Federal Aviation Administration

Final 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

The Federal Aviation Administration (FAA) submits this second and final annual report to Congress, with general updates to the two previous reports in their entirety.

Section 333 of the FAA Reauthorization Act of 2018 (Public Law No. 115-254) (the Act) directs the Secretary of Transportation to carry out a wide range of activities related to lithium batteries, including an action that would revise regulations to harmonize with international standards, evaluate packaging standards, and provide fora to encourage stakeholder input. Publication of the Pipeline and Hazardous Materials Safety Administration (PHMSA) final rule "Enhanced Safety Provisions for Lithium Batteries Transported by Aircraft" (Docket No. PHMSA-2016-0014 (HM-224I)), supports the mandate in Section 333(a) of the Act, which requires the Secretary of Transportation to to harmonize with certain international standards to enhance safety.

Per Section 333(e)(3) of the Act, a report was mandated annually for two years after submission of the initial report to inform Congress on interagency and international cooperative efforts to ensure compliance with domestic hazardous materials regulations as applied to the air transport of lithium batteries, as well as the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air. The FAA submitted the initial report to Congress on February 26, 2020. The FAA submitted the first annual update report to Congress the following year on November 2, 2021. This report lists activities that occurred after November 2, 2021, and fulfills the Act's reporting requirement for Section 333(e)(3). Key points of the report are:

- The FAA and the Pipeline and Hazardous Materials Safety Administration (PHMSA) continue to employ many tools, such as education, stakeholder engagement, collaboration, and, when required, various enforcement techniques to focus on this significant issue in the transportation sector.

- To promote safety regulations and foster an integrated approach to oversight, the FAA and PHMSA continue to conduct outreach with stakeholders and participate in the 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).

- The FAA and PHMSA implemented, and are continuously expanding, their stakeholder engagement activities in collaboration with all entities in the supply chain, including manufacturers, shippers, air and ground carriers, industry organizations, government representatives, and the public. Since the last update, both the FAA and PHMSA continue to provide lithium battery safety materials to the industry and communicate safety information through various techniques and media.

As in the previous reports, this report conveys the FAA's efforts towards continuous improvement related to stakeholder engagement and cooperative activities undertaken to reduce noncompliance with transport requirements. This includes domestic and international activities currently underway by PHMSA. The report further lists the specific activities which have occurred since the publication of the first annual update report. The U.S. Department of Transportation (DOT) is committed to continuing its work in collaboration with stakeholders to further lead in the enhanced, safe transport of lithium batteries.

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, from revising regulations to harmonizing with international standards, to evaluating packaging standards, to providing fora to enhance stakeholder input.

Section 333(e)(1) directs the Secretary to improve interagency and international cooperative efforts to ensure compliance with U.S. Hazardous Materials Regulations and ICAO Technical Instructions for air transport of lithium batteries. More specifically, Section 333(e)(2) directs the Secretary to conduct the following activities:

- Encouraging training programs at locations outside the United States from which substantial cargo shipments of lithium ion or lithium metal batteries originate for manufacturers, freight forwarders, and other shippers and potential shippers of lithium-ion and lithium metal batteries. See Sec. 333(e)(2)(A).
- Working with federal, regional, and international transportation agencies to ensure enforcement of U.S. Hazardous Materials Regulations and ICAO Technical Instructions with respect to shippers who offer non-compliant shipments of lithium-ion and lithium metal batteries. See Sec. 333(e)(2)(B).
- Sharing information, as appropriate, with federal, regional, and international transportation agencies regarding non-compliant shipments. See Sec. 333(e)(2)(C).
- Pursuing 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 non-compliant shipments, especially with respect to jurisdictions in which enforcement activities historically have been limited. See Sec. 333(e)(2)(D).
- Providing information in brochures and on the internet in appropriate foreign languages and dialects that describes the actions required to comply with U.S. Hazardous Materials Regulations and ICAO Technical Instructions. See Sec. 333(e)(2)(E).
- Developing joint efforts with the international aviation community to promote a better understanding of the requirements of and methods of compliance with U.S.

Hazardous Materials Regulations and ICAO Technical Instructions. 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.*"

The FAA submitted the initial report to Congress on February 26, 2020, and the first annual update report on November 2, 2021. This report is the final required report to Congress and fulfills the FAA's obligations under Section 333(e)(3) reporting requirements.

As in the previous reports, this report conveys cooperative efforts by DOT, FAA, and PHMSA, in cooperation with other federal agencies such as PHMSA, to carry out cooperative efforts to ensure that shippers who offer lithium ion and lithium metal batteries for air transport to or from the United States comply with U.S. Hazardous Materials Regulations and ICAO Technical Instructions.

