U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, DC 20591

November 2, 2021

The Honorable Maria Cantwell
Chair
Committee on Commerce, Science, and Transportation
United States Senate
Washington, DC 20510

Dear Chair Cantwell:

Section 333(e) of the FAA Reauthorization Act of 2018 directed the Secretary to provide an initial report and two subsequent annual updates to Congress describing efforts to improve interagency and international cooperative efforts to ensure compliance with safety regulations for air transport of lithium batteries. The initial report was sent to Congress in February 2020. Enclosed is the first annual update report to Congress on the progress in meeting the requirements of Section 333(e) of the FAA Reauthorization Act of 2018, P.L. 115-254.

We look forward to continued collaboration with your staff and would be happy to schedule time to brief you further, if desired.

A similar response has been sent to the Ranking Member of the Senate Committee on Commerce, Science, and Transportation and to the Chair and Ranking Member of the House Committee on Transportation and Infrastructure.

Sincerely,

Steve Dickson
Administrator

Enclosure

U.S. Department
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**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, DC 20591

November 2, 2021

The Honorable Roger F. Wicker
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate
Washington, DC 20510

Dear Ranking Member Wicker:

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800 Independence Ave., S.W.
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November 2, 2021

The Honorable Peter A. DeFazio
Chair
Committee on Transportation and Infrastructure
House of Representatives
Washington, DC 20515

Dear Chair DeFazio:

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Office of the Administrator

800 Independence Ave., S.W.
Washington, DC 20591

November 2, 2021

The Honorable Sam Graves
Ranking Member
Committee on Transportation and Infrastructure
House of Representatives
Washington, DC 20515

Dear Ranking Member Graves:

Section 333(e) of the FAA Reauthorization Act of 2018 directed the Secretary to provide an initial report and two subsequent annual updates to Congress describing efforts to improve interagency and international cooperative efforts to ensure compliance with safety regulations for air transport of lithium batteries. The initial report was sent to Congress in February 2020. Enclosed is the first annual update report to Congress on the progress in meeting the requirements of Section 333(e) of the FAA Reauthorization Act of 2018, P.L. 115-254.

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Steve Dickson
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Federal Aviation
Administration

# First Annual Update to Congress on Cooperative Efforts to Ensure Compliance with Aviation Safety Regulations for Lithium Batteries

*Safety is Our Mission*

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## Executive Summary

Section 333(e) of the Federal Aviation Administration (FAA) Reauthorization Act of 2018 ("the Act"; Public Law No. 115-254) directs the Secretary of Transportation to carry out a wide range of activities related to lithium batteries, to include action that would revise regulations to harmonize with international standards, evaluate packaging standards, and provide fora to encourage stakeholder input.

This report relays the FAA's efforts towards continuous improvement related to stakeholder engagement and cooperative activities undertaken to reduce noncompliance with transport requirements. This report also identifies domestic and international efforts currently underway by the Pipeline and Hazardous Materials Safety Administration (PHMSA). The Department of Transportation is working in collaboration with stakeholders to further lead in the enhanced, safe transport of lithium batteries.

The initial report was submitted to Congress on February 26, 2020. Section 333(e)(3) of the Act sets forth the reporting requirement, whereby a report is mandated annually for two years after submission of the initial report.

This report updates the initial report in its entirety related to continued and new actions, with emphasis on the following sections:

- FAA's Role in Lithium Battery Safety
- PHMSA's Role in Lithium Battery Safety
- DOT's Role in International Transportation of Lithium Batteries
- FAA Safety Promotion Activities
- Continued Outreach and Safety Promotion
- DOT's Compliance and Enforcement
- International Compliance and Enforcement

## Background

Lithium batteries are one of the Department's and civil aviation's significant safety concerns because they are susceptible to overheating and producing flames, explosions, and potentially toxic gases. Concerns with lithium batteries in air cargo cannot be managed flight by flight, battery by battery, package by package, or manufacturer by manufacturer. The aviation and lithium battery industries are too extensive to manage risk this way. For air carriers to have confidence in the transport of lithium batteries, the level of risk needs to be controlled with accountability and transparency. Therefore, it is important for the air transport industry to take a systems-based approach to manage risks. Stakeholders have to do their part in safety risk management by manufacturing lithium cells, batteries, and devices in accordance with appropriate regulations, quality standards, and processes. In addition, manufactures/shippers must ensure that those products are appropriately tested,

package marked, and labeled before offering them into transportation to manage risks to the overall National Airspace System.

Moreover, efforts have to be implemented and accepted on both a national and international level for aviation safety. Every product that touches an aircraft represents the cumulative effort of multiple organizations in the supply chain (e.g., supplier, manufacturer, distributor, retailer, and consumer). In this collaborative process, any single action can impact aviation safety. Everyone in the supply chain must make an effort to prevent and mitigate risks that could exceed the capability of the aircraft to safely transport.

## FAA Reauthorization Act of 2018

Section 333 of the FAA Reauthorization Act of 2018 (Public Law No. 115-254) directs the Secretary of Transportation to carry out a wide range of activities related to lithium batteries, including revising regulations to harmonize with international standards, evaluating packaging standards, and providing fora to enhance stakeholder input.

Section 333(e)(1) directs the Secretary to improve interagency and international cooperative efforts to ensure compliance with safety regulations for air transport of lithium batteries. More specifically, Section 333(e)(2) directs the Secretary to conduct the following activities:

- Encourage training programs at locations outside the United States where substantial cargo shipments of lithium ion or lithium metal batteries originate. See Sec. 333(e)(2)(A).
- Work with Federal, regional, and international transportation agencies to ensure enforcement of safety regulations with respect to shippers who offer noncompliant shipments of lithium ion and lithium metal batteries. See Sec. 333(e)(2)(B).
- Share information, as appropriate, with Federal, regional, and international transportation agencies regarding noncompliant shipments. See Sec. 333(e)(2)(C).
- Pursue a joint effort with the international aviation community to develop a process to obtain assurances that appropriate enforcement actions are taken to reduce the likelihood of noncompliant shipments. See Sec. 333(e)(2)(D).
- Provide information in brochures and on the internet in appropriate foreign languages and dialects that describe the actions required to comply with safety regulations. See Sec. 333(e)(2)(E).
- Develop joint efforts with the international aviation community to promote a better understanding of the requirements of, and methods of compliance with, safety regulations. See Sec. 333(e)(2)(F).

