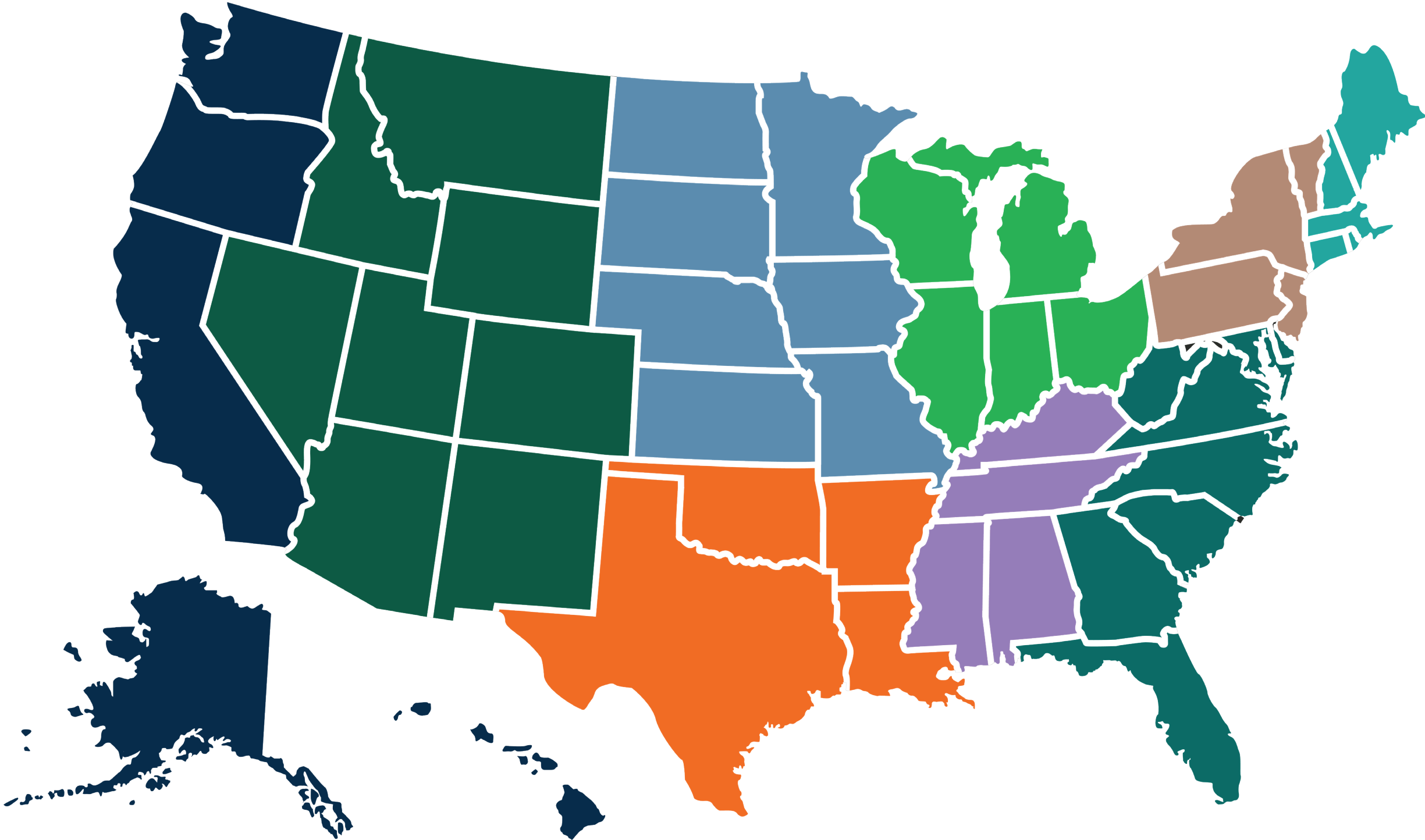
West South Central

 42.2%

 36.7%

 61.6%

 52.1%



East North Central

 52.3%

 43.4%

 58.2%

 62.4%

Mid-Atlantic

 51.1%

 35.5%

 52.3%

 56.1%

New England

 42.1%

 23.8%

 41.9%

 57.8%

South Atlantic

 51.1%

 35.5%

 52.3%

 56.1%

East South Central

 40.5%

 44.8%

 49.6%

 47.6%

The Thermal Runaway Incident Program

UL Standards & Engagement leads the Thermal Runaway Incident Program, a voluntary reporting system designed for the aviation industry to better understand the extent of the problem and prepare for, or possibly even help prevent, future incidents.

