UL Standards & Engagement

UL STANDARDS & ENGAGEMENT INSIGHTS AND POLICY ANALYSIS

The Impact of Public Awareness Gaps Around Lithium-Ion Batteries in Air Travel

More than two in five Americans

are unaware of risks associated with lithium-ion batteries overheating and leading to thermal runaway.

Lithium-ion batteries power some of today's most widely used consumer products, from personal electronics and rechargeable cordless home tools to electric bikes and electric vehicles. Further, many lithium-ion battery-powered devices, including phones, laptops, tablets, and portable power packs, are integral to the air travel experience.

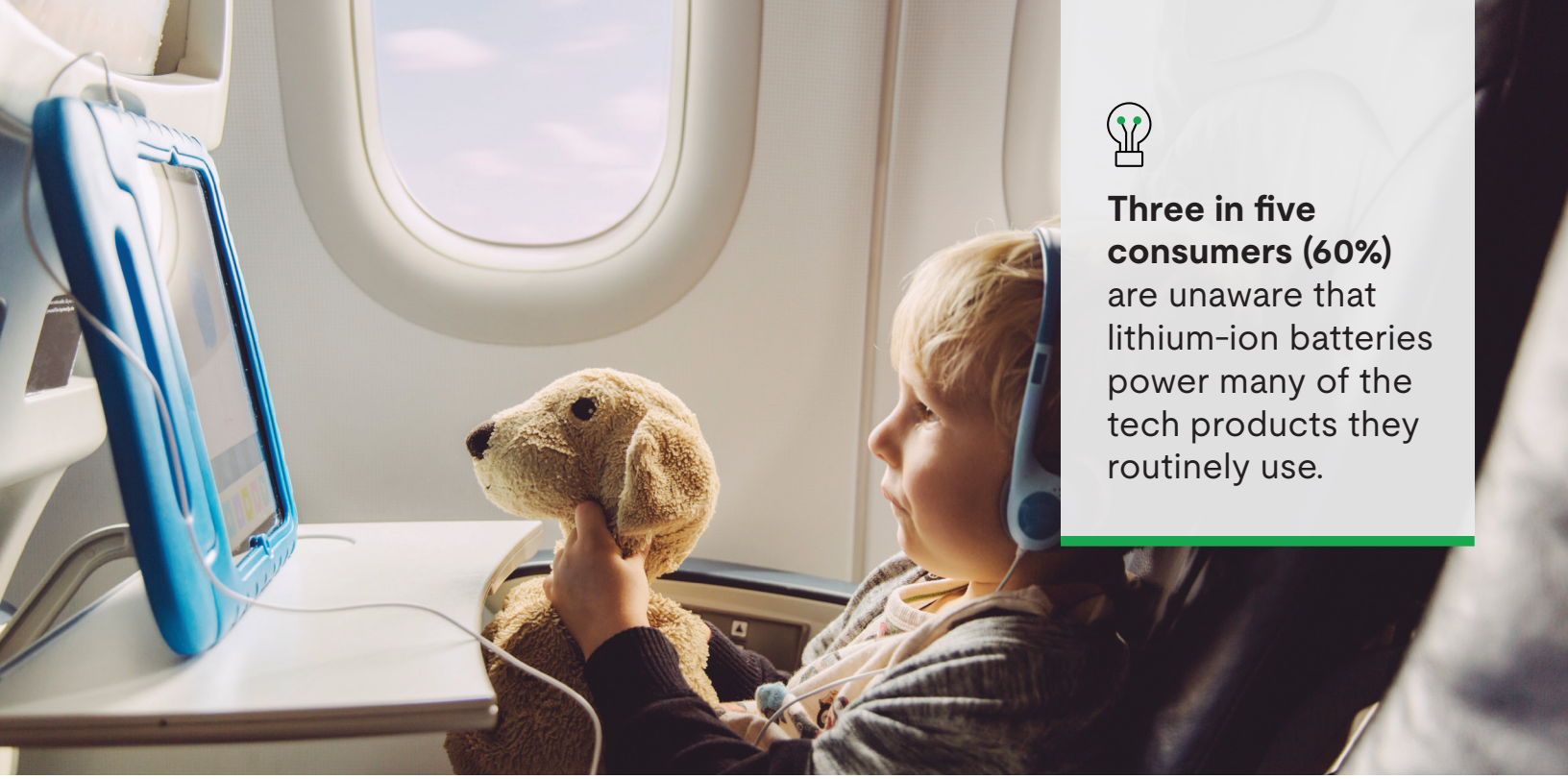
Air travel increased 37% from 2022 to 2023, leading to more passengers and the lithium-ion battery-powered devices they bring with them. These batteries, while efficient and widely used, can present safety hazards if damaged, improperly charged, poorly manufactured, or counterfeit. Those hazards become more complicated at 40,000 feet.