DOT's Approach to Lithium Battery Safety

As transportation safety is DOT's mission, the safe transport of lithium batteries remains a priority. Both PHMSA and FAA take a comprehensive approach to enhance transportation safety, by working with international organizations toward 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 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. PHMSA and the FAA have employed many tools, such as education, stakeholder engagement, collaboration, and various enforcement techniques when required to focus on this significant issue in the transportation sector.

FAA's Role in Lithium Battery Safety

The FAA continues to diligently fulfill its role in promoting safety pursuant to Title 49 of the Code of Federal Regulations (49 CFR) § 1.83(d)(1). In that role, 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 and reinforce SMS principles.

To fulfill oversight responsibilities, the FAA employs risk-based surveillance to collect system data and analyze the safety of air transportation of hazardous materials ("hazmat" or dangerous goods), 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 compliance, additional surveillance, or enforcement actions 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.

Along with being a DOT-wide priority, lithium batteries are one of the FAA's and civil aviation's significant safety concerns. The FAA is actively engaged in addressing lithium battery safety issues. Efforts include addressing existing safety concerns and evaluating future technologies for safe use and transport in aviation. The FAA's role in managing risks in the aviation system also includes working with air carriers. This collaborative effort encompasses the development of processes to monitor and control any given risk through best practices that mitigate both current and future risks. As air carriers have the ability to implement solutions expected to reduce the likelihood of a potentially catastrophic outcome, the overall level of safety and confidence in the aviation system can be enhanced. The goal is for air commerce within the transportation system 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. Risks are commonly mitigated through passenger education and stakeholder engagement, as well as the adoption of best practices by air carriers' passenger-notification systems. Additionally, Safety Alerts for Operators (SAFOs) and Information for Operators (InFOs) are useful and direct cooperation with air carriers to efficiently and effectively address some risks.

The greater contributor to system-safety risk is typically the larger quantities of lithium batteries shipped on cargo-only aircraft, rather than incidents involving passenger items. When these cargo shipments are compliant with aviation regulations for lithium batteries, air carriers can assess the inherent level of risk through their SMSs and SRM. However, when shipments of lithium batteries are non-compliant with aviation safety regulations, the risk becomes impermissible. To comprehensively mitigate risks, the FAA Office of Hazardous Materials Safety 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, labeling, accepting, and handling dangerous goods transported by air. Engaging with this diverse community to mitigate risks requires cooperation between government and private industry through all stages of manufacturing, distribution, and transport of lithium batteries and lithium-battery-powered items. Such cooperation is especially vital for incident investigation and coordination with other government agencies.

The transportation of lithium batteries always presents a risk, even with mitigation strategies in place. However, lithium batteries present a higher risk of a potentially catastrophic thermal runaway event when established risk controls/mitigations cannot be properly applied. The most egregious violations are categorically designated as undeclared shipments, with no markings or other required hazard communication to indicate that a shipment contains lithium batteries or hazmat of any kind. These undeclared shipments commonly are not properly prepared or packaged or both and may not be properly handled or segregated from other goods by the carrier, further increasing the risk to people and the aircraft of a thermal runaway event. In those instances, air carriers and their flight crews are unaware of the level of risk they are accepting for their operations. This is why safety promotion and reinforcement of roles and responsibilities at all levels of the supply chain are essential.

The FAA Hazardous Materials Safety Program continues to work collaboratively with other federal agencies on lithium battery issues. 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 under the Hazardous Materials Transportation Law (49 U.S.C. § 5101 et seq.) to promulgate for the Hazardous Materials Regulations (HMR; 49 CFR parts 171-180) (Title 49 of the United States Code (49 U.S.C.) § 5101 et seq.), which provide the core requirements to classify, package, and communicate the domestic transportation hazards of lithium batteries (HMR; 49 CFR 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 (e.g., product manufacturer offering hazardous materials for shipment, package manufacturer, shipper/offerors, and freight forwarder) that are critical to compliance and risk management. PHMSA also regulates multi-modal transportation of hazmat (known as "dangerous goods" globally) in commerce.

In addition, PHMSA leads multiple interagency and global fora to discuss all hazmat risks, including lithium batteries and international harmonization issues. PHMSA leads many of the efforts required by Section 333 of the Act. As noted in the initial Section 333(e)(3) report, PHMSA established a federal advisory committee to facilitate communication among lithium battery and cell manufacturers, shippers, end users, transporters, and the Federal Government. The committee serves as a group of experts to provide information related to lithium battery transport safety to the DOT Secretary, to receive advice on activities carried out throughout the world to communicate and enforce relevant U.S. regulations and the ICAO Technical Instructions, and to evaluate

the effectiveness of these activities. In July 2021, the committee issued a report detailing the recommendations and next steps.[i] The committee met twice in both 2021 and 2022.