Participants from more than 40 passenger and cargo airlines around the world provide detailed information about incidents within their operation into the TRIP database. The information is anonymized and shared with aviation industry and safety organizations, offering insights to help improve the safe

transport and usage of goods powered by lithium-ion batteries. The TRIP database is designed to capture data on the frequency, characteristics, and consequences of lithium-ion battery thermal runaway incidents in passenger and cargo operations.

At the end of 2025, the TRIP database contained a total of 1,164 incident records. These incident records date back to 2006, when a counterfeit battery in a flashlight went into thermal runaway on a cargo flight. This report specifically analyzes the data from passenger flight incidents in 2025.



In 2025, there was a major **jump of 15% in thermal runaway incidents** on passenger planes. Out of the 137 thermal events in 2025, **90% of those involved passenger operations.**

The Economics of Thermal Runaway Incidents

To better understand the impact of thermal runaway on U.S. commercial passenger flights, ULSE conducted an economic analysis of the factors of the thermal runaway incidents that resulted in significant passenger disruption on commercial flights within the U.S. from 2021 to 2024.

ULSE estimated the overall cost on passengers and airlines by analyzing travel disruptions for passengers, operational impact on airlines, and injuries resulting from thermal runaway incidents. Thermal runaway incidents can cause unintended and cascading impacts across the food service, hospitality, and retail industries where travelers who have thermal runaway incidents disrupt flights are displaced.

In looking at 2021 through 2024, thermal runaway events on U.S. commercial passenger aircraft may have caused at least 76 significant flight disruptions and three cases of injury. ULSE estimates that thermal runaway on commercial passenger flights that had significant flight disruption have conservatively cost about \$7.3 million in damages and loss, resulting in an average of about \$1.8 million per year, or \$96,000 per incident.

**ULSE conducted an in-depth economic analysis on thermal runaway on commercial passenger planes which will be published independently from this report.*

Thermal Runaway Incident Rates and Trends

In 2025, there was a **15% increase in thermal runaway incidents on passenger planes**, from 107 in 2024 to 123 in 2025. This increase can be partially attributed to the growth in airlines participating in the TRIP program but is also reflective of a long-term trend that shows consistent increase over time. Thermal runaway events rose from 2.05 incidents per week in 2024 to 2.36 incidents per week in 2025 on passenger planes. As incidents continue to rise, both traditional news and social media are playing a role in shaping the national conversation around battery safety and thermal runaway events. The heightened visibility appears to be influencing public perception: the share of passengers who report they are less willing to fly because of awareness about thermal runaway incidents on flights went from 27% in 2024 to 34% in 2025. At the same time, overall awareness remains relatively low.

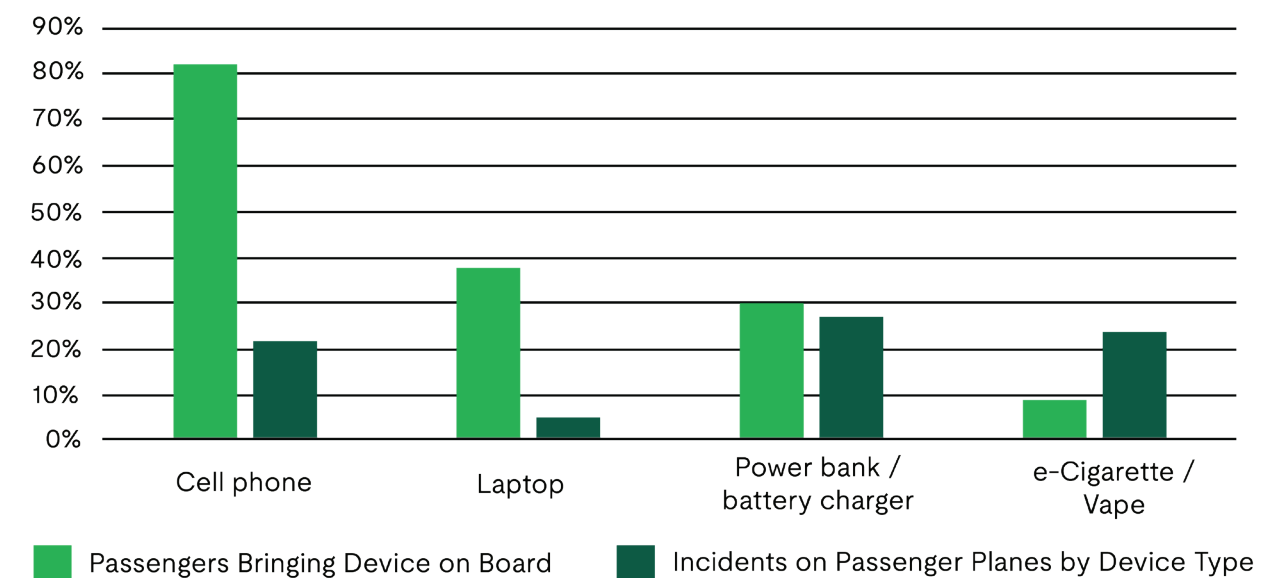
The Federal Aviation Administration also collects data on battery incidents, though there are key differences between TRIP and FAA data sets. FAA data is taken from mandatory federal reporting, while TRIP includes additional reports from every stage of the travel process by factoring in

