

**DEPARTMENT OF TRANSPORTATION****Pipeline and Hazardous Materials Safety Administration****49 CFR Parts 171, 172, 173 and 175**

[Docket Nos. PHMSA-02-11989 (HM-224C) and PHMSA-04-19886 (HM-224E)]

RIN 2137-AD48 and RIN 2137-AE05

**Hazardous Materials; Transportation of Lithium Batteries****AGENCY:** Pipeline and Hazardous Materials Safety Administration (PHMSA), DOT.**ACTION:** Final rule.

**SUMMARY:** The Pipeline and Hazardous Materials Safety Administration is amending the Hazardous Materials Regulations (HMR) to tighten the safety standards for transportation of lithium batteries, including both primary (non-rechargeable) and secondary (rechargeable) lithium batteries. Specifically, we are adopting with minor changes the amendments to the HMR published in an interim final rule on December 15, 2004, imposing a limited prohibition on the transportation of primary lithium batteries and cells as cargo aboard passenger-carrying aircraft. In addition, we are adopting many of the proposed changes to the HMR published under the April 2, 2002 NPRM; (1) Eliminating a hazard communication and packaging exception for medium-size lithium cells and batteries of all types transported by aircraft or vessel; (2) revising an exception for small lithium batteries and cells of all types to require testing in accordance with the United Nations Manual of Tests and Criteria; and (3) revising an exception for consumer electronic devices and spare lithium batteries of all types carried by airline passengers and crew. These amendments will enhance transportation safety by reducing fire hazards associated with lithium batteries and harmonizing U.S. and international standards.

**DATES:** *Effective Date:* The effective date of these amendments is January 1, 2008.

**Voluntary Compliance:** Voluntary compliance with all of these amendments, including those with a delayed mandatory compliance date, is authorized as of October 1, 2007.

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This final rule is the culmination of two rulemaking proceedings initiated by the Research and Special Programs Administration (RSPA), the predecessor agency to the Pipeline and Hazardous Materials Safety Administration (PHMSA), in order to reduce the risks of battery-related fires in transportation and in response to incident reports and recommendations of the Federal Aviation Administration (FAA) and National Transportation Safety Board (NTSB). The final rule continues in force a limited ban on the transportation of certain lithium batteries as cargo aboard passenger aircraft. It tightens other standards for the testing, handling, and packaging of lithium batteries, in each case to reduce the likelihood or consequence of a lithium battery-related fire in transportation. Although we developed these standards in separate rulemaking proceedings, we have combined them for publication in this single final rule in the interests of clarity and consistency and to minimize regulatory burdens.

**I. Background**

The final rule adopted today is one of several actions PHMSA is taking, in consultation with the FAA, to improve the safety of lithium batteries in transportation. Beyond rulemaking and enforcement, PHMSA and FAA are promoting and advancing non-regulatory solutions through a broad group of public and private sector stakeholders that share our interest in battery and transportation safety. We are working with representatives of the NTSB, the Consumer Product Safety Commission, manufacturers of lithium

batteries and battery-powered products, airlines, airline employee organizations, testing laboratories, and the emergency response and law enforcement communities to share and disseminate information about battery-related risks and developments and to promote improvements in industry standards and best practices. We report on these non-regulatory activities through our public Web site at <http://safetravel.dot.gov>.

**A. Overview of Lithium Battery Risks**

Lithium batteries are considered a hazardous material for purposes of transportation regulation because they can overheat and ignite in certain conditions and, once ignited, can be especially difficult to extinguish. In general, the risks posed by lithium batteries are a function of battery size (the amount of lithium content and corresponding energy density) and the likelihood of short-circuiting or rupture. By comparison to standard alkaline batteries, most lithium-ion batteries manufactured today contain a flammable electrolyte and have a very high energy density. A lithium battery is susceptible to thermal runaway, a chain reaction leading to self-heating and release of its stored energy.

The increasing manifestation of these risks, inside and outside of transportation, drives the need for stricter safety standards. Once used primarily in industrial and military applications, lithium batteries are now found in a variety of popular consumer items, including cameras, laptop computers, and mobile telephones. The numbers, types, and sizes of lithium batteries moving in transportation have grown steadily in recent years with the increasing popularity of these and other portable devices and the corresponding proliferation of battery designs, manufacturers, and applications.

Like other products that contain hazardous materials, lithium batteries can be transported safely, provided appropriate precautions are taken in design, packaging, handling, and emergency response. The rule adopted in this proceeding strengthens the current regulatory framework by imposing stricter and more effective safeguards, including design testing, packaging, and hazard communication measures, for certain types and sizes of lithium batteries in certain transportation contexts.

These adjustments are risk-based and data-driven, reflecting incident reports, laboratory testing, and other information that together promote better understanding of risks and

consequences in relationship to specific risk variables:

*Battery technology.* In the rulemaking proposals that gave rise to the final rule, we differentiated between “primary” (or non-rechargeable) and “secondary” (or rechargeable) lithium batteries. This distinction, which is well established in international standards, is related to the battery composition. “Primary” (non-rechargeable) lithium batteries generally contain lithium metal, while most “secondary” (rechargeable) lithium batteries contain an ionic form of lithium (lithium-ion). The technology used in lithium batteries has a significant impact on the battery application and, all other factors being equal, on corresponding transportation risks.

For purposes of this rulemaking, we use the term “primary lithium battery” to refer to a non-rechargeable battery

and the term “secondary lithium battery” to refer to a rechargeable battery. In most cases, this distinction will differentiate between different battery technologies. Although we understand that the distinction is being called into question by technological and market developments, we believe the regulatory definitions continue to have merit at this time, recognizing that further regulatory refinement will be necessary to respond to further technological developments and our growing understanding of transportation risks.

*Transportation mode.* The consequence of a lithium battery-related fire depends largely on the transportation context. In weighing the costs and benefits of regulation, we consider the mode of transportation and impose the strictest standards in air

transportation, particularly passenger service. Although most battery-related fires have caused only property damage or delays in ground transportation, even a small fire aboard an in-flight aircraft threatens catastrophic consequences.

*Battery size.* The degree of risk posed by lithium batteries is largely a function of the amount of stored energy, which is in turn a function of the number and relative lithium content of battery cells. These size standards are the accepted categorization of lithium batteries under the United Nations Recommendations and international regulatory bodies such as the International Civil Aviation Organization (ICAO). A cell is a single electro-chemical unit; a battery consists of one or more connected cells. The size of a cell or battery is determined by its lithium content, as summarized in the following chart:

TABLE 1.—BATTERY AND CELL CATEGORY DEFINITIONS

	Small (no more than)	Medium (between)	Large (more than)
Cells:			
Primary .....	1 g Li.	1 g and 5 g Li.	5 g Li.
Secondary .....	1.5 g ELC.*	1.5 g and 5 g ELC.	5 g ELC.
Batteries:			
Primary .....	2 g Li.	2 g and 25 g Li.	25 g Li.
Secondary .....	8 g ELC.	8 g and 25 g ELC.	25 g ELC.

\* ELC (Equivalent Lithium Content).

*Quantity.* The number of lithium batteries in a shipment can also affect the severity of an incident. For example, several thousand small lithium batteries consolidated together present a higher potential risk than a shipment of a single lithium battery, because one burning primary lithium or secondary lithium battery can produce enough heat and energy to propagate to other lithium batteries in the same overpack, freight container, or cargo hold.

*Product Design, Package Integrity, and Transportation Handling.* The risks that a lithium battery will short-circuit or rupture are a function of design, packaging, and handling. As with many hazardous materials, the risk of a transportation incident involving lithium batteries can be reduced by strengthening packaging and reducing the likelihood and impact of rough handling. The amendments adopted here include tightened testing standards to ensure that batteries that pose the greatest risk in transportation are designed to withstand normal conditions of transportation and packaged to minimize risks of mishandling or damage in transit.