DOT's Role in International Transportation of Lithium Batteries

As stated in the previous reports, lithium battery safety transcends borders. This concept applies at all levels—from the collaboration among organizations within DOT to interactions with industry and the international community. To promote safety regulations and foster an integrated approach to oversight, the FAA and PHMSA conduct outreach with stakeholders and participate in the ICAO DGP and the UN ECOSOC Sub-Committee of Experts on the TDG. During 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, uniform, 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 that expand ongoing efforts are as follows:

A. The ICAO DGP has leveraged an SAE International (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 considers and decides on how to integrate the resulting lithium battery package standard for risk mitigation.

B. The UN Informal Working Group (IWG) on Lithium Batteries, is 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 presented by lithium batteries and the reactions that may result from battery abuse.

C. The Safe Carriage of Goods Specific Working Group of the Flight Operations Panel (SCG-SWG FLTOPSP) addresses the broader scope of issues related to lithium batteries transported by air and the need for a coordinated response across various areas of expertise. Specifically, the SCG-SWG is tasked with addressing flight operations and procedures, advancing security in the carriage of goods, core facilitation, aircraft design, and cargo fire suppression systems, the safe transport of dangerous goods, security of the supply chain, and SRM.

D. The Dangerous Goods Panel Working Group on Energy Storage Devices (DGP-WG/Energy Storage Devices) was established to ensure that provisions related to the transport of lithium batteries or other energy storage devices, and supporting guidance material, enable an acceptable level of safety. The group

develops recommendations to address identified safety priorities and ensures that proposals align with safety management principles.

DOT continues to be an active member in the UN IWG on Lithium Batteries. The FAA William J. Hughes Technical Center (Tech Center) is one of nine participating laboratories located throughout the world developing and evaluating a lithium battery abuse test.

From 2021 to the present, the U.S. Delegation (the FAA and PHMSA) led the DGP-WG/Energy Storage Devices.

Specifically, the DGP-WG/Energy Storage Devices is tasked to:

1) Develop regulations to support a performance-based packaging standard for lithium batteries;
2) Consider additional operational controls to mitigate aviation-specific risks posed by lithium batteries, including:
    a. Any information necessary to conduct safety-risk assessments for carriage of cargo, including dangerous goods;
    b. A mechanism to identify and communicate specific hazards associated with different battery types;
    c. A mechanism to ensure transparency of all shipments, including those not subject to full regulation (Section II batteries);
    d. Provisions to mitigate safety risks posed by lithium batteries packed with or contained in equipment;
    e. Provisions are simplified to facilitate full compliance; and
    f. Provisions that provide for greater granularity with respect to the classification of lithium batteries developed through coordination with the UN ECOSOC Committee of Experts.

Three DOT-led, DGP-WG/Energy Storage Devices meetings were held during the 2020-2021 ICAO Biennium. The DGP-WG/Energy Storage Devices prioritized work on the performance-based packaging standard for lithium batteries and a review of the Technical Instructions on operators' ability to comply with Annex 6, Part I, Chapter 15, for excepted lithium batteries.

- The DGP-WG/Energy Storage Devices held preliminary discussions on the implementation of the performance-based packaging standard. It was agreed that regulatory oversight would need to be in place to give the entities in the supply chain confidence that the package meets the standard. Future deliberations amongst the DGP will further identify the appropriate means to ensure appropriate oversight.

- Through the DGP-WG/Energy Storage Devices, DOT successfully built consensus on eliminating regulatory provisions that limit the ability of airlines to identify packages containing lithium batteries and conduct required safety risk assessments. The DGP ultimately agreed to eliminate these provisions during DGP/28 held November 15–19, 2021. Future DGP-WG/Energy Storage Devices discussions will focus on expanding SOC limits to all lithium-ion batteries, including those packed with and contained in equipment prior to air transportation, as a risk mitigation strategy for shipments of all lithium-ion batteries.

In addition to those ongoing efforts, the progress of international cooperative efforts culminated in part during the strategic planning, oversight, and transport of the Novel Coronavirus Disease 2019 (COVID-19) vaccines. Since the onset of the COVID-19 pandemic, the FAA has collaborated proactively with other U.S. government agencies, air carriers, pharmaceutical companies, ICAO, and additional aviation stakeholders to enable safe and efficient transportation by air of critical medical supplies and personnel. This undertaking presented unique challenges and encompassed lithium-battery-powered data loggers to monitor temperature during the handling and shipping of those vaccines across the globe.