Section 333(e)(3) sets out the requirement for this report: "*Not later than 120 days after the date of enactment of this Act, and annually thereafter for 2 years, the Secretary shall submit to the appropriate committees of Congress a report on compliance with the policy set forth in subsection (e) and the cooperative efforts carried out, or planned to be carried out, under this subsection.*"

This report provides the first annual update to the initial report, required by Section 333(e)(3), related to stakeholder engagement and enforcement activities being taken to reduce noncompliance with battery transport requirements. The following information identifies domestic and international efforts currently underway by the Department of Transportation (DOT, "the Department").

## DOT's Approach to Lithium Battery Safety

As transportation safety is the Department's mission, the safe air transportation of lithium batteries is a priority. Both the Pipeline and Hazardous Materials Safety Administration (PHMSA) and FAA take a comprehensive approach to enhance such safety by working with international organizations towards that priority.

The comprehensive approach includes supporting lithium battery harmonization between domestic and international regulations; promoting battery safety with shippers of batteries and battery-powered devices; communicating information with our international partners on the hazards associated with the transportation of batteries; and working with and encouraging the battery industry to assist in promoting battery safety. FAA and PHMSA have employed many tools, such as education, stakeholder engagement, collaboration, and, when required, various enforcement techniques to focus on this significant issue in the transportation sector.

## FAA's Role in Lithium Battery Safety

The FAA's role is at the forefront in the aviation landscape, which has changed dramatically over the past decade. Several factors in particular are increasing the complexity of the industry and introducing different sources of safety risk into the aerospace system. These factors include concerns with lithium batteries and related emerging technologies that are being increasingly transported as aircraft cargo or passenger carry-on luggage. The FAA takes any risks to aviation safety very seriously, and lithium battery safety remains a top priority for the FAA. To fulfill the FAA's role in promoting safety (49 USC 183(d)(1), the FAA monitors and manages safety risk in the aerospace system through a Safety Management System (SMS) comprising four pillars: Safety Policy, Safety Risk Management (SRM), Safety Assurance, and Safety Promotion. The FAA initiates education and stakeholder engagement campaigns, responds to lithium battery noncompliance, and collaborates with air carriers to ensure compliance. Stakeholder engagement activities primarily support the Safety Promotion pillar.

In meeting its oversight responsibilities, the FAA uses risk-based surveillance to collect system data and analyze the safety of air transportation of hazardous materials, such as lithium batteries. The safety-data analysis of hazardous materials involves using metrics associated with key system elements to assess existing system safety risks, monitor trends in incidents, identify emerging hazards, and characterize system changes that affect safety. This SRM process facilitates safety assurance with the use of enforcement actions or additional surveillance, where necessary, to reduce the chance of recurrence. Additionally, the SRM process identifies targeted areas that may benefit from safety promotion to mitigate risks before incidents or accidents occur.

The FAA's role in managing risks in the aviation system also includes working with air carriers. This collaborative effort includes development of processes to monitor and control for any given risk through best practices that mitigate both current and future risks. If air carriers have the ability to implement solutions expected to reduce the likelihood of a catastrophic outcome, the overall level of safety and confidence in the aviation system will be enhanced. The goal is for air commerce to become better equipped for the continued advancement and evolution of lithium batteries, and also to be well prepared for future emerging technologies and energy sources.

The FAA Hazardous Materials Safety Program has handled a variety of incidents and risks involving passenger lithium battery items through investigation and surveillance. Passenger carry-on items present a safety risk in the cabin and—when lithium batteries are inappropriately placed in checked baggage—in the cargo compartment, which can lead to potentially serious lithium battery events, to include fire, smoke, extreme heat, or explosion. Typical passenger items involved in incidents include e-cigarettes/vape devices, laptops/tablets, mobile phones, Bluetooth accessories (e.g., headphones and speakers), battery chargers/battery packs, spare batteries, and equipment with lithium batteries installed (e.g., power tools, toys, and cameras). These risks are commonly mitigated through passenger education and stakeholder engagement, as well as the adoption of best practices by air carriers.

For some safety issues, the FAA combines safety information released in bulletins, such as Safety Alerts for Operators (SAFOs) and Information for Operators (InFOs), and direct cooperation with air carriers to efficiently and effectively address risks. At the beginning of FY20, FAA safety organizations responsible for operational air carrier oversight collaborated with air carriers to assess the potential system risk associated with Portable Electronic Devices (PEDs). In particular, there was concern over the popularity of newly available "smart bags" that often include an integrated lithium battery power pack, in addition to other PEDs (e.g., tablets and laptops) that may be inappropriately left in passenger baggage.

In efforts intended to further enhance safety, the FAA conducted coordinated oversight to:

- Determine air carriers' awareness and response to previously issued SAFOs and InFOs regarding PEDs;

- Determine actions implemented based on the recommendations in the SAFOs and InFOs; and
- Provide the FAA with a means to determine requirements for future action.

The surveillance identified FAA should continue to engage with air carriers who have not fully implemented recommended actions related to Safety Risk Assessments from the previously issued SAFOs and InFOs. This engagement includes ensuring the air carriers conduct appropriate Safety Risk Assessments (as part of their Safety Management System) to identify risks associated with the carriage of PEDs and that they document and communicate proposed plans for mitigation of those risks to the FAA. FAA monitors the carriers through its established compliance program to ensure that these plans are carried out and that documentation is provided showing the risk is effectively mitigated by these practices, procedures, and aircraft systems. Results also support FAA public education and stakeholder engagement regarding “smart bags.” Again, such safety promotion is important and is part of the FAA’s overall ongoing efforts for safe air transport of lithium batteries in passenger baggage.

While incidents involving passenger items can be high-profile and potentially lead to serious outcomes, the greater contributor to system-safety risk is typically the larger quantities of lithium batteries shipped on cargo-only aircraft. When these shipments are compliant with aviation regulations for lithium batteries, cargo air carriers accept the inherent level of risk. However, when shipments of lithium batteries are non-compliant, the risk becomes unacceptable. To comprehensively mitigate risks, the FAA Hazardous Materials Safety Program conducts surveillance and investigates incidents on air carriers, while also monitoring manufacturers, shippers/offerors, freight forwarders, and individuals—all with shared responsibility for properly packaging, labelling, accepting, and handling hazardous materials transported by air. Engaging with this diverse community to mitigate risks requires cooperation between government and private industry through all stages of distribution and transport of lithium batteries and lithium-battery powered items. Such cooperation is especially vital for incident investigation and coordination with the National Transportation Safety Board (NTSB) and other government agencies.