*Emergency Response.* In developing the final rule, we paid special attention

to the potential consequences of lithium battery-related fires. Although we take fire hazards seriously in all modes, we must be particularly concerned about the possibility of an uncontrolled fire aboard an aircraft.

To evaluate the hazards posed by primary lithium batteries in air transportation, FAA’s Technical Center initiated a series of tests to assess their flammability characteristics. FAA published a technical report detailing the results of the tests in June 2004 (DOT/FAAIARI–04/26). The battery tests were designed to test the batteries in an environment that is similar to actual conditions possible in a suppressed cargo fire. The FAA tests showed that the packaging materials delayed the ignition of the batteries, but eventually added to the fire loading and contributed to the battery ignition, even after the original (alcohol) fire had been exhausted. In addition, the packaging material held the batteries together, allowing the plastic outer coating to fuse the batteries together. This enhanced the probability of a burning battery igniting adjacent batteries, increasing the propagation rate. The technical report, which can be found in the docket for

this rulemaking, concluded that the presence of a shipment of primary lithium batteries can significantly increase the severity of an in-flight cargo compartment fire.

In addition, the report concluded that primary lithium batteries pose a unique threat in the cargo compartment of an aircraft because primary lithium battery fires cannot be suppressed by means of Halon, the only FAA-certified fire suppression system permitted for use in cargo compartments of a passenger-carrying aircraft operating in the United States.

FAA also conducted a series of test to determine the flammability of secondary lithium batteries and cells and issued a final report detailing the results in September 2006 (DOT/FAA/AR–06/38). This report can be found in the docket for this rulemaking. Flames produced by the batteries are hot enough to cause adjacent cells to vent and ignite. The report also concluded that Halon is effective in suppressing the electrolyte fire and preventing any additional fire from subsequent cell venting. The lithium-ion cells will continue to vent due to high temperatures but will not ignite in the presence of Halon.

### B. LAX Incident and NTSB Recommendations

The notices of proposed rulemaking (NPRMs) in these proceedings both tied the need for tighter safety standards to an April 28, 1999 fire at Los Angeles International Airport (LAX). The LAX incident involved a shipment of two pallets of primary lithium batteries that caught fire and burned after being off-loaded from a Northwest Airlines flight originating in Osaka, Japan. The two pallets involved in the fire contained 120,000 small primary lithium batteries that were excepted from domestic and international regulatory requirements applicable to hazard communication (i.e., marking, labeling, and shipping papers) and packaging. The packages on the pallets were damaged during handling at LAX, and this damage is believed to have initiated the subsequent fire. Northwest ground employees initially fought the fire with portable fire extinguishers and a fire hose. Each time the fire appeared to be extinguished, it flared up again.

The LAX incident illustrated the unique transportation safety problems posed by lithium batteries, including the risk of rough handling in transit, resulting short-circuiting, thermal runaway, ignition of adjacent batteries, and the ineffectiveness of halon as an extinguishing agent.

The NTSB conducted a full investigation of the LAX incident. The NTSB's final report, issued November 16, 1999, included five safety recommendations addressed to RSPA:

*A-99-80:* Together with the Federal Aviation Administration, evaluate the fire hazards posed by lithium batteries in an air transportation environment and require that appropriate safety measures be taken to protect aircraft and occupants. The evaluation should consider the testing requirements for lithium batteries in the United Nation's Transport of Dangerous Goods Manual of Tests and Criteria, the involvement of packages containing large quantities of tightly packed batteries in a cargo compartment fire, and the possible exposure of batteries to rough handling in an air transportation environment, including being or abraded open.

*A-99-81:* Pending completion of your evaluation of the fire hazards posed by lithium batteries in an air transportation environment, prohibit the transportation of lithium batteries on passenger-carrying aircraft.

*A-99-82:* Require that packages containing lithium batteries be identified as hazardous materials, including appropriate marking and labeling of the packages and proper identification in shipping documents, when transported on aircraft.

*A-99-83:* Pending completion of your evaluation of the fire hazards posed by lithium batteries in an air transportation

environment, notify the International Civil Aviation Organization's Dangerous Goods Panel (ICAO DGP) about the circumstances of the fire in the Northwest Airlines cargo facility at Los Angeles International Airport on April 28, 1999. Also pending completion of your evaluation of the fire hazards posed by lithium batteries in an air transportation environment, initiate action through the Dangerous Goods Panel to revise the Technical Instructions for the Safe Transportation of Dangerous Goods by Air to prohibit the transportation of lithium batteries on passenger-carrying aircraft.

*A-99-84:* Initiate action through the Dangerous Goods Panel to revise the Technical Instructions for the Safe Transportation of Dangerous Goods by Air to require that packages containing lithium batteries be identified as hazardous materials when transported on aircraft.

### C. Additional Incidents

The April 1999 LAX incident was not an isolated event; numerous incidents involving lithium batteries have been reported in the intervening years, most in the period since we initiated these rulemaking proceedings. Fortunately, none of the aviation-related incidents has resulted in death or serious injury; most of the incidents occurred either before or after flight. Some of these additional incidents are described below:

- On November 3, 2000, in Portland, Oregon, a small primary lithium battery short-circuited, causing a small fire and rupture of the battery. The primary lithium battery burned through its inner packaging and charred an adjacent package. The short-circuited battery had long flexible protruding positive and negative terminals.

- On April 12, 2002, small primary lithium batteries packaged in a fiberboard box ignited during handling in Indianapolis, Indiana.

- On August 9, 2002, a small secondary lithium battery in an electronic handheld device short-circuited, causing surrounding packing materials (bubble wrap) to catch fire.

- On August 7, 2004, large prototype secondary lithium batteries shipped under a competent authority approval from California to Europe apparently started a fire in a unit load device (ULD) during loading for a transatlantic flight (Memphis-Paris). The ULD and many other packages in it were damaged or destroyed by fire.

- On February 11, 2005, an undeclared package containing 18 small primary lithium batteries caught fire during unloading in White Bear Lake, Minnesota. Cargo handlers reported hearing a "pop" sound and then seeing the box "lifted" off the conveyor belt by the force. The package had been flown from Los Angeles to Minneapolis and

was to be trucked to Clear Lake, Wisconsin.

- On or about June 29, 2005, the contents of a ULD caught fire onboard a flight from Shanghai, China to the United States. Airline ground personnel discovered evidence of the fire after the plane landed safely in Ontario, California. A package containing a secondary lithium battery pack was identified as the source of the fire.

- On March 3, 2006, a U.S.-bound package containing secondary lithium batteries ignited in an outbound air transport station in Shenzhen, China.

- On July 17, 2006, a package with no marking or labeling containing 122 secondary lithium batteries of various sizes caught fire while being held in bond for customs clearance in Korea, after transportation by air from Vienna, Austria.

- On February 10, 2007, shortly after takeoff of a commercial flight, a fire ignited in a passenger bag stowed in an overhead bin. Although the fire is still under investigation, preliminary reports indicate both small lithium ion and small primary batteries were involved in the incident.

- On March 1, 2007, a package sent by an eBay vendor via the United States Postal Service, containing 24 primary lithium batteries, caught fire at the Sydney Australia Mail Gateway Facility. The package had been transported to Sydney from Los Angeles on a passenger aircraft.