As part of DOT's overall efforts, the department established the DOT Vaccine Transportation Working Group that included all DOT modes to support The Operation, formerly Operation Warp Speed. Subsequently, the FAA established the FAA COVID-19 Vaccine Air Transport Team in October 2020, to aid in the safe and efficient transport of COVID-19 vaccines.

As several kinds of vaccines need continual, cold temperatures during transport, it may be necessary to use dry ice (a hazardous material). As alluded to, lithium-battery-powered data loggers are critical for this objective. The FAA worked with air carriers and other aviation stakeholders to provide guidance on implementing current regulatory requirements for safely transporting larger than normal quantities of dry ice in air cargo with the use of those data loggers. Lithium-battery-powered data loggers also were utilized for the transport of COVID-19 vaccines not involving dry ice.

Throughout this unprecedented effort in agency action, DOT and the FAA employed a multi-disciplinary, integrated approach to coordinate planning and preparedness for flights carrying the COVID-19 vaccines through existing FAA policies and procedures; these focused actions helped to explore and address potential issues and promote positive outcomes. To better facilitate the effort, between December 4, 2020, and June 10, 2022, DOT and the FAA also led a recurrent Vaccine Distribution Engagement Meeting (VDEM) that convened government and industry to share ideas, successes, and challenges, and to ask questions related to transporting the COVID-19 vaccines. Aviation trade associations, air carriers, government partners, and other stakeholders have engaged in providing information and voicing concerns—with no consensus recommendations sought for any governmental action—related to the logistics of

transportation by air of the COVID-19 vaccines. The entities represented at the recurrent VDEMs have collaborated overall to successfully ship and transport the COVID-19 vaccines while upholding the highest standards of transportation safety. In working closely with noted stakeholders, this core collaboration ensured that DOT continued to adapt and lead the international community to address lithium-battery safety issues effectively, even for a public health crisis that established a framework for any such future response.

Advancements of the FAA Tech Center

The aviation community continues to rely greatly on the FAA's Fire Safety Branch located at the FAA Tech Center for research and testing and to provide technical expertise in international, collaborative efforts focused on managing the safety risks posed by the carriage of lithium batteries by air. Experts at the Tech Center continue their stalwart contributions to develop a baseline test method for the G-27 Packaging Standard (AS6413), establish a hazard-based system to classify lithium batteries and cells for transport, and improve transportation safety in this area.

Furthering the lithium battery research noted in the previous reports, from 2020-2022, the FAA Tech Center has led efforts to form the FAA Cargo Safety Steering Committee, an FAA interdisciplinary working group that convened to develop several initiatives related to Aircraft Cargo Safety. Through Cargo Safety, the FAA is evolving how the aviation industry and supply chain can identify and mitigate cargo hazards at the aircraft level. The primary output of these efforts was Advisory Circular (AC) 120-121, Safety Risk Management Involving Items in Aircraft Cargo Compartments, which was published in September 2021.[ii] The AC is a significant milestone for U.S. aviation safety and the cornerstone for an enhanced, unified approach to promoting the safety management culture throughout the aviation cargo supply chain. Publication of the PHMSA final rule "Enhanced Safety Provisions for Lithium Batteries Transported by Aircraft" (Docket No. PHMSA-2016-0014 (HM-224I) supports operators in applying more targeted controls to mitigate risks introduced into their system by shipments of lithium batteries when performing the safety risk management assessments outlined in the AC.

The FAA established three websites dedicated to support AC 120-121:

1) Source – https://www.fire.tc.faa.gov/CargoSafety/
   This website relates to assistance for operators who conduct appropriate risk assessments on items carried in aircraft cargo compartments and is a repository for the FAA Tech Center's lithium battery research and testing.

2) Source – https://www.faa.gov/aircraft/safety/CargoSafety
   This website implements a high-level aircraft safety initiative around information sharing for Aircraft Cargo Safety.

3) Source – https://www.faa.gov/hazmat/air_carriers/cargo_safety/
   This website creates a cross-reference to other websites and facilitates awareness of the dangerous goods' audience to Cargo Safety initiatives.

On April 21-22, 2021, the FAA Fire Research Branch organized the International Aircraft Systems Fire Protection Virtual Forum.[iii] The forum was held to enhance and inform the aviation industry of research developments in the field of fire safety. Air transportation regulators, research organizations, and private companies attended this forum organized by the Fire and Cabin Safety Research Group. That group consists of members of both the research and regulatory elements of each of the participating authorities that includes Transport Canada, the United Kingdom Civil Aviation Authority, the European Aviation Safety Agency (EASA), the National Civil Aviation Agency of Brazil, the Civil Aviation Safety Authority Australia, and the Civil Aviation Authority of Singapore.