incidents in the terminal, bag checking, security checkpoints, and baggage claim. FAA's database is limited to airlines certificated in the U.S. and foreign carriers' flights operating in U.S. airspace, while TRIP data includes foreign carriers and their flights throughout international airspace. Finally, the FAA has, at times, excluded overheating incidents, while TRIP data includes any report that includes the characteristics of explosion, fire, smoke, or heat.

Apart from the obvious dangers of a thermal runaway incident, TRIP data reveals that 12% of 2025 passenger flights that experience an onboard incident result in a diverted landing, return to the gate, emergency evacuation, or unplanned deplaning. These outcomes mean substantial disruptions, delays, or even cancellations that inconvenience travelers.

9% of adults report hearing about an aircraft thermal runaway incident, a figure that has trended slightly downward despite incidents increasing.

Some Devices Most Responsible for Incidents Carried by a Small Percentage of Passengers



The Leading Devices Behind Thermal Runaway Incidents in 2025

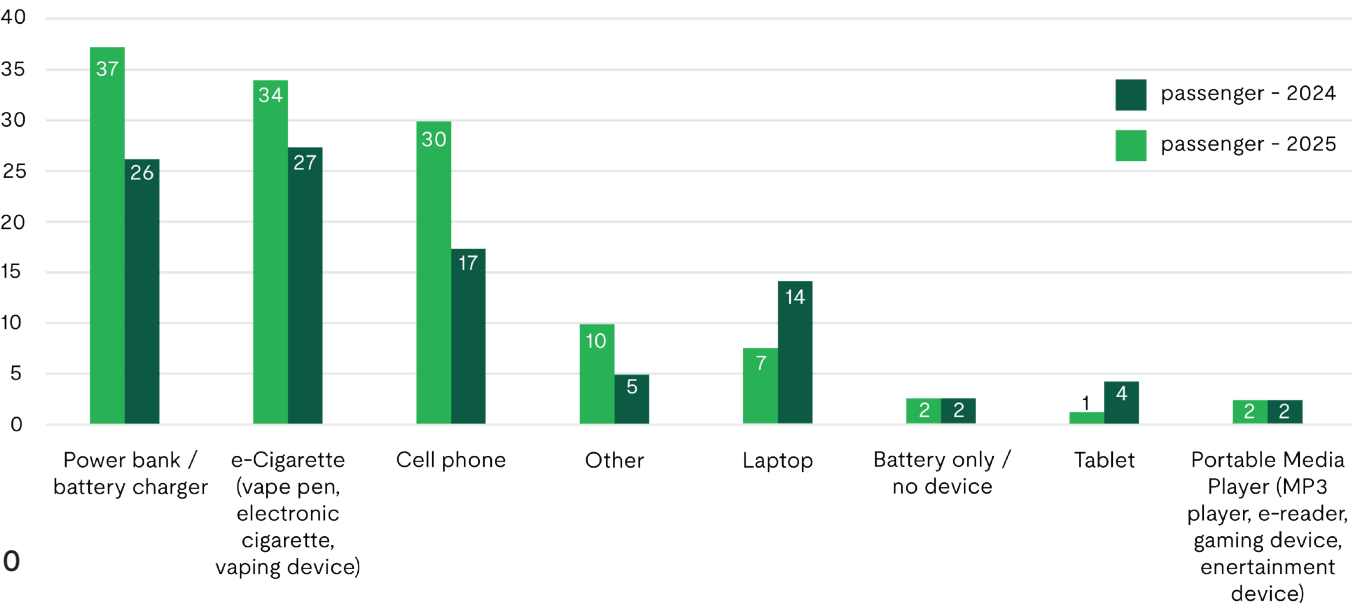
Nearly all airline passengers (96%) typically bring at least one rechargeable product containing lithium-ion batteries on board. The average traveler brings four devices, most commonly smartphones (82%), laptops (38%), wireless headphones (38%), and tablets (35%). Almost one third (30%) brings a portable charger with them, while 9% travel with an e-cigarette or vaping device.