### D. Recalls

In August and October of 2006 and March of 2007, several leading computer manufacturers recalled nearly 10 million notebook computer secondary lithium batteries based on manufacturing defects. The batteries in the 2006 recalls, manufactured by Sony Energy Devices Corporation, were voluntarily recalled in coordination with the U.S. Consumer Product Safety Commission (CPSC). According to CPSC reports, these defective secondary lithium batteries can spontaneously overheat and cause fires. The batteries in the March 2007 voluntary recall were manufactured by Sanyo Electric Company, Ltd. and designed to be extended-life batteries for Lenovo ThinkPad notebook computers. According to CPSC, the Sanyo lithium-ion batteries pose a fire hazard if the battery is struck forcefully on the corner (e.g., a direct fall to the ground).

### E. Regulatory Actions To Address Transportation Risks Posed by Lithium Batteries of All Types

As we explained above, the regulatory actions we are taking today are part of

a broader and ongoing effort to address the transportation risks posed by lithium batteries. Even as the measures adopted in this final rule progressed through the rulemaking process, more data surfaced concerning lithium battery risks. These developments have lent further support to the proposed approaches and spurred additional proposals for regulatory and non-regulatory change.

Inevitably, further technological advances, new product development, and market shifts will drive continued change in risks and benefits. We are committed to addressing those changes in a manner that safeguards our transportation systems and the traveling public, while promoting positive technological advances and minimizing regulatory costs and burdens for consumers and industry, including small businesses. To that end, we will continue to collect and analyze data concerning the risks posed by batteries and battery-powered devices of all types. We are committed to working with all affected stakeholders to identify risks and develop solutions, especially including non-regulatory solutions. In keeping with DOT regulatory policies and procedures, we will analyze the effectiveness of our rules over time, with a commitment to updating or eliminating any regulations that become unnecessary or unduly costly with changes in technology or transportation operations.

Recognizing that the risk and benefit profile is and has been dynamic, the final rule adopted today is best understood against the backdrop of existing and ongoing regulatory actions, including the separate rulemaking proposals that gave rise to this consolidated proceeding. By way of background, we begin with a discussion of regulatory requirements in place at the time of the LAX incident and NTSB recommendations.

1. *Regulatory Requirements Prior to Adoption of this Final Rule.* Under the Hazardous Materials Regulations (HMR, 49 CFR Parts 171–180), most lithium batteries and cells of all types and equipment containing or packed with lithium batteries or cells of all types are regulated as a Class 9 (Miscellaneous) hazardous material. A Class 9 material is one that presents a hazard during transportation, but that does not meet the definition of any other hazard class. The HMR require lithium batteries to be tested in accordance with a series of tests in Section 38.3 of the UN Test Manual. The tests are designed to ensure that a battery design type is capable of withstanding conditions encountered in transportation. The tests

include: (1) Test T.1 Altitude simulation, (2) Test T.2 Thermal test, (3) Test T.3 Vibration, (4) Test T.4 Shock, (5) Test T.5 External short circuit, (6) Test T.6 Impact, (7) Test T.7 Overcharge, and (8) Test T.8 Forced discharge. In addition, lithium batteries and cells must be: (1) Equipped with an effective means of preventing short circuits; (2) packaged in UN standard packagings meeting the Packing Group II performance level; and (3) identified on shipping papers and by package markings and hazard warning labels. See § 173.185(e).

Section 173.185 of the HMR contains exceptions from the packaging and hazard communication requirements of the HMR for small and medium-size lithium batteries and cells. Small and medium-size lithium batteries and cells must be packaged in strong outer packagings, and in a manner to protect against short circuits, but UN standard packagings are not required, and the requirements in Part 172 of the HMR applicable to shipping papers, marking, labeling, and emergency response information do not apply. Small lithium batteries and cells are also excepted from testing in accordance with the UN Test Manual.

2. *Changes to International Regulations.* Acting on a proposal by the United States, in December 2000, the United Nations Sub-Committee of Experts on the Transport of Dangerous Goods revised the UN Recommendations to: (1) Revise the lithium battery testing requirements in the UN Test Manual to provide more precise descriptions of the testing procedures and criteria and require more extensive testing to measure temperature, altitude, vibration, shock, impact, overcharge, forced discharge and intentional short; (2) eliminate an exception that permitted medium-size lithium batteries to be transported as unregulated material; (3) require testing of small lithium batteries to ensure they can withstand conditions encountered during transportation; (4) impose hazard communication and packaging requirements for small lithium batteries; and (5) provide exceptions for passengers and crew to carry lithium battery-powered equipment aboard an aircraft. These revisions were subsequently included in the 2003–2004 ICAO Technical Instructions. As a result of these revisions to the international regulations, NTSB classified recommendations A–99–83 and –84 as “Closed-Acceptable Alternate Action.”

3. *HM–224C Rulemaking.* On April 2, 2002, we issued an NPRM (HM–224C; 67 FR 15510) proposing changes to current HMR requirements for the

transport of lithium batteries consistent with the changes adopted in the UN Recommendations and ICAO Technical Instructions. These amendments were intended to improve the safety of lithium batteries in transportation and harmonize U.S. and international standards. Specifically, we proposed to: (1) Adopt the revised lithium battery test scheme in the UN Test Manual; (2) eliminate the exception for medium-size lithium batteries; (3) require testing of small lithium batteries; (4) impose hazard communication and packaging requirements for small lithium batteries; and (5) provide exceptions for passengers and crew to carry lithium battery-powered equipment aboard an aircraft.

4. *HM–224E Rulemaking.* Based in part on the June 2004 FAA technical report concerning the flammability characteristics of primary lithium batteries, discussed earlier in this preamble, on December 15, 2004, PHMSA published an interim final rule (IFR; Docket HM–224E; 69 FR 75208) prohibiting the shipment of primary lithium batteries as cargo on passenger-carrying aircraft. The IFR prohibits the offering for transportation and transportation in commerce of primary lithium batteries and cells, and equipment containing or packed with large primary lithium batteries (i.e., batteries containing greater than 25 grams of lithium) as cargo aboard passenger-carrying aircraft. In addition, equipment packed with or containing small or medium-size primary lithium batteries (i.e., batteries containing 25 grams or less of lithium) must be transported in accordance with Special Provisions A101 or A102. Under these Special Provisions, a primary lithium battery or cell packed with or contained in equipment may not exceed a net weight of 5 kg (11 pounds). Finally, the outside of each package that contains a primary lithium battery or cell forbidden for transport aboard passenger carrying aircraft must be marked “PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT.”

5. *Additional Recent Amendments to International Regulations.* At the international level, interest in the safe transportation of lithium batteries continues to grow as the number of lithium battery incidents (including non-transportation-related fires and product recalls) increases. The following activities and discussions of the ICAO Dangerous Goods Panel and the UN Sub-Committee of Experts on the Transport of Dangerous Goods signal further safety enhancements to the

ICAO Technical Instructions and UN Recommendations:

At its 2006 meeting (October 25—November 3, 2006), the ICAO Dangerous Goods Panel further considered amendments to the ICAO Technical Instructions concerning lithium battery safety. Based on a recommendation by the Panel, the ICAO Air Navigation Commission agreed to issue an addendum to the ICAO 2007–2008 Technical Instructions to prohibit the transport of lithium batteries that have the potential of producing a dangerous evolution of heat, fire, or short circuit as a result of being damaged or defective (e.g., those being returned to the manufacturer for safety reasons).

In December 2006, the United Nations Committee of Experts on the Transport of Dangerous Goods, based in part on U.S. proposals, revised Special Provision 188 (SP 188) of the UN Recommendations to address the risk that lithium cells and batteries currently excepted from regulation may short circuit in transportation. These

revisions (1) require individual packaging of lithium cells or batteries, (2) require protection against short circuits, accidental activation, and outer packaging of lithium battery-powered equipment; (3) eliminate the current exception from marking, documentation, drop testing, and gross weight limit for packages containing less than 24 lithium cells or 12 lithium batteries, and (4) standardize marking requirements for lithium batteries. Additionally, the UN Recommendations were amended to include separate dangerous goods list entries for metallic lithium and lithium ion batteries to assist shippers, transport personnel, and carriers in complying with the applicable regulations.