In 2021, the FAA released two Portable Electronic Device (PED) Fire Training videos. The videos reinforce guidance to operator staff who develop training and procedures for crewmembers fighting High-Energy Fires in the cabin or the flight deck. To that aim, the videos also will help the industry meet the spirit and intent of upcoming, updated Advisory Circular (AC) 120-80B, In-Flight Fires. One video is focused on educational information for crews in the cabin; the other is focused on educational information for crews in the flight deck. The FAA developed the videos in a broad collaboration with the Air Line Pilots Association (ALPA), Association of Flight Attendants, Alaska Airlines, The Boeing Company, and EASA. Internal FAA participation included the FAA Tech Center's Fire Safety Branch, Aircraft Certification Service, Flight Standards, and the Office of Hazardous Materials Safety.

Upon publication of the videos, a meeting was convened to facilitate the final messaging content for their promotion. From July 2021 to December 2021, the FAA participated in three (3) promotional activities specific to the ICAO SCG-SWG; the AFA Safety, Health, and Security Committee; and the ICAO Cabin Safety Group (ICSG).

Interagency Collaboration with USPS

In addition, DOT's collaboration with the U.S. Postal Service (USPS) and Postal Inspection Service (USPIS) has strengthened since 2021. The FAA continues to engage with USPIS in quarterly hazmat meetings to share safety information, identify risks and foster cooperation between the agencies in matters related to the air transport of hazmat. Along with the quarterly meetings, the FAA and USPS meet on an ad hoc basis to discuss issues such as regulatory changes, developments in the industry that are impactful on safety in the supply chain, and recent incidents involving hazmat that may have broader implications for transportation safety. Lithium batteries continue to be a focal point of these discussions.

The FAA also participates in the annual ICAO–Universal Postal Union Contact Committee (ICAO-UPU CC) meetings. ICAO and UPU Secretariats support the committee that is comprised of subject-matter experts drawn from their membership. The purpose of the meetings is to provide a forum for the discussion of matters related to the safety, security, and facilitation of air mail. The meetings also serve to focus collaboration between the FAA, USPS/USPIS, and the civil aviation sector to identify and explore options that will hone alignment with existing provisions, for safe and secure air transport of all dangerous goods within the supply chain.

International Lithium Battery Safety Events

Beyond the FAA and PHMSA's collaborative work that focuses on managing the safety risks posed by the air carriage of lithium batteries, the FAA participated in several safety promotion events intended to communicate the risks of lithium batteries in aviation cargo and promote lithium battery safety.

Those engagement events are as follows:

On January 12, 2021, the FAA participated in a UN Sub-Committee of Experts (SCOE) TDG, Informal Working Group (IWG) Meeting on the Classification of Lithium Batteries. The FAA provided feedback and alternative approaches to the current classification testing draft to support more simplified and appropriate methods of establishing the risk in lithium cell and battery propagation, production of flammable gas, and thermal runaway onset temperature.

On February 9, 2021, the FAA participated in the UN SCOE TDG, IWG on Lithium Battery Classification testing protocol meeting. The FAA Tech Center's Fire Safety Branch presented a proposed testing strategy on the concepts of flammability, propagation, and gas volume to maintain the level of data needed while reducing the burden of complex testing schemes.

During April 26–28, 2021, the FAA participated in the Council on Safe Transportation of Hazardous Articles (COSTHA) Virtual Annual Forum in the Data Logger / Tracker Panel discussion and the Air Carrier Roundtable discussion.

During the week of September 6, 2021, the FAA participated in a meeting with the International Air Transport Association's (IATA) Global Director of Safety, Head of SMS, and Global Head of Safety to discuss working together on ideas to advance measures to reduce or mitigate risks involved in the transport of PEDs by air.

On October 19, 2021, the FAA participated virtually in the International Aviation Logistics Forum in Shenzhen, China. It was hosted by the US-China Aviation Cooperation Program, The Boeing Company, the Shenzhen Airport Group, and other organizers from the U.S. Department of Homeland Security's Transportation Security Administration. The themes of this conference included the safety and security of the air

cargo supply chain, challenges from the COVID-19 pandemic and growing demands for air cargo, COVID-19 vaccine transport, lithium battery safety, and additional topics around dangerous goods. Additionally, the FAA participated in two complementary panel sessions to discuss FAA and Office of Hazardous Materials Safety (AXH) perspectives on dangerous goods' safety, highlighting the risks posed by lithium batteries in the aviation system.