Among the common types of devices carried on board by passengers, some are more significant potential contributors to thermal runaway incidents than others. **Portable chargers were responsible for the most incidents in 2025, with 30% of reported incidents attributed to these devices on passenger flights.**

The recent increase in portable charger incidents is not fully understood. Handling may play a role, as portable chargers are often treated more casually than laptops or smartphones. Portable chargers also lack operating protections of both hardware and software controls that current smartphones and laptops incorporate in their battery management systems, which provide a higher level of protection. Additionally, portable chargers vary more widely in quality than laptops and smartphones, with some devices containing uncertified, substandard, or counterfeit battery cells that can increase safety risks.

An incident can involve multiple thermal runaway characteristics. In 63 independent passenger incidents, explosion, fire, smoke, and heat, or a combination of those characteristics were cited. Fires were reported in nearly 18% of the incidents. Three were described as explosions.

Thermal Incidents, by Device Type



CRJ-440 | Small Jet

44 passengers | 3 crew members
approximately 188 devices on board.



A380 | Large Jet

525 passengers | 20 crew members
and approximately 2,180 devices on board.

What Passengers Know About Lithium-ion Batteries

28%
of passengers
would never
fly an airline
again if a major
thermal runaway
incident
occurred on
one of its planes

51%
of respondents
say they are
concerned
about other
passengers'
devices
overheating

58%
of Americans
are unaware
that lithium-
ion batteries
power many
products they
routinely use

45%
of respondents
say they are
concerned
about their
own devices
overheating

As more types of products adopt lithium-ion battery technology, they become more difficult for consumers to identify. The 2025 TRIP data showed a continued proliferation of the types of devices behind incidents. While they may not be reaching the same percentages as portable chargers, vapes, and cell phones, the growing usage of lithium-ion batteries in a variety of rechargeable products has brought a wide variety of items onto planes. Cabin crew interviewed by ULSE have reported seeing lithium-ion batteries in everything from children's toys to travel blenders to battery-assisted strollers.

Despite the prevalence of lithium-ion battery powered devices, nearly half (45%) of Americans admit to knowing nothing about these batteries. Further, 3 in 5 consumers (58%) are unaware that lithium-ion batteries power many of the products they routinely use. These knowledge gaps have serious implications for aviation safety.

When exposed to information about thermal runaway and the potential safety risks, travelers showed greater concern about the safety of other passengers' devices compared to theirs: 51% of respondents say they are concerned about other passengers' devices overheating; 45% are concerned about their own.

The upward trend of thermal runaway incidents may lead to eroding passenger confidence. Regarding a major thermal runaway incident (i.e., device catching fire), 43% of passengers surveyed said it would lead them to avoid traveling with an airline, and 28% said they would never fly that airline again. Moderate incidents (i.e., visible smoke from a device) would cause 44% to avoid the airline, with 18% saying they would not fly the airline again. Even minor incidents (i.e., a device overheating) would lead 31% of travelers to avoid the airline and 14% to never fly it again.

Despite the strong pull to avoid or stop flying in the wake of a thermal runaway incident, many travelers still underestimate the threat their devices pose on airplanes and engage in behaviors that run counter to best practices, especially when it comes to where they are packing them.

Packing Practices Reveal Troubling Behavior

Lithium-ion battery-powered devices should never be packed in checked baggage or in overhead compartments. Keeping these products within arm’s reach in the cabin provides better ability to handle thermal runaway incidents before they become a bigger threat.