PHMSA will carefully review any amendments to the international regulation and will consider further rulemaking action based on a robust notice and comment process. As previously stated, we are committed to working with all affected stakeholders

to evaluate risks and develop potential solutions, especially non-regulatory solutions.

II. Provisions of this Final Rule

The continuing incidents and recalls and the results of the FAA testing discussed above reinforce the actions we are taking in this final rule and the need for ongoing analysis of the transportation risks presented by lithium batteries. As we explain in the following sections, the provisions of this final rule will provide additional protection against all lithium battery-related fires, regardless of their source, by enhancing hazard communication and emergency response and limiting transportation options based on the availability of effective fire suppression technology. This final rule addresses the proposals advanced in 2002 under Docket HM–224C and the provisions of the 2004 IFR published under Docket HM–224E. The following tables are provided for your convenience:

As a result of HM–224E IFR the following requirements are already in effect:

- Primary lithium batteries are forbidden for transport aboard passenger aircraft.
• Primary lithium batteries transported by any means other than passenger aircraft must be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT".

The following provision pertaining to lithium batteries is unchanged by this combined final rule:

- Requirements for large lithium batteries (> 25 grams).

The following provisions have been modified as a result of this combined final rule:

- Section 175.10(a)(17) in that the equipment containing batteries and spares must be in carry-on luggage.

The following new requirements will take effect as a result of this combined final rule:

- The exception for medium batteries is eliminated by aircraft and vessel.
• Small battery exception from UN testing is eliminated.
• A new marking paperwork requirement is added for medium batteries shipped as excepted via highway and rail transportation.
• A new marking paperwork requirement is added for small batteries that are shipped excepted.

A. Docket HM–224C

1. Background: Proposed Requirements

As mentioned above, our April 2, 2002, NPRM (67 FR 15510) proposed to: (1) Adopt the revised lithium battery test scheme in the UN Test Manual; (2) eliminate the current exceptions for medium-size lithium batteries of all types; (3) require testing of small lithium batteries of all types; (4) impose hazard communication and packaging requirements for small lithium batteries

of all types; and (5) provide exceptions for passengers and crew to carry lithium battery-powered equipment aboard an aircraft.

On June 15, 2005, we published an Initial Regulatory Flexibility Analysis (IRFA) (70 FR 34729) and requested comments on the potential small business impacts of the proposals in our April 2, 2002 NPRM. The issues raised by commenters to the IRFA are addressed in this document and the final regulatory flexibility analysis

(FRFA), which can be found in the public docket for this rulemaking.

2. Discussion of Comments to HM–224C

PHMSA received 22 written comments on the NPRM and the IRFA in this proceeding. The following companies, organizations, and individuals submitted comments, which are discussed in detail in this section:

- Electronic Industries Alliance (EIA; RSPA–2002–11989–3 and 16)

David Linden (Linden; RSPA-2002-11989-4)  
 Intel Corporation (Intel; RSPA-2002-11989-5)  
 National Electrical Manufacturers Association (NEMA; RSPA-2002-11989-6)  
 FEDCO Electronics, Inc. (FEDCO; RSPA-2002-11989-7, 12, 18, 24)  
 Argonne National Laboratory (ANL; RSPA-2002-11989-8)  
 National Transportation Safety Board (NTSB; RSPA-2002-11989-9)  
 Portable Rechargeable Battery Association (PRBA; RSPA-2002-11989-10, 19, 25)  
 Air Line Pilots Association International, Inc. (ALPA; RSPA-2002-11989-11)  
 Air Transport Association of America (ATA; RSPA-2002-11989-13)  
 Air Line Pilots Association, International (ALPA; RSPA-2002-11989-14)  
 Mark S. Ditmore (Ditmore; RSPA-2002-11989-15)  
 Valance Technology, Inc. (Valance; RSPA-2002-11989-20)  
 SION Power (SION; RSPA-2002-11989-22)  
 Cramer Law Group on behalf of SkyBitz Inc., (SkyBitz; RSPA-2002-11989-23)  
 ACR Electronic Inc (ACR; RSPA-2002-11989-26)  
 David Hadfield (RSPA-2002-11989-27)

a. *Elimination of the Exception for Medium-size Lithium Cells and Batteries.* In the NPRM, we proposed to eliminate the exception from most HMR requirements for medium-size lithium cells (including when packed or contained in equipment) containing 5 grams or less of lithium or lithium alloy and batteries (including when packed or contained in equipment) containing not more than 25 grams of lithium or lithium alloy per battery if they pass tests specified in Section 38.3 of the UN Test Manual. With the elimination of this exception, medium-size lithium batteries and cells of all types would have to be transported as Class 9 hazardous materials and conform to all associated hazard communication and packaging requirements. This exception has already been removed from the IMDG Code and the ICAO Technical Instructions, effectively requiring these lithium batteries to be transported as Class 9 materials when transported internationally by aircraft or vessel and in regulations applicable in other countries and regions throughout the world (e.g. European Road and Rail Agreements (ADR/RID)).

Several commenters urge PHMSA to retain this exception for domestic surface transportation. The Portable

Rechargeable Battery Association (PRBA) states that retention of the exception for medium-size lithium batteries of all types will have the largest positive effect on reducing the cost impacts on small businesses and recommends PHMSA retain the exception for lithium-ion batteries containing no more than 16 grams of equivalent lithium content shipped at a state of charge of no more than 50%. PRBA states testing data clearly show that the degree to which a lithium-ion cell reacts to abuse is significantly affected by state of charge. PRBA also suggests we should consider retaining the exception for medium-size lithium batteries when the batteries are contained in or packed with equipment and shipped by ground only. PRBA states this exception would substantially reduce costs associated with shipping products as Class 9 materials and cover a significant number of products shipped by small businesses.

In response to the proposal to eliminate the exception of medium sized batteries, Valance Technology, Inc. states PHMSA did not provide sufficient justification for eliminating the exception. SION Power asserts eliminating the exception for medium-size lithium batteries will adversely affect its commercial development and suggests that, in the case of primary lithium batteries, eliminating the exception will limit the size of batteries using smaller cells. SkyBitz favors scaling back the exception for medium-size lithium batteries by limiting the number of cells or batteries per package, rather than eliminating the exception. ACR Electronics, Inc. states PHMSA should retain the exception for medium-size lithium batteries provided they are contained in strong, waterproof safety equipment.

We continue to believe that significant safety benefits can be achieved by requiring medium-size lithium batteries and cells of all types to be shipped with appropriate hazard communication information. As recent incidents demonstrate, the hazards associated with these shipments should be communicated to transport workers and emergency response personnel to ensure safe handling in transportation and appropriate incident response actions. We are not convinced that requiring medium-size batteries to be transported with appropriate hazard communication information will impede the development or marketing of these batteries.

However, the comments raise legitimate concerns about the costs that may be incurred by companies,

particularly small businesses, if we were to remove the exception in its entirety. Therefore, in this final rule we are eliminating the exception for medium-size lithium batteries and cells of all types transported by aircraft or vessel, but retaining a limited exception for ground transportation (i.e., motor vehicle and rail car). This action improves overall safety by reducing the risk of lithium battery-related incidents in the transport modes that are inherently most vulnerable to high consequence accidents, while minimizing the costs for businesses that ship lithium batteries by motor carrier or rail.