On November 4, 2021, the FAA participated in the ICAO Cooperative Development of Operational Safety and Continuing Airworthiness Program (COSCAP) Dangerous Goods Workshop. This South-East Asia region hosted this workshop with participants from North Asia and South Asia, covering the entire Asia-Pacific region. AXH presented on three panels with civil aviation authority (CAA) partners from the United Kingdom (UK) and Australia. Each CAA delivered information covering COVID-19 vaccine transport, undeclared dangerous goods, lithium battery safety, and safety partnerships in collaboration. Approximately 100 attendees participated virtually and in person from 20 countries and three industry groups. Following this meeting, the FAA is working with the UK and other CAAs to establish regular dialogue via virtual meetings to discuss lithium battery safety initiatives and other activities to promote dangerous goods' safety.

On April 26-27, 2022, the FAA sat on a Cargo Safety breakout panel at the Aviation Safety InfoShare in St. Louis, MO. The event was well attended by global industry and government aviation partners, including the UK.

On May 24, 2022, the FAA presented at the 31st Cargo Network Services Corporation (CNS) IATA Partnership Conference in Phoenix, AZ, to raise awareness of the risk and importance of shipping dangerous goods and lithium batteries and cultivating a safety culture across the global supply chain.

Education Campaigns and Stakeholder Engagement Activities

DOT 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 continuously expand their stakeholder engagement activities in collaboration with all entities in the supply chain, including manufacturers, shippers, air and ground carriers, industry organizations, government representatives, and the public.

As noted in the previous reports, 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, or seminars
- Congressional briefings and fact sheets
- Interactive presentations
- Workshops and panel discussions

- Video messages
- Content on public websites
- Social media platforms
- Publications, or print materials (e.g., posters, flyers, and brochures)

Targeting and connecting the shifting audiences with these materials requires a variety of messages, media, and fora. All of the awareness campaigns aim to contribute to the promotion of safety in the transportation system. PHMSA engages in several activities and initiatives for lithium battery safety, focusing on a multi-modal approach that includes highway, rail, air, and vessel transportation. The FAA engages 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. Again, understanding a specific audience is key to having the messaging resonate for the success of awareness-building efforts.

FAA's Continued 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 uses a wide variety of analytics and metrics, appropriate to the individual activity, to measure whether stakeholder engagement materials are reaching the intended audience.

As generally known, lithium batteries pose a high risk to aviation safety when not packaged, stored, or shipped properly in aircraft. To underscore safety messaging, the FAA regularly engages with passengers, industry, government, and standards-making organizations—all in an effort to manage and minimize safety risks. The FAA Hazardous Materials Safety Program continually collaborates internally with the FAA Office of Communications to measure social media and website content through the analysis of user views and user interactions, or postings. The FAA also reviews stakeholder feedback and analytics from individual activities of both qualitative and quantitative information, such as evaluating interactions with the audience and measuring the overall audience size, to shape and inform future engagement activities.

The three initiatives that the FAA has implemented—SafeCargo for air cargo shippers, PackSafe for passengers, and OperateSafe for air carriers, or operators—remain effective and are utilized to provide targeted and graphical aviation-related messaging and interactive resources. The FAA continues to support these initiatives through social media, collaborative efforts with stakeholders, along with updated website content. The FAA also continues to develop new materials related to lithium battery safety for these campaigns.

More specifically, for the three initiatives regarding the agency's priority of lithium battery safety, the goals for educating core stakeholders on the FAA's SMS approach to Cargo Safety are the following:

- PackSafe—build awareness among *passengers* on the risks of lithium batteries and the responsibility to protect batteries, including those allowed in baggage. For example, the focus is on protecting against damage/short circuits encompassing vapes or e-cigarettes, spare batteries or portable rechargers, and PEDs.
- SafeCargo—build awareness among *shippers in e-commerce* on risks of lithium batteries and the need to protect batteries, including improperly declared batteries, also encompassing vapes or e-cigarettes, spare batteries or portable rechargers, and PEDs.
- OperateSafe—encourage *operators* to share PackSafe and SafeCargo lithium battery messaging with customers and promote operator-specific lithium battery education (e.g., PED training videos created jointly by the FAA's Aviation Safety organization and Tech Center)

The FAA continues to track website traffic to identify overall growth and changing trends.

In addition to general educational campaigns, including website information, dangerous goods awareness videos, and social media campaigns, the FAA maintained virtual and in-person participation in sponsored, national stakeholder engagement events throughout FY 2021 and 2022. In FY 2021, examples of national stakeholder engagement events include those by the National Business Aviation Association Go Fight Operations Conference, COSTHA, Special Operations Forces Industry Conference, Institute of Supply Management, the National Retail Federation, RetailX, CNS IATA, and American Pyrotechnics Association. That participation continued into FY 2022 in such events as the Regional Air Cargo Carriers Association, NBAA-Business Aviation Convention & Exhibition, Air Cargo Americas, Air Cargo 2022 (of the Air and Expedited Motor Carriers Association), Consumer Electronics Show 2022, and The International Air Cargo Association's Executive Summit 2+2 2022. The FAA values and leverages these events to provide targeted messaging to various aviation stakeholders. The objective is to reduce risks posed by dangerous goods' stakeholders to the National Airspace System (NAS) through mutual learning and communication efforts. As alluded to, the FAA measures the effectiveness of interactions with attendees through both qualitative and quantitative information. This information provides insights into the audience reached at any given event, and it also provides baseline metrics for the effectiveness of future events.