The most serious incidents in calendar years 2019-2020 were those involving fire, smoke, or extreme heat (thermal event). The risk to an aircraft and its crew is high when this occurs unmitigated while in flight. Due to the mitigations and controls in place, these events are extremely rare. The vast majority of these types of incidents occur elsewhere in the distribution chain of lithium battery shipments on the ground, typically before, and sometimes after, they are on an aircraft. Shipments of lithium batteries that occur when the air carrier or the flight crew are not properly informed of their presence pose a higher-than-acceptable risk. Lithium batteries have an inherent residual risk that is acceptable when all mitigations are in place, but they carry a higher risk of a potentially catastrophic outcome from a thermal event because established risk controls/mitigations cannot be properly applied. The most egregious of this type violation are categorically designated as undeclared shipments, with no markings or other required indication that the shipment contains lithium batteries or hazardous

materials of any kind. These undeclared shipments commonly are not properly prepared and/or packaged, and may not be properly handled or segregated from other goods by the carrier, further increasing the risk to people and the aircraft from a thermal event. Air carriers and their flight crews are unaware of the level of risk being accepted for their operations.

Other violations include issues with labels or shipping papers, to include obscured labels and required information omitted on shipping papers. Some issues become null within the system by the shipper/offeror or the air carrier refusing to accept items; however, items are, at times, improperly accepted and/or not included on manifests for review by the flight crew. If shipments are undeclared or otherwise improperly labeled or documented, they may, in turn, be improperly handled and thereby increase the risk of a fire event. Air carriers have procedures, often not required by regulation, but are best practices for increased safety, that they may neglect to follow.

Many of these incidents, instances of non-compliance, or other issues, are non-systemic and determined to be low-risk, using standardized risk-assessment tools. Actions for these circumstances typically include contacting the appropriate individuals or groups at the air carrier, or other regulated entities, to inform them of the issue so they may address it through their established processes. Other systemic, more serious issues that are determined to be higher risk, have related actions that can include additional surveillance to ensure compliance and/or enforcement (e.g., administrative actions and civil penalties).

In addition, the FAA Hazardous Materials Safety Program has worked collaboratively with other federal agencies on lithium battery issues. In CY 2020, the FAA and PHMSA participated in the NTSB investigation of a shipping truck that allegedly caught fire due to undeclared lithium batteries. The subsequent investigation ruled out the batteries as the source of the fire. This level of cooperation, with an efficient exchange of information, even in circumstances where it can be difficult to obtain, shows a continuous, coordinated effort across government agencies to improve the safety of the transport of lithium batteries by air.

## PHMSA's Role in Lithium Battery Safety

PHMSA has authority for the Hazardous Materials Regulations (HMR) (49 U.S.C. 5101 et seq.) that provide the core requirements to classify, package, and communicate the domestic transportation hazards of lithium batteries (HMR; 49 Code of Federal Regulations, parts 171-180). This safety authority and framework serve as the basis for many of the decisions made throughout the supply chain. Noncompliance with PHMSA's classification, packaging, or communication requirements impacts safe transport in all modes, but has a potentially larger impact on aviation safety due to the increased possibility of high-consequence events. PHMSA regulations apply to persons and organizations that perform pre-transportation functions (i.e., product manufacturer, package manufacturer, shipper/offerors, freight forwarder, etc.) who are critical to

compliance and risk management. PHMSA also regulates multi-modal transportation of hazardous materials (known as “dangerous goods” globally) in commerce.

In addition, PHMSA leads multiple interagency and global fora to discuss all hazardous material risks, to include lithium batteries and international harmonization issues. PHMSA leads many of the efforts required by Section 333 of the FAA Reauthorization Act of 2018. As noted in the initial report, PHMSA has established a Federal advisory committee to facilitate communication between lithium battery and cell manufacturers, shippers, end users, transporters, and the Federal Government. These efforts are to provide a forum for the Secretary of Transportation to discuss activities of the Department and seek stakeholder input relating to lithium battery transportation safety, including input that helps the Federal Government develop positions to advocate in international fora. The Committee is actively working on developing recommendations for the Department to consider to advance the safe air transportation of lithium batteries. The first meeting occurred in January 2020, and the second meeting occurred in September 2020.

## DOT’s Role in International Transportation of Lithium Batteries

As stated in the initial report, lithium battery safety transcends borders. This concept applies at all levels—from the collaboration among organizations within the Department, to interactions with industry and the international community. To promote safety regulations and foster an integrated approach to oversight, FAA and PHMSA conduct outreach with stakeholders and participate in the International Civil Aviation Organization (ICAO) Dangerous Goods Panel (DGP) and the United Nations (UN) Economic and Social Council (ECOSOC) Sub-Committee of Experts on the Transport of Dangerous Goods (TDG). During these annual meetings, Member States share safety data and information and collaborate to develop harmonized safety regulations, standards, and best practices. These efforts help to ensure the safe, secure, harmonized, and efficient transportation of dangerous goods internationally, as well as domestically. The overall collaboration promotes a better understanding of the requirements and methods of compliance among the international aviation community. Key international activities include:

- The ICAO DGP has leveraged a SAE (formerly known as Society of Automotive Engineers) technical committee—G-27 Lithium Battery Performance Packaging Committee (AS6413)—for the development and maintenance of a minimum performance packaging standard aimed at facilitating the safe shipment of lithium batteries as cargo on aircraft. ICAO DGP will consider and decide on how to integrate the resulting lithium battery package standard for risk mitigation.
- UN Informal Working Group (IWG) on Lithium Batteries, a body to develop a comprehensive hazard-based system to classify lithium batteries and cells for transport. Such a system will include determining the inherent hazards represented by lithium batteries and the types of reaction(s) that may result.

The FAA's Fire Safety Branch located at the William J. Hughes Technical Center ("Tech Center"), Atlantic City International Airport, Atlantic City, New Jersey, is the world's leader in aviation fire-safety research, and has been heavily involved in advancing the safe international transportation of lithium batteries. The aviation community relies heavily on Tech Center research and testing to provide technical expertise in several international, collaborative efforts focused on managing the safety risks posed by the carriage of lithium batteries by air. Experts at the FAA's Tech Center have contributed greatly to the development of a baseline test method for the G-27 Packaging Standard (AS6413) and development of the hazard-based system to classify lithium batteries and cells for transport and improve transportation safety in this subject-matter area.