For medium-size lithium batteries and cells transported by motor carrier or rail, we are imposing more limited, less costly hazard communication requirements. Rather than requiring compliance with the hazard communication and packaging requirements applicable to Class 9 materials, in this final rule, we are adopting, with some revisions, a hazard communication and packaging program developed by industry. Under this program, a package containing medium-size lithium batteries and cells of all types must: (1) Be marked to indicate it contains lithium batteries and special procedures must be followed in the event that the package is damaged; (2) be accompanied by a document indicating the package contains lithium batteries and special procedures must be followed in the event that the package is damaged; (3) weigh no more than 30 kilograms; and (4) be capable of withstanding a 1.2 meter drop test. For those packages that are not prepared for air shipment, (i.e., not offered and transported as a Class 9 material) we are requiring that the package be marked to indicate that they may not be transported by aircraft or vessel. In this final rule, the provisions applicable to the transportation of medium-size lithium batteries of all types are relocated from § 173.185 to Special Provision 189.

b. *Revisions to the Exceptions for Small Batteries.* Section 173.185(b) of the HMR provides significant exceptions from packaging and hazard communication requirements for small lithium cells and batteries. In addition, small lithium cells and batteries are not subject to the UN testing requirements. In the 2002 NPRM, we proposed to require testing of small lithium batteries and cells of all types in accordance with the UN Test Manual. We also proposed to require each package containing more than 24 lithium cells or 12 lithium batteries to be: (1) Marked to indicate that it contains lithium batteries and

that special procedures must be followed in the event that the package is damaged; (2) accompanied by a document indicating that the package contains lithium batteries and that special procedures must be followed in the event that the package is damaged; (3) no more than 30 kilograms gross weight; and (4) capable of withstanding a 1.2 meter drop test in any orientation without shifting of the contents that would allow short-circuiting and without release of package contents.

The NTSB supports the proposal to require all lithium batteries, including small lithium batteries and cells currently excepted from the HMR, to be tested in accordance with the revised UN Test Manual, and to require packages containing more than 12 small lithium batteries or 24 cells to be capable of passing a drop test. The NTSB suggests the proposed rule could be improved by requiring a package containing 12 small lithium batteries or 24 lithium cells to be classed as a Class 9 material, and subject to the labeling and shipping paper requirements of the HMR. The Airline Pilots Association International (ALPA) states it agrees new testing requirements are needed.

The Air Transport Association of America (ATA) supports the proposals in the April 2002 NPRM, but notes a number of its members are particularly concerned about the retention of the exception for small lithium batteries as proposed in the NPRM. ATA states such provisions will be confusing to transport workers involved in accepting, sorting and loading packages in air transportation. According to ATA, air carriers are concerned that an indication on a package that it contains "lithium batteries" may cause packages to be removed from the system for clarification or possible rejection. The removal of a package from the system could occur more than once during the transportation cycle.

ATA recommends PHMSA either regulate or deregulate such materials (with no exceptions) and not "band-aid" a situation that will present problems in transportation. ATA also states the safety risks associated with the transportation of small lithium batteries and cells are addressed if packages are "capable of withstanding a 1.2 meter drop test in any orientation without damage to cells or batteries contained in the package, without shifting of the contents that would allow short circuiting and without release of package contents."

FEDCO states that, including new batteries in active design, it has about twenty 1- and 2-cell primary lithium batteries and 13 new lithium-ion packs

containing from 2 to 12 cylindrical cells. FEDCO estimates the cost of having an independent testing facility, such as Underwriters Laboratories, perform the proposed tests would be about \$20,000 per battery design. In addition, FEDCO states the testing of its existing 450 primary lithium and secondary lithium battery designs will cost an additional \$9 million. FEDCO proposes an exception from the proposed tests for batteries and battery packs consisting of cells that have passed the UN tests; the exception would permit the batteries and battery packs to be transported without further testing.

FEDCO also makes the following recommendations to ease the financial impact on small business:

(1) Except single-cell and two-cell primary lithium batteries from the UN Test Manual provided that the cells in the batteries have already passed those UN tests;

(2) Provide manufacturers with a four-year "grandfather" period in which to comply with the new testing requirements for existing battery designs; and

(3) Extend the exception in the UN Recommendations for small production runs of cells or batteries from 100 to 1,000 batteries.

SION Power recommends the following exceptions for small lithium batteries and cells: (1) Except single cell batteries from testing if the cells have already passed the UN tests; and (2) except prototype or small production runs of cells or batteries, defined as no more than 200 cells or 50 batteries, from the UN tests. As a precondition to these exceptions, SION Power suggests requiring that the base cell and battery pack pass a 55 °C short circuit test. SION Power further recommends shipment of prototype or small production runs as Class 9 materials.

PRBA requests the following changes to the NPRM:

(1) Provide a four-year grandfather clause for testing small cells and batteries;

(2) Adopt a 1,000-unit small production run exception from UN testing for certain small primary lithium and lithium-ion cells and batteries; and

(3) Clarify that single-cell batteries do not require UN testing.

PRBA, FEDCO, SION, Valence Technology, ACR, SkyBitz Inc, EIA, and Intel Corporation all suggest an exception, consistent with the international regulations, from marking, packaging, and shipping paper requirements for equipment containing small lithium batteries and cells.

The UN Test Manual's lithium battery test methods are designed to measure

the capability of the cells or batteries to maintain their construction integrity against shorts in normal transport environments. Parameters considered include: Temperature, altitude, vibration, shock, impact, overcharge, forced discharge, and intentional short. The test criteria were developed to minimize the risk of lithium cells or batteries becoming an ignition (fire) source during transport. Once ignited, a fire may spread to other lithium batteries in the package. To ensure that small lithium batteries and cells will be transported in commerce only if they are able to withstand normal transport conditions, in this final rule, we are revising the HMR to subject small lithium batteries and cells to the test methods in the UN Test Manual.

Information from an independent testing laboratory, which is currently performing these tests, suggests the cost for performing the tests is \$6,000 per lithium battery design, and not \$20,000 or more as stated by some commenters. (Subsequent to the completion of our analysis, some testing laboratories have indicated to us that costs of performing the UN Tests have decreased to about \$4,000 to \$3,000). Further, not all lithium batteries and cells must be tested. In accordance with the UN Test Manual, section 38.3.2.1, only lithium batteries and cells that differ from a tested type by a change of more than 0.1 gram or more than 20% by mass, whichever is greater, to the cathode, to the anode, or to the electrolyte, must be tested.

The UN Test Manual states that a single cell lithium battery should be considered a cell and not a battery, regardless of whether the unit is termed a "battery" or a "single cell battery." Thus, a single cell lithium battery consisting of a cell that has passed the appropriate UN tests is a cell and need not be re-tested even if the components of the battery, other than the cell contained therein, are a new design type. Lithium batteries consisting of more than one cell are subject to the tests in the UN Test Manual.

We agree with those commenters who ask us to adopt a small-production-run exception for motor vehicle, rail and vessel transportation similar to the one in Special Provision 310 of the UN Recommendations for small lithium batteries and cells. Thus, we are adopting the following small-production-run exception for small lithium batteries and cells transported by motor vehicle, rail and vessel:

(1) The cells and batteries must be transported in an outer packaging that is a metal, plastic, or plywood drum; or metal, plastic, or wooden box meeting

the criteria for Packing Group I packagings; and

(2) Each cell and battery must be individually packed in an inner packaging inside the outer packaging and surrounded by non-combustible, non-conductive cushioning material.

Consistent with the international standards, the exception will apply to production runs of up to 100 lithium batteries or cells of all types. This exception addresses the need to increase safety standards for these lithium batteries, while not imposing undue costs on the regulated community.

We agree with commenters who request an appropriate transition period for lithium battery manufacturers to test lithium battery designs that are currently on the market. Therefore, in this final rule, we are adopting a two-year compliance date for the testing of small lithium batteries and cells.

PHMSA agrees with the commenters who requested an exception from the marking, packaging and shipping paper requirements for equipment containing small lithium batteries and cells. We are adopting the exception in this final rule.