Airlines and airports are taking steps to mitigate the risks, including having battery fire containment products on board and warning passengers at check-in not to place lithium-ion battery-powered devices in their checked luggage. Further, 24 passenger and cargo carriers, including the largest in the industry, participate in UL Standards & Engagement's Thermal Runaway Incident Program, voluntarily reporting incidents to the TRIP database and participating in program summits to solve for risk.

Still, consumer awareness of products that rely on lithium-ion batteries and the risks they may carry is concerningly low. Across four waves fielded between August and December in 2023, ULSE surveys consistently found that more than two in five Americans are unaware of risks associated with lithium-ion batteries overheating and leading to thermal runaway.

These knowledge gaps, combined with the notion of assumed safety, have serious implications for aviation safety. Many airline travelers underestimate the threat their devices pose while traveling on airplanes and practice behaviors that run counter to best practices, such as ignoring battery safety signage and not following in-flight device storage recommendations – if they are even aware of them.

Below is an in-depth look at key trends across four separate UL Standards & Engagement online surveys on Lithium-Ion Battery Safety and Aviation fielded in August, September, October, and December 2023. Survey results shown below represent simple averages across these four waves.



Three in five consumers (60%) are unaware that lithium-ion batteries power many of the tech products they routinely use.

Consumers' Assumed Safety Conflicts With Lack of Awareness

Nearly all respondents own at least one rechargeable or cordless product powered by lithium-ion batteries, and these products are often used daily. Yet, many consumers do not believe they or their family members are at risk from lithium-ion batteries overheating. If such risks do occur, these consumers admit they are not familiar with how to mitigate them.

Consumers know little about lithium-ion batteries:

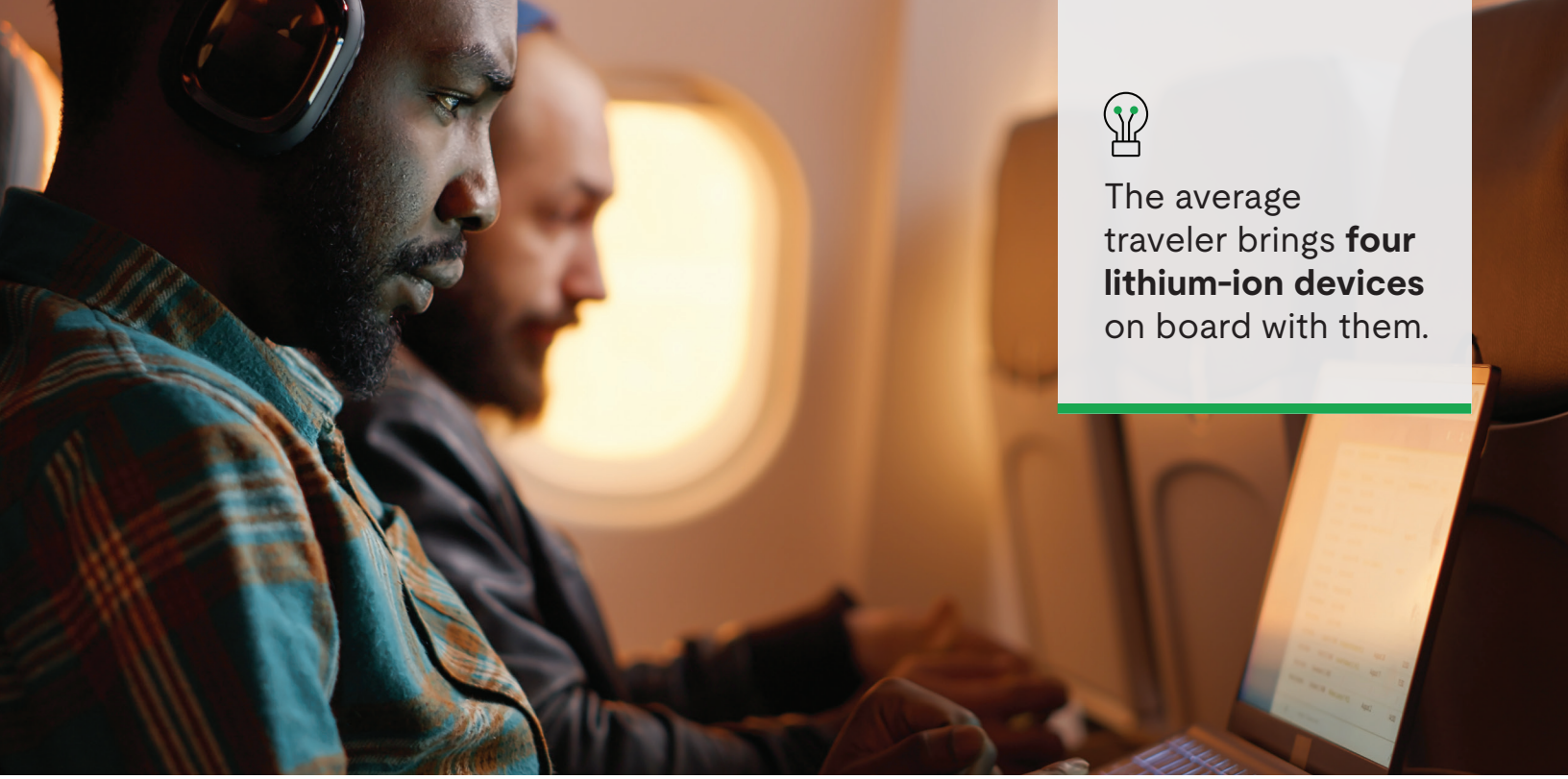
Virtually all respondents said they own at least one lithium-ion battery-powered product, from smartphones and tablets to small kitchen appliances. Yet more than two in five (44%) Americans admitted to knowing nothing about lithium-ion batteries. It follows that many consumers (58%) do not feel the risks are relevant to them personally, and 63% say they are unfamiliar with how to reduce those risks.

Uncertainty over what powers their devices:

In addition to knowing little about lithium-ion batteries, three in five consumers (60%) are unaware that lithium-ion batteries power many of the tech products they routinely use. Even for popular technology products such as smartphones, tablets, and laptops, at least two in five consumers (46%) are unaware that lithium-ion batteries power these devices.

Affordability trumps safety in purchase decisions:

More than two in five (44%) choose replacement chargers and batteries for their personal electronics based on what's affordable, regardless of manufacturer or certification. Some so-called "affordable" options can be substandard or counterfeit, making them more likely to go into thermal runaway.



The average traveler brings **four lithium-ion devices** on board with them.

The Lithium-Ion Battery-Powered Devices Passengers Are Packing

Nearly all flyers bring a device powered by lithium-ion batteries on board with them when traveling by plane, and it is leading to a rise in thermal runaway incidents on aircraft.