Most notably, the Fire Safety Branch has conducted the following lithium battery research:

- *Impact of Lithium Battery Vent Gas Ignition on Cargo Compartment Fire Protection*
- *Lithium battery thermal runaway vent gas analysis*
- *Fire Resistant Container (FRC)*
- *Passive Protection of Lithium Battery Shipments*

The noted research has been widely publicized in the news and throughout the international aviation community. FAA representatives presented it to international stakeholders at G-27 meetings in November 2018, March 2019, July 2019, and November 2019. A published FAA Fire Safety Branch report contains a compilation of research projects designed to determine the hazards and possible mitigations on the shipment of lithium batteries as cargo on transport category airplanes. That report summarizes 12 years of test data and results on lithium batteries that can be found on the FAA Fire Safety Branch website: https://www.fire.tc.faa.gov/pdf/TC-16-37.pdf.

In addition to G-27 meetings, FAA and PHMSA participated in laboratory testing and provided technical expertise in the above-noted UN IWG on Lithium Batteries, more specifically, to develop a comprehensive hazard-based system to classify lithium batteries and cells for transport. Such a system should include ways to determine the inherent hazards represented by lithium batteries and the types of reactions that may be derived from those hazards. The last in-person meeting regarding hazard-based classification convened in Arlington, Texas, in October 2019. Attendees focused on test-evaluation data provided by seven testing facilities for review and analysis: FAA FSB, The Boeing Co., and UL from the United States; Federal Institute for Materials Research and Testing from Germany; French National Institute for Industrial Environment and Risks from France; Central Laboratory of Batteries and Cells from Poland; and Contemporary Amperex Technology Co. Limited from China. Efforts were made to facilitate progress completing additional evaluation testing. The testing protocol will be finalized in upcoming virtual meetings. Further testing will be conducted by the aforementioned testing facilities. Once round-robin testing is completed, the UN IWG on Lithium Batteries will summarize and submit testing results to the UN Sub-

Committee of Experts on the Transport of Dangerous Goods (SCOE TDG) for review. The latest meeting occurred virtually in December 2020.

To complement these efforts and further promote cargo safety, FAA's Tech Center Fire Safety Branch planned, organized, and hosted the Ninth Triennial International Aircraft Fire and Cabin Safety Research Conference that convened in Atlantic City, New Jersey, in October 2019. The conference had five sessions regarding lithium battery safety in aviation with various presentations.

FAA presentations included:

- *Hazards Associated with Personal Electronic Devices (PED) Placed in Checked Luggage*
- *Practical Considerations for Fighting a Lithium Battery Fire in the Aircraft Cabin*
- *Flight Deck and Cabin Risk Reduction Informational Videos*
- *Certification and Installation Guidance on Lithium Battery on Aircraft*
- *FAA Dangerous Goods Program: Incidents and Undeclared*
- *FAA Testing for G-27 Packaging Standard*
- *Thermal Runaway Event Analysis – Gas Temperature and Pressure*
- Electric Energy Storage for Safe Installations

The conference included 645 attendees from 25 countries—jointly sponsored by the FAA, the European Aviation Safety Agency (EASA), Transport Canada Civil Aviation, the Agencia Nacional de Aviacao Civil of Brazil, the Civil Aviation Bureau of Japan, and the Civil Aviation Authority of Singapore. Attendees shared recent, ongoing, and planned research in the areas of aircraft-fire and cabin-safety research. Attendees represented airlines, aircraft manufacturers, aircraft interior component manufacturers, cabin-safety inspectors, fire-suppression systems manufacturers, human-factors researchers, computer modelers, regulators, safety researchers, and academics. The overall theme of the conference was "*Improving Safety Through Data-Driven Innovation*."

In addition to the FAA and PHMSA's collaborative work focused on managing the safety risks posed by the carriage of lithium batteries by air, FAA participated in several safety promotion events aimed at communicating the risks of lithium batteries in aviation cargo and promoting lithium battery safety.

In September 2019, the FAA presented at the ICAO DPG meeting in Montreal, Canada, on the FAA Dangerous Goods Stakeholder Engagement strategy, SMS Safety Promotion, and how it relates to lithium battery safety. Topics discussed included lithium battery safety videos, stakeholder engagement materials, guidance, social-media campaigns, conference displays, and high-impact engagement events and activities centered on lithium batteries.

In November 2019, the FAA participated in the Underwriters Laboratories, Inc. (UL) Aviation Safety Summit held in Singapore that focused on exploring the intersection of

aviation safety and battery science for a safer world. The Aviation Safety Summit included 60 participants contributing to 10 structured engagement sessions. Each session was designed to build upon all other sessions. The FAA participated as a panelist in two of the sessions, and presented on the *International Rules for Transporting Batteries in Aviation and Cargo Safety Risk Assessments* for air operators with a lithium battery focus.

In December 2019, the FAA presented *Information on research on the state of charge (SOC) of lithium ion cells/batteries* at the 56th Session of the United Nations Sub-committee of Experts on the Transportation of Dangerous Goods (UNSCOE TDG) in Geneva, Switzerland. The presentation's goal was to inform the UN's ECOSOC's SCOE TDG of existing FAA research related to lithium ion batteries. Comprising the SCOE TDG are intergovernmental organizations, UN specialized agencies, Member States, and non-governmental organizations.

Also in December 2019, following the UN's 56th Session, the FAA participated in the Dangerous Goods European Liaison Group semi-annual meeting in Dublin, Ireland. The Irish Aviation Authority hosted the Session, which involved meetings between Civil Aviation Authorities (CAA), EASA, and industry representatives from EU Member States. The FAA presented on its Hazardous Materials Safety Program stakeholder engagement activities to all participants. The presentation focused on the FAA Hazardous Materials Safety Program developments regarding three of the four SMS pillars: Safety Policy, Safety Risk Management, and Safety Assurance. The FAA also provided updates on developments for Safety Promotion, the fourth pillar of SMS. The presentation included providing a summary of the FAA Hazardous Materials Safety Program website updates, collaborative videos, overview of the risk-based approach to stakeholder engagement, social-media campaigns, and branding philosophy. That presentation also covered lithium battery-specific safety messaging and tools for shippers to safely offer lithium battery shipments.