We continue to believe that the hazards associated with small lithium batteries should be communicated to transport workers so that they can handle packages appropriately. Therefore, in this final rule we are adopting the communication and packaging program developed by the industry, and described above, for small lithium batteries.

In summary, in this final rule, PHMSA is amending the HMR to require that small lithium batteries be tested in accordance with the UN Test Manual. In addition, we have adopted the proposed size standards for small lithium batteries thus eliminating the distinction between liquid and solid cathode lithium batteries. Unless contained in equipment, each package containing more than 24 lithium cells or 12 lithium batteries must also be:

(1) Marked to indicate it contains lithium batteries and special procedures must be followed in the event that the package is damaged;

(2) Accompanied by a document indicating the package contains lithium batteries and special procedures must be followed in the event that the package is damaged;

(3) No more than 30 kilograms gross weight; and

(4) Capable of withstanding a 1.2 meter drop test in any orientation without shifting of the contents that would allow short circuiting, and without release of package contents.

In accordance with § 173.21(c), electrical devices likely to create sparks

or generate a dangerous quantity of heat are forbidden for transportation unless packaged in a manner to preclude such an occurrence. In this final rule, we are adding language to clarify that the restrictions in § 173.21 of the HMR apply to lithium batteries of all types.

We note that adoption of hazard communication requirements for shipments of lithium batteries does not “classify” or “declassify” these materials as hazardous materials. Lithium batteries, regardless of their size (i.e., small, medium and large), are hazardous materials and are subject to applicable requirements in the HMR.

*c. Exceptions for Aircraft Passengers and Crew.* Consistent with amendments to the ICAO Technical Instructions, in the April 2002 NPRM we proposed to allow airline passengers and crew to carry consumer electronic devices containing lithium batteries. In addition, we proposed to allow passengers and crew to carry spare lithium batteries for such devices subject to limits as to lithium content, the number of batteries, and the type of lithium batteries. In the IFR adopted December 15, 2004 (Docket HM-224E), had we not amended § 175.10, airline passengers and crew would have been forbidden to carry consumer electronic devices powered by primary lithium batteries. As amended in the IFR, lithium batteries contained in equipment and spares of all types (primary and secondary) are authorized in carry-on or checked baggage. In this final rule, we are adopting the amendments proposed in the April 2002 NPRM to permit carriage by passengers and crew of lithium battery-powered consumer electronic devices and associated spare lithium batteries. We are also clarifying in this final rule that the proposed battery size limitation for spare batteries also applies to the batteries installed in the device. These amendments also state that spare lithium batteries may only be carried in carry-on luggage and that they must be individually protected against short circuits. Unprotected batteries are susceptible to short circuits when exposed to items typically carried by passengers and crew members, such as car keys and coins. We recommend that passengers protect spare batteries by placing them in protective cases or individual zip-top bags or placing non-conductive tape across exposed terminals. We note that ICAO is considering eliminating the passenger aircraft exception for medium-size (8–25 grams aggregate equivalent lithium content) batteries. If adopted by ICAO, we will consider adopting this in a future rule.

*d. Editorial Changes.* In the 2002 NPRM, we proposed to make several editorial changes to § 173.185 to help users better understand their obligations. First, we proposed to move the definition of “equivalent lithium content” and “lithium content” from former § 173.185(a) to § 171.8 and eliminate as unnecessary the first sentence of former § 173.185(a). Also, as proposed, we have removed the grandfather provision that was previously provided under § 173.185(d).

PRBA requested revisions to the definition of “equivalent lithium content” to provide that a lithium polymer battery based on lithium-ion chemistry or technology is regulated as a lithium-ion battery for purposes of determining equivalent lithium content. PRBA notes that the UN Test Manual definition for a lithium-ion cell or battery states “a lithium polymer cell or battery that uses the lithium-ion chemistries, as described herein, is regulated as a lithium-ion cell or battery.”

Based on the comment from PRBA on the definition of “equivalent lithium content,” in this final rule, we are adding a definition for “aggregate lithium content.” Except for some minor differences, the other editorial amendments are adopted as proposed. In addition, we have made editorial amendments to §§ 171.11, 171.12, and 171.12a to address changes in regulatory citations.

We have also moved the provisions applicable to small lithium batteries from § 173.185 to Special Provision 188 for consistency with international regulations. We have also made some editorial changes to the exception related to the prohibition of primary lithium batteries aboard passenger aircraft in order to clarify the requirements. We also clarified the packaging requirements for lithium batteries packed with equipment. We inadvertently proposed to remove the requirement that lithium batteries or cells that are packed with the equipment are required to be packaged in specification packaging.

*e. Shipping Lithium Batteries for Recycling.* PRBA filed a petition for rulemaking on February 8, 2002 (P-1423), asking for an amendment to the HMR requirements for shipping spent lithium batteries for recycling. Currently, under the exception in § 173.185(h), lithium cells and batteries “for disposal” may be offered for transportation or transported to a permitted storage facility and disposal site by motor vehicle when they are equipped with an effective means of preventing external short circuits and

packed in a strong outer packaging conforming to the requirements of §§ 173.24 and 173.24a. Lithium batteries transported under this provision are excepted from the performance packaging requirements of Part 178 of the HMR.

Section 173.185(h) does not specifically address the transportation of lithium cells and batteries for recycling. In its comments to the NPRM, PRBA states that failure to include the change in the final rule will have significant implications for the Rechargeable Battery Recycling Corporation's used battery collection and recycling program. We agree with the comments of PRBA and others on expanding the exception for shipping lithium batteries for disposal to include lithium batteries shipped for recycling, and in this final rule have modified § 173.185(d) accordingly.

#### B. Docket HM-224E

##### 1. Background: IFR Requirements

As explained above, on December 15, 2004, PHMSA published an IFR (Docket HM-224E; 69 FR 75208), prohibiting the shipment of primary lithium batteries as cargo on passenger-carrying aircraft. The IFR prohibits the offering for transportation and transportation in commerce of primary lithium batteries and cells, and equipment containing or packed with large primary lithium batteries (i.e., batteries containing greater than 25 grams of lithium) as cargo aboard passenger-carrying aircraft. In addition, equipment packed with or containing small or medium primary lithium batteries (i.e., batteries containing 25 grams or less of lithium) must be transported in accordance with Special Provisions A101 and A102. Under the IFR, Special Provision A101 specified that a primary lithium battery or cell packed with equipment may not exceed 5 kg (11 pounds) gross weight. On September 28, 2006, we issued a correction to Docket HM-224E, 71 FR 56894, revising Special Provision A101. The correction clarified that we intended the 5 kilogram limit to be net weight. In addition, in accordance with Special Provision A102, primary batteries or cells contained in equipment may not exceed 5 kg (11 pounds) net weight. Further, the IFR requires the outside of each such package that contains a primary lithium battery or cell forbidden for transport aboard passenger carrying aircraft to be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT."

Under the IFR, for air shipments of non-excepted Class 9 primary lithium batteries and for shipments of equipment that contains or is packed with Class 9 primary lithium batteries, the words "Cargo Aircraft Only" must be entered after the basic description on shipping papers. The package must bear a CLASS 9 and a CARGO AIRCRAFT ONLY label, and the package must be otherwise marked as required by the HMR. The IFR applies to both foreign and domestic passenger-carrying aircraft entering, leaving, or operating in the United States and to persons offering primary lithium batteries and cells for transportation as cargo on any passenger-carrying aircraft.

The IFR resulted from an assessment by PHMSA and the FAA of recent lithium battery fires in air transportation, and the FAA technical report, discussed earlier in this preamble, evaluating the flammability of primary lithium batteries and the effect of air carrier fire suppression systems on primary lithium battery fires.