Unfortunately, many passengers do not follow this critical practice because they do not understand the dangers of packing rechargeable devices in checked luggage. Airlines warn travelers about lithium-ion batteries more than ever. However, these warnings may go unseen and unheard.

When asked about what they recall seeing and hearing about lithium-ion batteries, 52% of airline travelers are either unsure or did not see any signage or hear announcements about lithium-ion batteries during their travels. This lack of awareness results in rechargeable devices that are often out of reach. Approximately 39% of passengers admit to putting lithium-ion powered products in their checked luggage. Despite the dangers of having devices powered by lithium-ion batteries in checked luggage or in overhead compartments, it continues to occur.

Airlines participating in TRIP have shared that TSA screeners may remove laptops, cell phones, and other personal electronic devices from checked bags that have swollen batteries or other damage. However, devices that do not show such outward signs of damage are not being removed. Devices that enter thermal runaway in checked baggage cannot be accessed by crew while in flight, and fires in the cargo hold may not be detected as quickly as they would in the cabin. There are limited options to fight fires in the cargo hold: typically only through means such as halon extinguishers and oxygen-depriving systems. However, these methods are not effective on lithium-ion battery fires, which are more difficult to extinguish and more likely to reignite compared to other materials.

Where Passengers Are Packing Rechargeable Devices

	Smartphone	Laptop	Tablet	Portable Charger	E-cigarettes
At My Seat	91%	53%	63%	46%	44%
Out of Reach	9%	47%	37%	54%	57%
Overhead Bin	5%	27%	20%	26%	22%
In Checked Luggage	4%	20%	16%	27%	35%



54% of portable chargers are in checked luggage or the overhead compartment, not within arm’s reach.

Where Incidents Happen and How to Educate Passengers

TRIP data shows that in 27% of passenger flight incidents during 2025, the battery or device exhibiting thermal runaway symptoms was stored in a bag, backpack, or purse. In 33% of incidents, the device was carried or held by the person but was not in use, a significant increase of 12 percentage points from the previous year. In 11% of incidents, signs of thermal runaway occurred while the device was in use. In 12% of incidents, devices were charging using the aircraft’s USB or AC outlets when they went into thermal runaway.

The speed of containment is critical in thermal runaway. The speed at which thermal runaway can intensify means that, within seconds, the other events could have been more serious.



For portable chargers, vaping devices, and smart luggage with removable batteries, the majority were stored out of reach and out of sight in every region, creating additional safety risks.

Passenger education can significantly help reduce the threat of thermal runaway. Communicating best practices on how and where to pack rechargeable devices needs to happen before passengers arrive at the airport. Among U.S. passengers 39% said they would prefer to receive lithium-ion battery safety information during booking, and another 31% said they would favor email (ideally through some simple dos and don’ts). This type of straightforward guidance would be most effective according to 88% of passengers. Clarity also matters. A large majority (80%) of passengers want airlines to clearly communicate lithium-ion battery safety measures.

Feedback from both flight attendants and passengers shows that public understanding of lithium-ion battery risks remains low.

Many travelers are unsure whether their personal devices even contain batteries, and they often overlook existing airport signage. Others understand them to be “rechargeable devices” vs “devices with lithium-ion batteries.”

Passengers described the airport environment as fast paced and overwhelming, noting that important safety messages can be easily missed. They emphasized that information about lithium-ion batteries needs to be delivered through multiple channels, such as the mobile app, inflight videos, and email, to ensure it is noticed and understood.

Several themes emerged:



Limited awareness: “When I’m in the airport everything is a blur. I don’t pay attention to the signs.”



Motivation through safety:

“Most people will look into something that can cause them harm during their flight.”



Uneven emphasis: Passengers noted that liquid restrictions are heavily stressed, while lithium-ion battery rules are not.



Desire for education: Travelers expressed that they want clearer guidance so they can be better prepared.

From Check-In to Baggage Claim: When Incidents Occur

As noted earlier, TRIP data covers the continuum of air travel, from the moment passengers walk into the airport until they pick up their luggage at baggage claim. Any thermal runaway incident on an aircraft is a serious safety concern, but the risk significantly increases once the plane is at 30,000 feet.