## Stakeholders' Role in Lithium Battery Safety

The safe transportation of lithium batteries by air is a collective priority for stakeholders. More and more, stakeholders take a systems-safety approach to enhance safety in air transport of lithium batteries, often working together to address risks before the batteries enter air transport.

Stakeholders include the international community, lithium battery manufacturers, device manufacturers, the aviation community, and everyone in the supply chain. Many stakeholders understand the risks that lithium batteries pose to aviation safety. Some stakeholders have even initiated voluntary efforts to address existing safety concerns, and evaluate future technologies for safe use and transport in the air mode. For example, Operation Safe2Fly is an initiative being developed by Underwriters Laboratories and the Independent Pilots Association to develop a voluntary industry auditing program for lithium battery safety.[i]

Stakeholders are also taking actions to promote safer methods of testing, packaging, and manufacturing quality control for lithium batteries. Voluntary efforts by stakeholders are a critical component in globally advancing lithium battery transportation safety. The Department is encouraged by these voluntary efforts and supports engagement on the shared mission to advance and enhance aviation safety.

## Education Campaigns and Stakeholder Engagement Activities

The Department works towards continuously improving an organizational culture that fosters the development and implementation of effective and efficient safety measures and processes. This includes the active participation of stakeholders to raise awareness of safety concerns. The FAA and PHMSA have implemented, and are continuously expanding, their stakeholder engagement activities, in collaboration with all entities in the supply chain, to include manufacturers, shippers, air and ground carriers, industry organizations, government representatives, and the public.

One of the key elements to a successful stakeholder engagement program is to recognize that different audiences require different messages, media, and fora. Nevertheless, all of the awareness campaigns contribute to promoting safety in the transportation system. PHMSA is engaged in several activities and initiatives for lithium battery safety, focusing on a multi-modal approach, including highway, rail, air, and vessel transportation. The FAA is engaged in similar activities and initiatives that focus specifically on the air-transport mode. These targeted awareness activities provide messaging appropriate to the audience to address risk at the source and optimize value and efficiency. Knowing the specific audience is key to the success of these efforts.

Both the FAA and PHMSA provide lithium battery safety materials to industry, and communicate safety information through various techniques and media, including: State and industry conferences/seminars; Congressional briefings and fact sheets; presentations, workshops and panel discussions; video messages; content on public websites; social media; print materials (posters, flyers, brochures); and publications for external audiences.

The activities covered by the education campaigns and stakeholder engagement activities section of this report address paragraphs (e)(2)(A), (E), and (F) of Section 333 of the FAA Reauthorization Act of 2018.

## FAA Safety Promotion Initiatives

The FAA provides public awareness and educational campaigns for the air transportation of dangerous goods, such as lithium batteries that specifically target air passengers, air cargo shippers, and air carriers. The FAA has been dedicated since 2017 to providing innovative, multimedia, cross-platform resources to reduce undeclared dangerous goods shipments by air. The overall goal is to enhance awareness and reinforce safety

messaging so that it resonates. The FAA uses a wide variety of analytics to measure whether stakeholder engagement materials are reaching the intended audience. These metrics are appropriate to the individual activity to measure effectiveness. For example, when the FAA has attended trade shows both qualitative and quantitative information is tracked, such as evaluating interactions with the audience and measuring the overall audience size. The FAA Hazardous Materials Safety Program collaborates with the FAA Office of Communications to measure social media and website content through analysis of user views and user interactions with content. The FAA also reviews stakeholder feedback and analytics from noted individual activities to shape and inform future engagement activities. As a result of those efforts, the FAA has implemented three initiatives—SafeCargo for air cargo shippers, PackSafe for Passengers, and OperateSafe for Air Carriers—that provide targeted and graphical aviation-related messaging and interactive resources. See Figure 1 below.

The FAA continues to support these initiatives through social media, collaborative efforts with stakeholders, and updated website content. The FAA also continues to develop new materials related to lithium battery safety for these campaigns. For example, a new "Vapes on A Plane Marketing Kit" was launched in January 2020 to share safety information about electronic smoking devices with manufacturers, retailers, and consumers. The FAA's integration of social-media platforms to disseminate the aviation safety message and concerns on lithium batteries has allowed it to have a larger impact and presence informing passengers and businesses engaging in air transportation. The FAA will continue to promote lithium battery safety and compliance with its ongoing stakeholder engagement efforts.

Figure 1.

| SafeCargo | PackSafe | OperateSafe |
|---|---|---|
| **Shippers & Start-Ups**<br>• Interactive shipping guides for most frequently undeclared items.<br>• Informational videos. | **Passengers**<br>• Check the chart for safe start!<br>• Interactive tool and videos to help passengers pack for flights. | **Air Carriers**<br>• Resources to better identify undeclared shipments and report discrepancies. |

The dangerous goods' website that the FAA launched on December 18, 2018, remains an information-sharing tool to further reduce the amount of undeclared dangerous goods in air transportation.[ii] It is an innovative website designed to enhance awareness of undeclared dangerous goods by providing interactive, targeted content and resources that stakeholders can easily access to find answers to their questions. The website consolidates the videos, interactive guides, and content used throughout various FAA dangerous goods campaigns and continues to be a resource for mitigating risks. The FAA, in efforts for continuous improvement, uses several different analytics to evaluate the effectiveness of online materials in reaching the intended audience behavior. Frequently asked questions are tracked and used to develop safety messaging and

identify whether updates to the website are needed. Lithium batteries consistently comprise an average of 15 to 30 percent of all questions. Therefore, lithium battery questions from stakeholders are continually evaluated for inclusion in additional safety messaging to meet the changing needs of stakeholders.

Website traffic is tracked on a quarterly basis and compared both to past quarters and previous years to identify overall growth and seasonal trends. This analysis shows that FAA's overall stakeholder engagement activities have been successful in both generating traffic to the site and sustaining growth of the audience. For example, between FY 2019 and FY 2020, all Dangerous Goods webpage views increased by more than 15 percent. The SafeCargo materials for shippers increased by more than 50 percent during the same time period. FAA's social media posts reports that analyzed the FAA's lithium battery and undeclared dangerous goods social media engagement, show an increase from 1.5 million impressions in FY 2019 to 1.9 million impressions in FY 2020. Messaging has become more visible, providing a reasonable expectation of enhanced stakeholder awareness.