##### 2. Discussion of Comments in HM-224E

On January 27, 2005, PHMSA conducted a public meeting to provide an informal forum for interested persons to offer comments on the IFR. Six persons made oral presentations at the public meeting. In addition, we received 38 written comments from private citizens and the following companies and organizations:

Karin Rindal (RSPA-2004-19886-4)  
 Delaine Arnold (RSPA-2004-19886-5)  
 McDowell Research, Ltd. (RSPA-2004-19886-6)  
 Rollie Herman (RSPA-2004-19886-7)  
 Homer C. Lambert (RSPA-2004-19886-10)  
 Portable Rechargeable Battery Association (PRBA; RSPA-2004-19886-39, 44)  
 Information Technology Industry Council (ITI; RSPA-2004-19886-41)  
 Solectron Corporation (RSPA-2004-19886-42)  
 CTIA—The Wireless Association (RSPA-2004-19886-40)  
 National Electrical Manufacturers Association (NEMA; RSPA-2004-19886-23, 24, 38)  
 FEDCO Electronics, Inc. (RSPA-2004-19886-12, 13)  
 Dangerous Goods Advisory Council (RSPA-2004-19886-11)  
 Liferaft and Marine Safety (RSPA-2004-19886-14)  
 Anthony Affisio (RSPA-2004-19886-15)  
 DBC Marine Safety Systems Ltd (RSPA-2004-19886-16)  
 Lucent Technologies (RSPA-2004-19886-18)

Siemens AG (RSPA-2004-19886-9)  
 Rockwell Automation (RSPA-2004-19886-20)  
 Intel Corporation (RSPA-2004-19886-21)  
 Honeywell Corporate (RSPA-2004-19886-17, 22)  
 FedEx Express (RSPA-2004-19886-25)  
 URS Corporation (RSPA-2004-19886-26)  
 United States Marine Safety Association (RSPA-2004-19886-27)  
 Federation Industries Electriques (RSPA-2004-19886-28)  
 ZVEI (RSPA-2004-19886-29, 31)  
 SAFT America Inc. (RSPA-2004-19886-30, 32)  
 Air Transport Association of America, Inc. (RSPA-2004-19886-33)  
 Air Line Pilots Association, International (ALPA; RSPA-2004-19886-34)  
 Automated Media Systems (RSPA-2004-19886-35)  
 Switlik Parachute Co. Inc. (RSPA-2004-19886-36)  
 Fisher Scientific Company, L.L.C. (RSPA-2004-19886-37)  
 The International Brotherhood of Teamsters Airline Division (Teamsters; RSPA-2004-19886-43)

All comments submitted to the Dockets Management System, under Docket Number PHMSA-04-19886 (HM-224E) and comments received at the public meeting have been considered in developing this final rule. The comments are addressed in detail below. Several commenters submitted comments that were outside the scope of this rulemaking. They are not discussed in this preamble.

a. *Prohibition of Primary Lithium Batteries and Cells Aboard Passenger Aircraft.* The IFR imposed a limited prohibition on offering for transportation and transportation of primary lithium batteries and cells as cargo aboard passenger-carrying aircraft and equipment containing or packed with large primary lithium batteries. Under the IFR, only small or medium-size primary lithium batteries packed with or contained in the equipment for which they are intended to provide power are permitted to be transported as cargo aboard passenger-carrying aircraft.

Several commenters oppose the prohibition adopted in the IFR. For example, NEMA suggests the record does not support the ban of cargo shipments of primary lithium batteries and lithium batteries packed with or contained in equipment aboard passenger aircraft. NEMA requested that the exception for 5 kg (11 pounds) net weight of batteries packed in equipment be extended to shipments of primary

lithium batteries shipped without equipment. NEMA also recommends PHMSA allow, consistent with international requirements, shipments of up to 12 batteries and 24 cells of batteries to be transported in accordance with the exception in § 173.185(b) of the HMR. NEMA states it is unclear how PHMSA could determine shipments of such products packed with or contained in equipment could pose a serious risk in air transportation when there has been no testing of primary lithium batteries in equipment.

Several commenters recommend PHMSA retract the IFR and issue a final rulemaking to harmonize the HMR with standards for transporting lithium batteries in the UN Recommendations or ICAO Technical Instructions. These commenters suggest harmonization would alleviate the confusion caused by the different lithium battery weight limits, exemptions, and testing requirements in the HMR and the international transportation regulations.

Two commenters address the April 28, 1999 LAX incident mentioned in the IFR. These commenters suggest the incident occurred under atypical handling procedures and was the direct result of inadequate packaging. SAFT America states improved packaging requirements, mandatory testing of all primary lithium batteries and cells in accordance with the UN Recommendations, and procedures to quarantine damaged shipments would successfully address the root cause of the incident. This commenter further states all other incidents involving primary lithium batteries and cells involved improper packaging or batteries contained in checked or carry-on baggage; the commenter notes that neither of these situations is addressed in the IFR. FedEx suggests packaging for all battery types must be reviewed and better packaging requirements must be developed to prevent fires and recommends further studies to identify an effective extinguishing agent for lithium batteries.

Several commenters express concern the IFR will result in unacceptable economic burdens on the industry and will adversely affect the efficiency with which primary lithium batteries and cells are transported. FEDCO states the majority of its sales are to distributors and dealers of computer products and to battery retail stores, with major competition from foreign importers of primary lithium batteries. FEDCO expresses concern that most foreign importers of primary lithium batteries are "under the radar" in so far as PHMSA is concerned. FEDCO asserts its personnel have seen numerous cases

where foreign importers have shipped regulated and hazardous primary lithium batteries by air with inadequate packaging and virtually no insulation that would prevent the batteries from short circuiting. FEDCO suggests PHMSA needs to develop methods of policing the practices of foreign importers of primary lithium batteries before a serious incident occurs.

Fisher Scientific Company, L.L.C. states it has found individual primary lithium batteries, whether shipped installed or with equipment, do not represent a hazard during transportation. Fisher Scientific states it has shipped well over 10,000 shipments of primary lithium batteries over a period of 20 years, with no transportation incidents attributable to the batteries, and it requests an exception from the HMR for single batteries classified as dry (e.g. consumer alkaline), or lithium or lithium ion batteries. Fisher Scientific suggests an exception for small primary lithium batteries would provide an adequate level of safety with a minimum of operational disruption and no negative economic impacts.

We do not agree with those commenters who urge withdrawal of the IFR. Although we are hopeful that intervening technological advances will make lifting the prohibition feasible in the future, until we can be satisfied that primary lithium batteries will not ignite in flight and/or that any such fire could be suppressed by standard fire suppression systems in passenger aircraft cargo compartments, we cannot sanction the shipment of primary lithium batteries as cargo in passenger aircraft. Incident reports and test data indicate primary lithium batteries present unique and serious risks if transported as cargo on passenger-carrying flights. The FAA report concludes that primary lithium batteries self-propagate once the lithium in a single battery begins to burn. Because of this, lithium batteries that are not involved in the initial fire may still ignite and propagate. In addition, the only FAA-certified fire suppression system authorized for use in a passenger-carrying aircraft cannot extinguish or suppress a primary lithium battery fire.

For those reasons, PHMSA and FAA continue to believe the prohibition on the transportation of primary lithium batteries on passenger aircraft is appropriate and well-founded. Although some commenters questioned the original justification for the IFR, intervening developments have buttressed the record, calling further attention to primary lithium battery

risks and strengthening the case for final regulatory action. We take these risks seriously, recognizing the potential for catastrophic harm in any passenger airline accident and the relative availability of transportation alternatives. When it comes to safeguarding airline travel, we intend to be proactive, identifying and addressing the most serious safety risks before they result in costly accidents. Although we insist that regulatory actions be data-driven, we will not wait for accidents to address known risks. In the case of primary lithium batteries, although the evidence of transportation-related risks is mounting, no incident has resulted in serious injury or loss of life. Far from demonstrating that the prohibition is unnecessary, this safety record could well reflect the fact that the IFR has been in place for over two years.