12% of thermal runaway incidents occurred during critical phases of flight

This includes takeoff, climb, descent, final approach, and landing. During these phases, the risk is inherently higher. Furthermore, passengers cannot evacuate and the ability to clear the area where an incident is occurring is hampered, unsafe, or not possible.

Two-thirds (63%) of thermal runaway incidents occurred during the cruising phase.

BAGGAGE CLAIM →

In 2025, 2% of thermal runaway incidents occurred during the baggage handling process

This is defined as the entire chain of events from when a passenger turns over a bag to the airline to when the passenger retrieves the bag at baggage claim. The 2025 figure is down from 5% in 2024 but still includes at least one incident at nearly every step of the baggage handling process, with baggage claim being the only exception.

84% of thermal runaway incidents reported in 2025 occurred on the aircraft
(a decrease from 89% in 2024).

Cargo is frequently carried on commercial flights. In fact, **approximately 25% of cargo is transported on passenger flights.** Learn more about TRIP cargo incident data in the [ULSE report](#)

Global Data Shows Differences in Awareness, Behavior, and Concern

Regional variations in traveler battery safety perceptions and behaviors show widespread differences in concern and support for safety measures yet reveal an opportunity for locally relevant communications.

Latin American (79%) and Asian-Pacific (79%) travelers generally report higher concern about thermal runaway in an aviation context (74% of Europeans are concerned and only 67% of North Americans) and feel more personally at risk. These groups are also more likely to self-educate on lithium-ion battery safety practices, but unsafe packing habits persist, particularly for high-risk items like portable chargers. By comparison, North American and European travelers show similar levels of awareness and concern, though Europeans are more supportive of additional battery safety measures and are more willing to pay for them. North Americans report the lowest support rates and are the least willing to accept added inconvenience in exchange for higher levels of safety.

Awareness of devices powered by lithium-ion batteries is low globally, and passengers continue to practice unsafe habits with some high-risk products they bring onboard. More than 3 in 10 do not know what lithium-ion batteries are, and this lack of awareness and understanding of potential risks can lead to unsafe usage habits.

The proportion of travelers packing portable chargers unsafely is especially concerning. 67% of Asia-Pacific portable charger owners, 58% of European owners, 60% of North American owners, and 63% of Latin American owners are bringing their devices on flights, representing thousands of these devices in the air at any given time. Among those bringing portable chargers, 42% in Latin America place them in checked luggage at a substantially higher rate of unsafe packing compared to other regions including Europe (28%), Asia-Pacific (25%), and North American (23%). However, the broader issue is not limited to Latin American travelers. At least a quarter of travelers with portable chargers

around the globe are exposing themselves and other travelers to potential risks through their packing decisions. Across regions and borders, awareness is a global concern.

Eighty-one percent of Asian-Pacific travelers, 63% of Latin Americans, 58% of Europeans, and 57% of North Americans recall lithium-ion battery safety messages or announcements during their last trip, and more than 8 in 10 worldwide would support even more battery safety messages from airlines. Typically, these announcements or messages are seen or noticed when passengers are moving through security checkpoints (ranging from 21% to 46%, regionally). However, most travelers would prefer to receive lithium-ion battery safety information during booking, including 34% of North Americans, 27% of Europeans, 25% of Latin Americans, and 19% of Asia-Pacific travelers.

Preferences also differ by region when it comes to information delivery methods. North Americans (31%) and Europeans (25%) would prefer to receive these announcements via

Around two-thirds (65%) of travelers across the board recall lithium-ion safety announcements, but there is a disconnect between when travelers notice these announcements, and when they would prefer to receive them.

email, but Latin Americans (24%) and Asia-Pacific travelers (18%) travelers would be more likely to choose in-person briefings.

Airline selection criteria also vary by region, particularly around safety measures and price. Latin American and Asia-Pacific travelers generally prioritize caution and safety compared to their European and North American counterparts. Nearly 9 in 10 Latin American (89%) and Asia-Pacific (87%) travelers would support airline safety measures such as limits on the max capacity of portable chargers and restrictions on in-flight charging. This support is also strong among Europeans (83%), but notably lower among North American (72%) travelers. Finally, 90% of Latin American and 85% of Asia-Pacific travelers support the hypothetical requirement of storing personal electronic devices in special fire-resistant bags while on a plane, compared to 83% of Europeans, and only 71% of North Americans.