Nearly all airline passengers bring lithium-ion batteries on board:

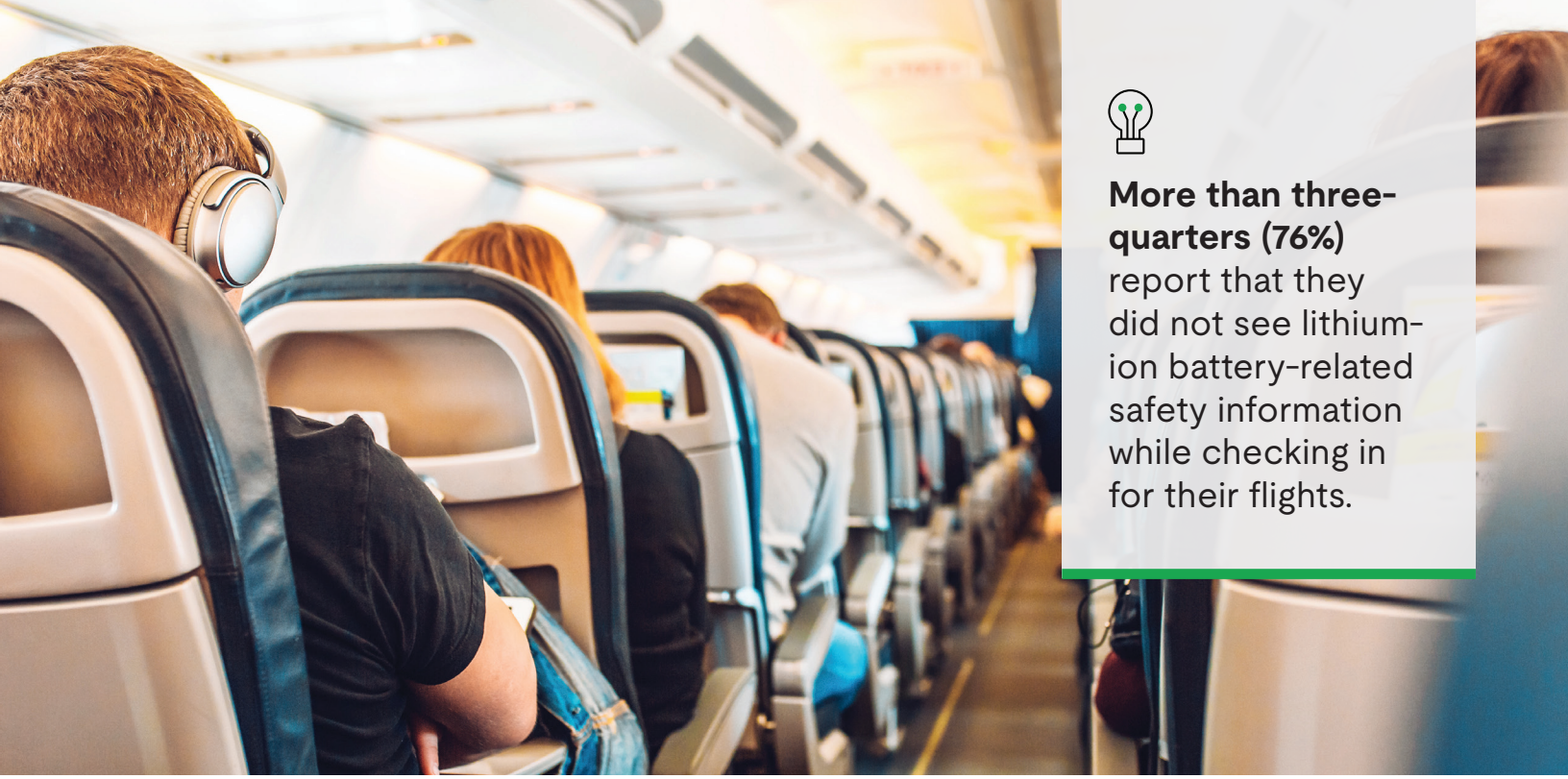
96% of airline travelers typically bring at least one rechargeable product containing lithium-ion batteries with them, with the average traveler bringing four devices on board with them — smartphones (82%), laptops (41%), wireless headphones (39%), and tablets (36%). 31% bring a portable charger or power bank with them, while 10% travel with an e-cigarette or vaping device.