In keeping with such collaborative interaction and information-sharing, in March 2022, the FAA worked proactively with PHMSA, USPS/USPIS, Consumer Product Safety Commission, and other U.S. government agencies to create a team to respond to a large lithium battery recall. This team set up a response and communication network with affected and partner agencies, to ensure clear communication and address potential aviation transportation safety concerns for the ongoing recall that affected over one million lithium-ion battery-powered devices. As a result, the company provided an update on procedures to comply with requirements for damaged, defective, and recalled lithium batteries, ensuring devices would not be inadvertently shipped by air. The

company also voluntarily updated its Recall Website to include frequently-asked questions on restrictions for air travelers and cross-referenced the FAA PackSafe for Passengers web page.

Lastly, to advance the DOT priority of safe air transport of lithium batteries, the FAA continually supports voluntary compliance efforts that are part of the overall aviation safety system. The FAA continues to provide safety information to all air carriers through the dissemination of notices, such as ACs, InFOs, SAFOs, Notices to Air Missions, General Notices, and Temporary Flight Restrictions.

PHMSA's 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 multi-modal campaign, which is a public-awareness campaign that seeks to prevent serious incidents regarding everyday items considered hazardous materials ("hazmat" or dangerous goods), including lithium batteries. See below in 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 ALPA, the Association of Mail and Business Centers, and the USPS have expressed support for this campaign.[iv]

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 continuously enhances its website[v] that hosts 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 continued to develop and distribute multiple job-aid publications[vi] regarding the safe transportation of lithium batteries. In September of 2021, PHMSA published the “Lithium Battery Guide for Shippers” plain-language publication to enable shippers to better understand and comply with the HMR. This publication acts as a comprehensive compliance tool that simplifies the complex and varied HMR requirements into scenario-based shipping instructions based on battery type, size, and packaging configuration. In support of the rollout of this publication, PHMSA also developed and recorded a webinar that instructs shippers on the use of the publication in their operations.

In February of 2022, PHMSA published “Lithium Battery Test Summaries (TS)” to assist lithium battery manufacturers and distributors with understanding and implementing the lithium battery test summary requirements that became effective January 1, 2022. PHMSA and FAA actively supported the development of this international regulatory provision to provide traceability, accountability and verifications throughout the transportation system for compliance with critical lithium battery design safety standards.

PHMSA maintains its commitment to updating and expanding guidance material on shipping lithium batteries and is working on increasing its global impact by translating publications like the “Lithium Battery Guide for Shippers” and the “Lithium Battery Test Summary (TS)” publications into other languages, such as Spanish and Simplified Chinese. The documents are made available on PHMSA’s website and distributed at various ’stakeholders’ outreach events, such as conferences, and training seminars.

PHMSA has also focused outreach efforts on the emerging risks associated with end-of-life lithium battery transportation working with other federal agencies such as the Environmental Protection Agency (EPA) and Consumer Product Safety Commission (CPSC). Since late 2019, PHMSA has hosted webinars and workshops attended by thousands of stakeholders, including battery manufacturers, retailers, collection programs, and recyclers, on the HMR requirements for transporting lithium batteries for recycling and disposal as well as damaged, defective, and recalled lithium batteries. In addition, in May 2022, PHMSA published the “Safety Advisory Notice for the Disposal and Recycling of Lithium Batteries in Commercial Transportation,” a plain-language overview of the risks and requirements for transporting lithium batteries at end-of-life. PHMSA continues to expand this outreach initiative, focusing planned efforts on discrete segments of this industry, such as the micro-mobility device (e.g., e-bikes, scooters) industry, to continue to promote the safe transportation of lithium batteries.

Interagency Lithium Battery Safety Working Group

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

Through regular meetings and discussions, the Working Group discerned the diverse range of respective federal authorities and voluntary consensus standards for lithium battery safety. Many of those discussions have focused on identifying common areas across agencies that encompassed: hazards associated with lithium batteries, existing

statutory authorities related to lithium battery safety, opportunities for interagency coordination, and interagency efforts to ascertain new and existing technologies to improve the safe manufacture, use, and transport of lithium batteries. A report detailing these findings is forthcoming.