Overall, the findings point to a global lithium-ion battery safety challenge, with regional differences in concern, behavior, and appetite for airline intervention. Latin American and Asia-Pacific travelers appear more concerned about

safety and more supportive of additional safety measures, while North American travelers are less willing to accept cost or convenience trade-offs. Simultaneously, unsafe packing behavior remains common globally, even among travelers who recall safety messaging.



How to Reverse the Trend

With more rechargeable devices carried on board by passengers, the corresponding increase in thermal runaway incidents is unsurprising. Unsurprising does not mean acceptable.

Strategies to reduce the risk emerge via TRIP, active participation of the aviation community, and additional insights and analysis from ULSE’s surveys, interviews, ethnographic research, and focus groups. Three areas of opportunity surfaced:



1

Cabin Crew Procedures and Training

All cabin crew are trained to respond to thermal runaway incidents on board an airplane. Procedures vary across airlines according to the layout of the plane, number of crew on board, and available safety equipment such as fire extinguishers, containment products, and personal protective equipment.

Cabin crew self-identified gaps in their understanding of thermal runaway events and the appropriate order of operations when addressing these fires.



The recommendations that emerged through ULSE’s conversations with cabin crew include the following:

- Training design and procedures should be closely linked to available safety equipment.
- Planes should be equipped with the appropriate safety equipment in the correct locations.
- Training should be evaluated and revised based on emerging risks.
- Training should replicate common, real-world scenarios, such as a device overheating in an overhead bin or between seats, or a fire occurring during the critical phases of a flight.

2

Standards for Safety Equipment on Board

To help address these potentially catastrophic incidents, containment products have been developed and marketed to airlines. These products are typically bags or boxes large enough to hold a laptop computer, and are designed to suppress the flames, smoke, and off-gassing from lithium-ion battery fires. The FAA does not currently require airlines to have this equipment on aircraft, but some airlines have taken the initiative to stock their fleets.

Efficacy and ease of use are essential to mitigating battery

fires using these products. As a result, ULSE was approached by aviation industry representatives to develop a safety standard for them. The collective effort resulted in UL 5800, Battery Fire Containment Products, first published in 2020. In-scope containment products are intended for use in the aircraft's passenger cabin or flight deck by authorized personnel for lithium-ion battery-powered portable electronic devices that are entering or have entered thermal runaway.



In order to comply with UL 5800, a containment product must:

- 1 Be operable by one user without assistance and include safety information, permanent markings, and operating instructions.
- 2 Include all required components, personal protective equipment, gloves, and peripheral materials.
- 3 Address devices with electrical energy up to 300 Wh.
- 4 Contain all flames, shrapnel, sparks, and other harmful debris during a thermal runaway event.
- 5 Control smoke according to two performance levels. Level 1 requires all visible smoke to be confined within the product, while Level 2 permits no more than 5 m² of total smoke release.
- 6 Keep surface temperatures within specified limits for handles, contact surfaces, and dedicated vents.



ULSE is currently working with a technical committee and other stakeholders on the development of UL 5810, Active Fire Protection for Air Cargo Containers, to help address lithium-ion battery-related hazards in cargo and some baggage-handling settings. Additionally, UL 5840, Electrical Systems of Battery Powered Aviation Ground Support Equipment, was published in 2022 to help address hazards related to ground support equipment operating around aircraft.

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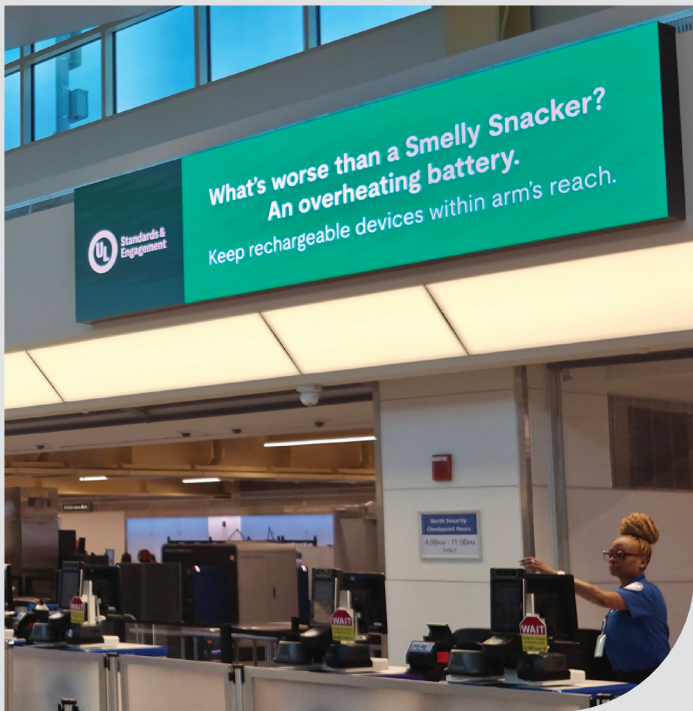
Passenger Education