Thermal runaway incidents are on the rise:

According to ULSE's TRIP data, thermal runaway incidents increased during 2023 to the highest point recorded in the database's five-year history.

E-cigarettes are the leading cause of incidents:

The 2023 ULSE TRIP database found that e-cigarettes were the leading cause of thermal runaway incidents on airplanes, accounting for 35% of all reported incidents. The second-most reported devices were power banks and cell phones, each accounting for 18% of incidents, respectively. Laptops were responsible for 13% of reported incidents.



More than three-quarters (76%) report that they did not see lithium-ion battery-related safety information while checking in for their flights.

Flight Passengers Are Missing the Message

A majority of airline passengers are either missing airport signage or are unaware of airline policies regarding battery safety. The absence of that knowledge leads to mistakes that present a risk to travelers and crew.

Passengers are missing safety messages:

More than three-quarters (76%) report that they did not see lithium-ion battery-related safety information while checking in for their flights. More than half of travelers do not recall seeing or hearing (38%) or do not know if they saw or heard (14%) safety signage regarding lithium-ion batteries during online check-in, at the airport, or on the plane.

Lithium-ion batteries are being packed in checked luggage:

Devices that go into checked baggage cannot be accessed by crew while in-flight, yet among those traveling with e-cigarettes — the leading cause of thermal runaway incidents — 27% pack them in checked luggage. Another 27% are putting portable power banks in checked luggage. Thermal runaway in the baggage compartment of an aircraft is a critical safety risk.

Devices in cabin are often out of reach:

More than a quarter of passengers are storing laptops (27%) and power banks and portable chargers (26%) away from visible sight in overhead compartments. Keeping devices in arm's reach mitigates risk, as only 12% of 2023's reported incidents in the TRIP database occurred while a device was being used.

Mitigating the Thermal Runaway Risk in Aviation Through Standards

More than half (53%) of U.S. adults are not aware that there are standards that exist to oversee safety and performance of lithium-ion batteries, let alone standards for battery fire containment products that can be stored on aircraft to help suppress thermal runaway or extinguish battery fires on board. Products that conform to standards help lower the risk of thermal runaway incidents occurring on aircraft.

ULSE was approached by representatives of the aviation industry to develop a safety standard for containment products used to suppress lithium-ion battery fires: UL 5800, Battery Fire Containment Products. These containment products are intended to be used by authorized personnel on commercial, private, and military flights for portable electronic devices such as cellphones, tablets, and e-cigarettes if they are actively experiencing thermal runaway or fire in the cockpit or main passenger cabin.

Although ULSE has developed standards for a variety of electronics incorporating rechargeable lithium-ion batteries — as well as the actual batteries — issues can still arise due to damage, misuse, or manufacturing errors, which can cause a battery to enter thermal runaway and ignite. When these issues occur during flight, products covered by UL 5800 can help to prevent a potential disaster.

Methodology:

The results are taken from four ULSE Insights surveys, each consisting of responses from 2,000+ U.S. adults conducted August 28-30, 2023, September 25-29, 2023, October 23-27, 2023, and December 8-13, 2023. All studies were designed and formulated by UL Standards & Engagement. Surveys were administered online by BV Insights. As a member of the Insights Association and ESOMAR (the European Society for Opinion and Marketing Research), BV Insights adheres to industry ethics and best practices, including maintaining the anonymity of respondents.

The margin of sampling error at 95% confidence for aggregate results is +/- 2.2%. 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.

Note: All numbers are percentages unless otherwise noted. Figures may not total 100% due to rounding.