Along with general educational campaigns, to include website information, dangerous goods awareness videos, and social-media campaigns, the FAA participates in national stakeholder engagement events and uses these events to provide targeted messaging to various aviation stakeholders. Stakeholder engagement is the commitment to collaborate with aviation dangerous goods stakeholders to reduce risk to the National Airspace System (NAS) through mutual learning and communication efforts. The aviation supply chain also includes agents that perform pre-transportation functions. Agents include product manufacturers, package manufacturers, shippers, freight forwarders, and offerors. The FAA measures the effectiveness of interactions with attendees through both qualitative and quantitative information. Not only does this information provide insight into the audience reached at the event, but these metrics are also used to measure effectiveness when deciding whether to return to a similar event in a future year.

Research activities by the FAA Tech Center have provided a more complete understanding regarding the potential hazards of lithium batteries and identified gaps where safety controls were ineffective.[iii] Resulting research data, and reporting on the potential hazards of lithium batteries in aviation they identified, have influenced safety discussions and priorities within FAA and the Department. The research data also have influenced U.S. industry, other U.S. agencies, worldwide industry, and worldwide governments. An example of that influence materialized in the collaboration between the FAA Tech Center and the United Kingdom CAA on lithium battery safety videos to provide information for air operators. The FAA Hazardous Materials Safety Program worked with the FAA Fire Safety Branch on a taskforce assembled through the International Aircraft Systems Fire Protection Forum, with industry representatives from airlines, aircraft manufacturers, airline crew unions, and regulatory agencies, both U.S. and international, to refresh the videos. The updated videos will be published on the OperateSafe website in 2021.

In furtherance of the DOT priority specifically focused on safe air transportation of lithium batteries, the FAA supports voluntary compliance efforts that are part of the overall aviation safety system. The FAA provides safety information to all air carriers by way of dissemination of notices, such as Advisory Circulars (AC); InFOs, SAFOs, Notices to Airmen, General Notices, and Temporary Flight Restrictions. The FAA has published more than 20 of these varied notices directly addressing lithium battery safety.[iv] The FAA will continue to publish notices to address specific risks, as needed, and promote the observance of all applicable notices.

The FAA also maintains participation in industry standards development organizations, such as the Radio Technical Commission for Aeronautics; SAE; ASTM (formerly known as the American Society for Testing and Materials); and the International Organization for Standardization, to provide consistency of information and ease of incorporation, where possible. All of these efforts remain ongoing.

## PHMSA Outreach and Engagement Initiatives

PHMSA maintains engagement in several activities and initiatives for lithium battery safety, focusing on a multi-modal approach, including highway, rail, air, and vessel transportation. The “Check the Box” campaign, launched in 2018, is an example of PHMSA’s multimodal campaign, which is a public-awareness campaign that seeks to prevent serious incidents regarding everyday items considered as hazardous materials (“hazmat”), including lithium batteries. See below at Figure 2. PHMSA leads this DOT-wide multi-modal initiative, with support from the FAA, Federal Motor Carrier Safety Administration, Federal Railroad Administration, and United States Coast Guard. Stakeholders, such as the Air Line Pilots Association, the Association of Mail and Business Centers, and the United States Postal Service have expressed support for this campaign.[v]

PHMSA has also promoted the “Check the Box” campaign internationally, through ICAO. This campaign is also promoted via various communication tools, including the “Check the Box” website, which hosts the following resources: brochures, fact sheets, and videos that increase awareness of the risks of hazardous materials and promote a better understanding of pertinent regulations. Additional outreach occurs via social-media platforms, informational webinars, and in-person engagement at industry events.

Figure 2.


PHMSA will continue to release videos, public service announcements, news articles, and programmatic display promotions informed by incident data and other situational conditions. PHMSA is also exploring opportunities for increased outreach through modal and industry partners, as well as other Federal agencies. Further information and promotional material can be found at: https://checkthebox.dot.gov/.

PHMSA has also developed a website[vi] to host content and resources, including publications that aid compliance with the U.S. Hazardous Materials Regulations (49 CFR; parts 171-180) and ICAO Technical Instructions. These resources specific to lithium batteries describe the requirements and methods of compliance and aim to promote a better understanding of them.

Additionally, PHMSA has developed and distributed multiple job-aid publications[vii] regarding the safe transportation of lithium batteries. Examples include "How to Safely Send Batteries and Battery Powered Devices by Mail." PHMSA maintains its commitment to update and expand guidance material on shipping lithium batteries, and plans on increasing its global impact by translating certain finished products into other languages, such as Standard Chinese. The documents are made available on PHMSA's website and distributed at various stakeholder outreach events, such as conferences, fora, and training seminars.

PHMSA has engaged more broadly in discussions with the International Air Transport Association (IATA) to participate in lithium battery safety outreach initiatives. In 2019, PHMSA participated in a safety workshop in the Netherlands and a lithium battery safety webinar including more than 200 global participants. These engagement efforts brought together representatives from lithium battery manufacturers, freight forwarders, ground-handling agents, airlines, trainers, and regulators, to discuss existing and planned requirements for shipping lithium batteries by air, and leverage existing meeting infrastructures and contacts provided by IATA. PHMSA plans to continue engaging with international shippers, carriers, and regulatory counterparts on lithium battery safety issues at every opportunity and attended such an event virtually in October 2020.[viii]

In June 2019, PHMSA partcipated in the United Kingdom's Civil Aviation Authority International Lithium Battery Safety Workshop. The two-day workshop brought together 70 particpants from manufacturing, testing, logistics, airline operators, government agencies and aviation regulators. The group discussed lithium batteries and the risk to flight safety, and evaluated practical solutions that could reduce non-compliant shipments in air transport.

Additionally, PHMSA plans to begin discussions with the U.S. Department of State and Departmental leadership to initiate an Asia-Pacific Economic Cooperation (APEC) workshop addressing capacity building in the safe air transport of lithium batteries within the APEC Transportation Working Group. This workshop would bring together APEC member governments to discuss training and outreach to shippers and carriers of lithium batteries.

## Continued Outreach and Safety Promotion

Stakeholders have varying levels of understanding of their responsibilities related to the safe transportation of dangerous goods. Targeted communication, based on stakeholder understanding, roles, and responsibilities, is critical and ever-evolving. As a result, the Department will continue to develop new initiatives and campaigns to educate the public on risks associated with air transport of dangerous goods, such as lithium batteries. In support of this priority, the Department will continue to target industries that can be more susceptible to undeclared lithium battery shipments (e.g., consumer electronics and e-commerce/startups). National and international safety promotion provides critical safety messaging to shippers, air carriers, and travelers, to increase their awareness and interest in dangerous goods safety.