DOT's Safety Compliance and Enforcement

DOT utilizes an intermodal, collaborative approach to safety compliance and enforcement.

PHMSA has oversight of entities that offer hazmat for transportation, and that manufacture, requalify, rebuild, repair, recondition, or retest packaging (other than cargo tanks and tank cars) used to transport hazardous materials. In alignment with PHMSA's general oversight, the FAA has oversight of the transportation or shipment of hazardous materials by air through delegated authority to the FAA Administrator under 49 CFR § 1.83(d)(1). As one DOT, the modal compliance and enforcement programs of both PHMSA and the FAA are designed to promote compliance with the statutory and regulatory requirements applicable to all activities regulated or enforced by the respective agencies. This collaborative regulatory and systems-based compliance and enforcement structure enables comprehensive safety oversight that is intended to mitigate safety risks and prevent accidents in transport.

Undeclared lithium batteries remain a high risk to transport by air because they may not be properly handled, and as alluded to above, air carriers and their flight crews are unaware of the level of risk being accepted for their operations. Undeclared lithium batteries have been discovered through screening procedures or inspections. Most incidents related to undeclared dangerous goods occurred on the ground before the cargo was loaded onto the aircraft. This is due to DOT's robust surveillance and oversight activities.

The FAA has issued compliance and enforcement activities against air carriers, shippers/freight forwarders, and passengers for undeclared and/or improperly prepared lithium batteries. PHMSA and the FAA can address noncompliance through informal actions, warning notices or letters of correction, civil penalties, and referrals for criminal prosecution. The goal of surveillance within the compliance and enforcement framework of DOT's safety mission is to mitigate risk introduced into the transportation system and deter future noncompliance. Overall, DOT utilizes positive reinforcement of the safety mission that encourages the promotion of noted safety messaging, stakeholder training, and updates to procedures or manuals with follow-on demonstration of compliance, and general educational campaigns.

Compliance and Enforcement involving Foreign Parties

DOT continues to 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. The lithium battery industry continues to expand, placing more lithium batteries and other dangerous goods into the transportation system. 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.

The mailbox AXH established in CY 2019, 9-ASH-AXH-InternationalIncidents@faa.gov, provides international stakeholders with a centralized point of open communication to send to, or receive from, incident reports, documentaries, and other evidence developed in incident investigation. The goal is to strengthen oversight and foster better coordination of investigation actions, along with proposed and final enforcement actions. ICAO's "National Authority for Dangerous Goods Transport by Air" webpage continues to include this information, to provide the email address within the International Dangerous Goods stakeholder community.

Summary

Transportation Safety is DOT's mission, with dedicated efforts to ensure safe outcomes. In the advancement of that mission, the FAA utilizes a comprehensive, cooperative approach to improve compliance with safety regulations for air transport of lithium batteries through stakeholder engagement and enforcement activities. As detailed in the previous reports, transportation safety activities remain underway in collaboration with internal and external stakeholders. Those activities coalesce to provide an international, systems- and risk-based approach to mitigate risks posed by lithium batteries and numerous dangerous goods in the national airspace and other modes of transport.

Although DOT has fulfilled its requirement under Section 333(e)(3) of the Act, the work continues. It is challenging yet rewarding work that keeps millions of Americans and citizens across the globe safe. Despite challenges met, the FAA's safety record remains unparalleled with a proven commitment to the safety mission.

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[i] Pipeline and Hazardous Materials Safety Administration, Lithium Battery Air Safety Advisory Committee Report (January 2021). https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2021-07/Report%20to%20Congress%20-%20Lithium%20Battery%20Air%20Safety%20Adviosry%20Committee%20-%20July%202021.pdf

[ii] Federal Aviation Administration, Safety Risk Management Involving Items in Aircraft Cargo Compartments Advisory Circular (September 2021). https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-121.pdf

[iii] International Aircraft Systems Fire Protection Forum Virtual Meeting Agenda (April 21-22, 2021). https://www.fire.tc.faa.gov/pdf/systems/April21Meeting/SysAgenda-0421.pdf

[iv] Air Line Pilots Association Int'l, 'Check the Box' PHMSA Launches Campaign to Help Curb Shipment of Undeclared Hazardous Materials (October 2018). http://www.alpa.org/news-and-events/air-line-pilot-magazine/the-landing-check-the-box

[v] Pipeline and Hazardous Materials Safety Administration, Transporting Lithium Batteries webpage. https://www.phmsa.dot.gov/lithiumbatteries

[vi] Pipeline and Hazardous Materials Safety Administration, Transporting Lithium Batteries webpage. https://www.phmsa.dot.gov/lithiumbatteries