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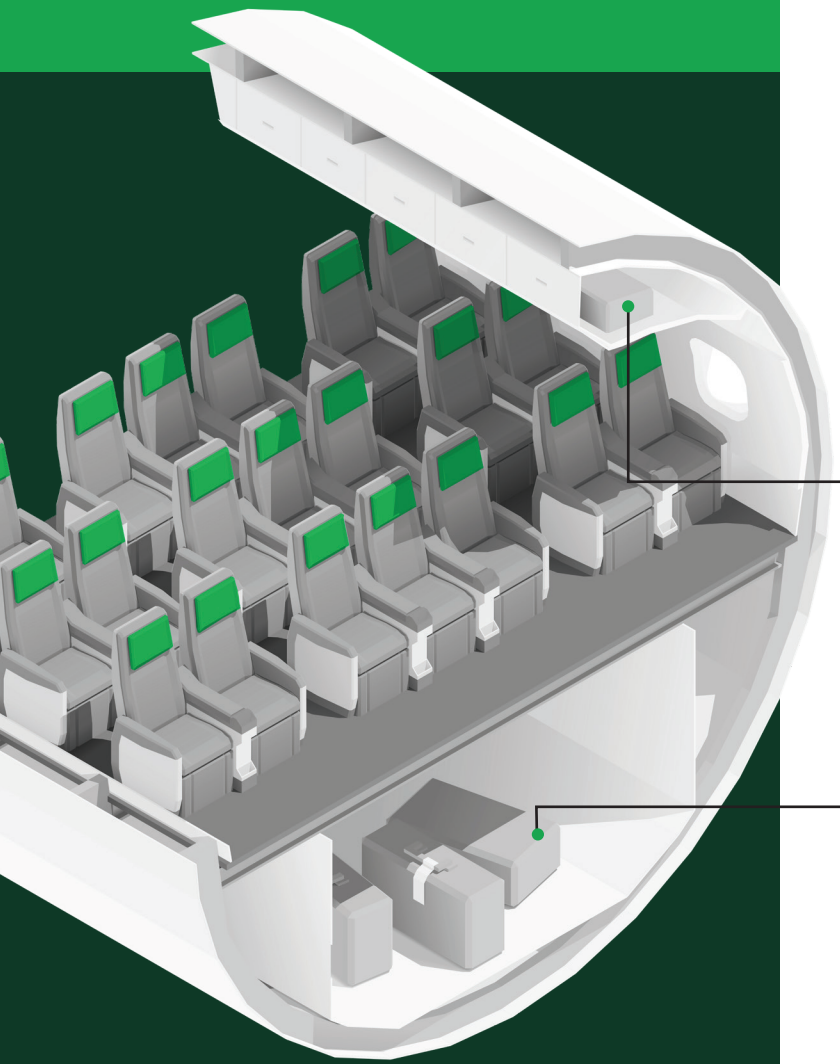
Understanding Thermal Runaway Risks in Aviation

Thermal runaway is a state of uncontrollable heat that can result in fire or explosion if the lithium-ion battery is damaged, overcharged, or defective.



52% of airline travelers either don't know or don't remember if they saw either signage or heard an announcement regarding lithium-ion battery safety on planes

96% of airline travelers typically bring at least one rechargeable product containing lithium-ion batteries with them when traveling on an airplane

35% of all reported thermal runaway incidents on airplanes started from e-cigarettes

53% of passengers store their power banks and portable chargers away from visible sight

Where do passengers store their lithium-ion batteries?

Overhead Compartment	
27%	**Laptop**
26%	**Portable Charger**
18%	E-Cigarette
17%	Tablet
5%	Smartphone

Checked Luggage	
27%	**E-Cigarette**
27%	**Portable Charger**
15%	Laptop
15%	Tablet
3%	Smartphone

Source: ULSE Aviation & Thermal Runaway Insights Surveys Aug-Dec 2023