## Compliance Initiatives for Global Lithium Battery Safety

In conjunction with stakeholder engagement activities and training, the Department supports collaborative efforts with the international aviation community to support compliance with lithium battery safety regulations.

The activities covered by this section of the report address paragraphs (e)(2)(B)-(C) and (F) of Section 333 of the FAA Reauthorization Act of 2018.

## Lithium Battery Interagency Working Group

Under § 333(c), PHMSA has established the Interagency Lithium Battery Safety Working Group to share best practices of Federal agency efforts related to the safe manufacture, use, and transportation of lithium batteries and cells. The Lithium Battery Interagency Working Group also provides group members of participating agencies a unique opportunity to foster awareness of noncompliant dangerous goods shipments. Through this effort, PHMSA can continually share incident and undeclared shipment data with group members. This framework helps focus on shippers that have experienced frequent issues during the shipment of lithium batteries and equipment packed with, or containing, lithium batteries.

## Safety Compliance and Enforcement

Even with the significant efforts to identify hazards and engage various stakeholders involved in the air transport of lithium batteries, incidents and noncompliance will, and do, still occur.

The activities covered by the safety compliance and enforcement section of this report address paragraphs (e)(2)(B)-(D) of Section 333 of the FAA Reauthorization Act of 2018.

## DOT's Compliance and Enforcement

The Department provides an essential component to the safety resolution process.

PHMSA has oversight of entities that offer hazardous materials for transportation, and that manufacture, requalify, rebuild, repair, recondition, or retest packaging (other than cargo tanks and tank cars) used to transport hazardous materials. PHMSA's Office of Hazardous Materials Safety Field Operations division serves to ensure transportation safety and security by conducting compliance, incident and accident response and investigations; performing safety, performance, and regulatory adequacy and fitness determinations; executing outreach, education, and training activities; and providing feedback, information, and intelligence through its nationwide operations. PHMSA also works to address reports of lithium battery incidents, as lithium battery incidents occur in all modes of transportation.

The FAA has oversight of the NAS. The authority to carry out investigations and enforcement relating to the transportation or shipment of hazardous materials by air has been delegated to the FAA Administrator under 49 C.F.R. § 1.83(d)(1). The FAA

Hazardous Materials Safety Program is evolving oversight to a risk-based management approach that embraces many interdependent principles, including Risk Based Decision Making, SMS,[ix] FAA's Compliance Program,[x] and voluntary safety reporting programs.[xi] This regulatory and systems-based structure enables a proactive approach to safety that is intended to prevent aviation accidents.

The FAA initiates civil penalty action against persons who offer or accept, for transportation by air, lithium battery shipments that fail to comply with DOT Hazardous Materials Regulations. The civil penalties sought for noncompliant lithium battery shipments are generally higher because of their significant safety risk. The Lithium Batteries Severity Level table assigns severity levels for lithium battery shipments, based on the nature and quantity of the batteries involved (e.g., number of cells or batteries, Watt-hour rating, and mass) and the packaging of the shipment.[xii] The FAA also has authority under 49 C.F.R. part 109 to issue emergency orders to prevent the shipment of lithium batteries by air transportation if the Administrator determines that such shipment is causing an imminent hazard.[xiii]

As one DOT, the modal compliance and enforcement programs of both the FAA and PHMSA are designed to promote compliance with the statutory and regulatory requirements applicable to all activities regulated or enforced by the respective agencies. The programs provide a wide range of options for addressing noncompliance. These options include the following:

- Warning notices or letters of correction,
- Informal Actions,
- Civil Penalties,
- Referrals for criminal prosecution.

The impact and risk to the transportation system are always evaluated to determine the appropriate actions when noncompliance occurs. The FAA and PHMSA take the action most appropriate to promote safety and compliance with the standards and regulations, focused primarily on the root cause of the noncompliance. The initial priority of the agencies is to correct any ongoing noncompliance. Both agencies provide public reporting on civil penalties and certain enforcement cases, but this reporting does not include the number of actions involving a specific hazardous material commodity, such as lithium batteries.[xiv]

To expound upon domestic compliance and enforcement since CY 2019, the FAA, through its Hazardous Materials Safety Program, levied a variety (FAA Compliance and Enforcement Program) compliance and enforcement actions, to include civil penalties, administrative actions, and compliance actions. Undeclared lithium batteries are a high risk to transport by air because they may not be properly handled, and air carriers and their flight crews are unaware of the level of risk being accepted for their operations. As noted above, those incidents that had the most risks were undeclared shipments of lithium batteries in cargo that led to fire, smoke, extreme heat, or explosion. Most of these incidents occurred on the ground, and most before the cargo was loaded onto the

aircraft. Undeclared lithium batteries have also been discovered through screening procedures or inspections.

Another risk that warrants action is improperly prepared lithium batteries—including packaging and labeling that is improper, missing, or obscured—and lack of inclusion of information identifying the hazardous material on shipping papers and flight manifests, as required. FAA issued compliance and enforcement actions against air carriers, shippers/freight forwarders, and passengers for undeclared and/or improperly prepared lithium batteries. The lithium batteries were either on their own, or installed in, or packaged with, equipment (e.g., laptops, tablets, e-cigarettes, power tools, engine parts, and scooters). The goal of these compliance and enforcement actions is to mitigate the risk introduced into the transportation system and deter future noncompliance. Some examples of mitigations resulting from compliance and enforcement actions are: new or remedial training of company employees, changes to company procedures and manuals, additional requirements for a period of time to demonstrate compliance, and levying of fines to discourage repeat violations.

## Compliance and Enforcement involving Foreign Parties

Compliance and enforcement efforts involving foreign parties poses special challenges. Due to the extensive supply chain in some countries, identifying the person or organization responsible for noncompliance can be very difficult, and necessitates enlisting the appropriate foreign civil aviation authorities. Coming to a resolution with a foreign party can be complicated, especially if it does not have a presence in the United States, or the U.S. standards differ from international standards. To use every available tool to promote the most effective way to correct ongoing noncompliance, the agencies share information on noncompliance of dangerous goods shipments with Federal, regional, and international partners during investigations, as appropriate.