Most passengers do not know about best practices for packing and handling lithium-ion battery powered devices. Education can make a difference, even if the message is simply to keep rechargeable devices within arm’s reach.

Both frequent and infrequent fliers reported that to change their behavior, they would like to receive information reinforcing the message about how to pack these devices in different ways and with greater frequency than they do currently. Successful passenger awareness efforts must be clear, consistent, and present at multiple points before and during the

passenger journey to raise awareness and result in behavioral change. Nearly 9 in 10 (88%) passengers say they would want simple dos and don’ts.

Last year, ULSE launched its passenger safety initiative, an educational campaign emphasizing the importance of keeping devices within arm’s reach so travelers can move quickly in the event of thermal runaway. The campaign was disseminated digitally via social media and online advertising and placements in select U.S. airports, and its reach will be expanded in 2026 and beyond.



The Approach to Methodology

Survey Methodology

This report combines findings from two survey series designed by UL Standards & Engagement (ULSE) Insights and administered online by BV Insights.

The first dataset is drawn from the 2025 U.S. Trending Data tracker, (n=8,041 U.S. adults). The margin of sampling error at 95% confidence for aggregate results is +/- 1.09%. Differences between population segments are noted where statistically significant at the 95% confidence level.

The second dataset reflects a global survey (n=10,804 adults) across Latin America, Europe, North America, and Asia-Pacific. A single margin of sampling error is not reported for these results given the inclusion of multiple countries with distinct sampling and weighting parameters.

Sampling error is larger for subgroups of the data. As with any survey, sampling error is only one source of possible error. While non-sampling error cannot be accurately calculated, precautionary steps were taken in all phases of the survey design and the collection and processing of the data to minimize its influence.

Qualitative Methodology

In addition to the survey data, this report draws on qualitative research to provide deeper context on how aviation stakeholders understand, experience, and respond to lithium-ion battery and thermal runaway risks. Passenger-focused research includes a digital ethnography (N=7) and focus groups with business (N=50) and leisure (N=46) travelers held in person in Atlanta, Dallas, and Chicago, and online in NYC, Orlando, and Los Angeles. The report also draws on qualitative research with cabin crew and airline decision-makers, including a digital ethnography (N=4), focus groups (N=38), and in-depth interviews (N=9). Qualitative data were transcribed, uploaded into the MAXQDA software platform, and analyzed with a hybrid coding frame.

Economic Methodology

ULSE used various data sources to conduct an economic analysis to determine an estimate of the impact of thermal runaway events that caused significant flight disruption from 2021 to 2024. The modeling and results presented here are based on information provided by ULSE and third parties, upon which ULSE has relied on producing a report and estimates in good faith. Any subsequent revision or update of those data will affect the assessments and projections shown.

To derive the estimates of thermal runaway incidents with significant flight disruption and associated costs, ULSE considered several indicators collected by TRIP, DOT, BTS, etc. Due to the lack of data, ULSE could not fully quantify the cost of damage associated with the spillover effect of thermal runaway parameters.

Incident Analysis Methodology

ULSE draws on TRIP member voluntary incident reports for incident data. Member airlines report full thermal runaway incidents as well as near misses. A thermal runaway is defined as an incident that results in explosion, fire, smoke, or a dangerous evolution of heat. TRIP represents a subset of the industry, and data is not normalized by number of participating airlines nor miles flown. This approach conforms to other incident reporting systems’ methodologies, including the Federal Aviation Administration.

Data from prior years' annual reports may not be comparable with the data in this report, as some airlines have contributed historical incidents from 2024 and earlier.