To that end, the FAA and PHMSA support ICAO Annex 18, Section 11.2, which establishes that States should participate in cooperative efforts with other States concerning noncompliance with the dangerous goods requirements, with the aim of eliminating such noncompliance. Dangerous goods incidents in air transportation and noncompliance that are determined to have originated from an international location, will be considered for referral to that State for appropriate action to correct any continuing noncompliance. State referrals on dangerous goods incidents contain information that the FAA has gathered about the incident, so that the State can investigate and take any appropriate action.

In CY 2019, the FAA updated internal processes for international referrals to support organizational changes to FAA's Hazardous Materials Safety Program and implementation of updated database tools. To ensure open communication, FAA Hazardous Materials Safety Program's Policy, Standards and Stakeholders Division established 9-ASH-AXH-InternationalIncidents@faa.gov, a shared mailbox that provides international stakeholders with a single point of contact to send to, or receive from,

incident reports, documentary, and other evidence developed in the investigation of incidents, allowing for better coordination of investigations and enforcement actions, and proposed and final enforcement actions. ICAO's "National Authority for Dangerous Goods Transport by Air" webpage was updated with this information, as well as a campaign to actively distribute the email address within the International Dangerous Goods stakeholder community.

The FAA Hazardous Materials Safety Program has developed procedures for the efficient processing, disposition, and recordkeeping of both inbound international dangerous goods incident referrals received through the International Incidents mailbox, and outbound incident referral packages to foreign CAAs. Dangerous-goods incidents occurring abroad and originating from a domestic shipper are referred to the FAA and are evaluated by applying SMS Safety Risk Management. Inspections and investigation prioritization is given to high-risk commodities, which include lithium batteries. Shippers and air carriers found in violation are subject to FAA Order 2150.3, FAA Compliance and Enforcement Program.

Dangerous goods incident referrals discovered domestically, but originating from shipments offered abroad, are investigated by FAA's Hazardous Materials Aviation Safety Inspectors (HMASIs). The FAA Hazardous Materials Safety Program compiles all gathered information and items of evidence (i.e., photographs, statements, and documentation) from HMASIs and forwards the foreign referral package to the originating State's designated National Authority. If a State is unwilling or unable (due to lack of resources or infrastructure) to pursue an incident, the FAA Hazardous Materials Safety Program may opt to address the matter through domestic enforcement procedures.

In 2019 and 2020, the FAA Hazardous Materials Safety Program referred lithium battery incidents originating from shippers located in Australia, Honduras, Mexico, the United Kingdom, Zambia, and the Philippines. These incidents primarily consisted of undeclared shipments containing lithium batteries, offered as general cargo. These undeclared shipments posed a significant risk to air transportation, as they failed to provide the personnel who handled them or the operators who transported them, the critical information needed to ensure safe transportation. Other shipments that failed to display required hazard communication were discovered. These improperly marked packages had inaccurate or incomplete information about the lithium battery contents, which may have denied air carrier personnel the opportunity to appropriately evaluate the risk, or to refuse as a hazmat shipment.

Inbound international referrals are generated by the CAA for shipments generated (or forwarded) by U.S. shippers that are discovered abroad not to be in conformance with international dangerous goods transportation regulations. Many of these referrals involve improperly prepared lithium battery shipments. In CY 2019, the FAA Hazardous Materials Safety Program received referrals from the CAAs of the United Kingdom, Germany, Mexico, Australia, and South Korea. These inbound referrals were assessed,

logged, and transferred for investigation by FAA towards cooperative efforts for the safe transport of lithium batteries.

Inbound referrals for noncompliant shipments of lithium metal and ion batteries may be addressed with warning notices, compliance actions, informal actions, or civil penalties. One significant inbound international referral from the United Kingdom involved an improperly prepared lithium battery shipment. It resulted in the offeror, a large global shipper, developing a voluntary SMS implementation plan under the Nationally Coordinated Oversight Plan.

Because of the FAA's investigation, the shipper agreed to cease and desist from all shipping by the division responsible for the incident and hire a third-party company to audit its training program for effectiveness. Further, the shipper is implementing changes to current processes and procedures to prevent reoccurrence. The FAA Hazardous Materials Safety Program is working with the shipper's dangerous goods team to evaluate the shipper's Safety Risk Management processes and controls outlined in its response to the incident. Efforts are also progressing to evaluate the shipper's comprehensive fix proposal to ensure that proper risk mitigation strategies and processes are incorporated throughout all divisions of the company.

The lithium battery industry continues to expand. Collaboration with Foreign States will remain a key component of ensuring air transportation safety of lithium batteries. FAA stakeholder engagement efforts will further ensure the continued growth and development of these cooperative efforts and strengthen oversight.

## Summary

As stated in the initial report, the Department has taken—and continues to take—a comprehensive, cooperative approach to improve compliance with safety regulations for air transport of lithium batteries through stakeholder engagement and enforcement activities. Detailed in this annual update are many ongoing activities to provide an international, systems and risk-based approach to manage air transportation of lithium batteries and other dangerous goods. The Department works in collaboration with stakeholders and international fora to further develop these efforts.

In conclusion, the FAA looks forward to submitting the second annual update on lithium battery safety efforts, while continuing to provide the safest, most efficient aerospace system in the world.

[i] http://www.ipapilot.org/batteries/OperationSafe2FlyHandout.pdf
[ii] https://www.faa.gov/hazmat/
[iii] https://www.fire.tc.faa.gov/
[iv] https://www.faa.gov/hazmat/resources/lithium_batteries/;
https://www.faa.gov/hazmat/resources/guidelines/
[v] http://www.alpa.org/news-and-events/air-line-pilot-magazine/the-landing-check-the-box
[vi] https://www.phmsa.dot.gov/lithiumbatteries
[vii] https://www.phmsa.dot.gov/lithiumbatteries
[viii] https://www.iata.org/en/events/cargo-events/
[ix] https://www.faa.gov/about/initiatives/sms/
[x] https://www.faa.gov/about/initiatives/cp/
[xi] https://www.faa.gov/hazmat/air_carriers/compliance_enforcement/
[xii] See FAA Order 2150.3C, Chapter 10 which provides specific sanction guidance for lithium battery shipments.
[xiii] See Emergency Restriction/Prohibition Order issued to Braille Battery, Inc. on September 16, 2016.
[xiv] PHMSA Hazmat Enforcement Actions, https://www.phmsa.dot.gov/regulatory-compliance/hazmat/enforcement-decisions;
FAA Enforcement Reports,
https://www.faa.gov/about/office_org/headquarters_offices/agc/practice_areas/enforcement/reports/