We disagree with those commenters who contend that imposing more robust packaging requirements would address the safety risks posed by shipment of primary lithium batteries as cargo aboard passenger planes. These comments do not address the central fact that the fire suppression system in an aircraft cargo compartment is ineffective in suppressing a fire involving lithium batteries. The aircraft cargo compartment fire scenario of concern to PHMSA and FAA is not limited to a fire initiated by the primary lithium batteries, but includes a fire started by an outside source. Increasing packaging integrity and improved compliance do not address this significant concern. As we indicated in the preamble to the IFR, a primary lithium battery involved in a fire in a passenger aircraft cargo compartment could overcome the safety features of the cargo compartment. Further, primary lithium batteries are capable, on their own, of initiating a fire that could have catastrophic consequences. The FAA report on the flammability characteristics of primary lithium batteries raises significant concerns justifying our conclusion that they should be prohibited aboard passenger carrying aircraft.

PHMSA generally agrees with the commenters that the continually increasing amount of hazardous materials transported in international commerce warrants the harmonization of domestic and international requirements to the greatest extent possible. Harmonization facilitates international transportation, while promoting the safety of people, property and the environment. Our goal is to harmonize without diminishing the level of safety currently provided by the HMR and without imposing undue

burdens on the regulated public. However, we are obligated to impose additional requirements when the international standards do not adequately protect the American public. Over time, we expect increased harmonization of domestic and international standards as both regimes continue to address the transportation risks posed by the growing use of lithium battery technology.

b. *Battery Testing.* The Portable Rechargeable Battery Association (PRBA) expresses concern about the manner in which the FAA tests on primary lithium batteries were conducted, the conclusions reached, and the regulatory steps taken. Specifically, PRBA contends:

(1) PHMSA has not shown that the FAA fire testing of primary lithium batteries and cells represents realistic conditions that could be encountered in air transportation and pose an unreasonable risk to the traveling public.

(2) The FAA test results do not provide a rational basis for the IFR, particularly when compared with other FAA cargo compartment fire tests.

(3) It is unlikely that the pressure rise caused by burning primary lithium batteries would lead to an overpressure of an air craft cargo compartment.

(4) The fire tests are arbitrary and more severe than the other tests used to evaluate the hazards of other chemicals and articles.

(5) The effects of packaging material for shipments of primary lithium batteries were largely ignored in the FAA tests.

(6) Primary lithium batteries were subjected to extreme temperature testing when in a separate proposed rulemaking (Docket HM-224B) PHMSA proposed to subject packaged oxygen cylinders carried in passenger cargo compartments to a temperature of only 400° F.

For the following reasons, we do not agree with the PRBA comments. The FAA tests demonstrated that the lithium output from a single burning primary lithium battery is sufficient to penetrate single-layer cargo linings. Once penetration occurs, the ability of Halon to suppress a fire is reduced, and the fire can spread throughout the cargo compartment. Similarly, most cargo containers used in commercial shipments (roughly 90%) have only a single lining. Small numbers of burning primary lithium batteries can also raise the pressure pulse in a cargo container to the level at which the walls of the containers separate (1 psi). Separation of the cargo container raises the same concerns as perforation of the

containers. In the FAA tests, one brand of primary lithium batteries required only three burning batteries to raise the pressure pulse above 1 psi, while the two other brands required only four primary lithium batteries to reach the same psi. The pressure tests were added to the test protocol on the basis of initial test results; the FAA was surprised to see pressure changes in the tested compartment in the single-battery tests. Cargo containers are designed to only support 1 psi because they need to be suitable for depressurization. A more robust cargo compartment would be incompatible with the need for a depressurized environment.

Temperatures in a suppressed cargo compartment fire can be above the auto-ignition temperature for primary lithium batteries. Thus, the lithium batteries do not have to be in close proximity to the fire source in order to experience dangerous elevated temperatures during a cargo compartment fire. The current fire suppression system installed on board an aircraft needs a fire to be activated by a pilot. We note that the Halon system suppresses, but does not extinguish, a fire, thus allowing for the continuous generation of heat by a deep-seated fire. In addition, the temperature and heat flux data collected in the 64 cubic foot test facility cannot be compared to those collected in a full scale fire test like those described in the report "Minimum Performance Standards (MPS) for Aircraft Cargo Compartment Halon Replacement Fire Suppression Systems" (DOT/FAA/AR-TN03/6; a copy of which is in the public docket). For example, the ratio of flammable materials to compartment volume is much lower in the battery tests. To get comparable measurements, the battery tests would require a much larger quantity of primary lithium batteries, placed in a full scale cargo compartment along with other combustibles. Peak ceiling temperatures and temperature-time areas could then be compared meaningfully. Aircraft cargo compartments are as air tight as possible, which is necessary to contain the Halon fire suppression gas in the event of a cargo fire and to pressurize the cabin with available engine bleed air. In addition, cargo liners are designed to separate when exposed to a pressure of only 1 psi, in order to rapidly relieve pressure during a rapid cabin depressurization, and prevent the collapse of the cabin floor and possible loss of the aircraft. The pressure rise due to battery ignition is directly related to the size of the compartment. However, the data obtained during the FAA tests indicate that a significant pressure rise

can result from ignition of a small quantity of lithium batteries in the 10m<sup>3</sup> facility and raises legitimate concerns about the rise possible with a full shipment of primary lithium batteries in a larger cargo compartment.

In its comments, PRBA refers to the NPRM published on May 6, 2004 by PHMSA under Docket HM-224B (69 FR 25469), which proposed a requirement for oxygen cylinders to be overpacked in a packaging that would allow the cylinder to withstand a temperature of 400° F for 3 hours. (On January 31, 2007 PHMSA published the HM-224B Final Rule (72 FR 4442).) PRBA questioned why the lithium batteries were subjected to higher temperature tests than the 400° F proposed for oxygen cylinders. Other commenters also question the validity of the tests cited in the IFR and our use of the test results as a basis for prohibiting the air transportation of primary lithium batteries and cells. For example, NEMA questions whether PHMSA has improperly relied on the FAA test report, which addresses a worst-case scenario for bulk shipments of lithium batteries, in limiting the transportation of single batteries or products packed with or contained in equipment. NEMA states that unlike "bulk shipments" of primary lithium batteries, batteries packed with or contained in equipment are not close in proximity to each other during transportation.

FedEx states that there appears to have been more problems with non-bulk shipments of primary lithium batteries as opposed to bulk shipments and that the FAA flammability test was conducted only on bulk shipments of primary lithium batteries. FedEx recommends that the FAA examine non-bulk shipments of primary lithium batteries and conduct appropriate tests on these types of primary lithium battery shipments.

Though the focus of the FAA Test Report was the shipment of primary lithium batteries in bulk, the tests performed by the FAA Tech Center provide more than sufficient justification to prohibit smaller shipments of primary lithium batteries. Several of the tests performed by the FAA Tech Center involved as few as four primary lithium batteries. In terms of the effectiveness of the halon suppressions system, the report states "the halon immediately extinguished the 1-propanol fire and reduced the overall temperature profile in the chamber but did nothing to impede the progress of the primary lithium battery fire once a single primary lithium battery had ignited." In terms of the pressure pulse, the report states:

One test was conducted with three Panasonic PL 123A batteries. The conditions were similar to the Sanyo CR2 and Duracell PL 123A battery tests. The pressure rise in the vessel was 1.2 psi (see Figure 17). These results are significant. The cargo compartment is only constructed to withstand a 1-psi pressure differential in order to rapidly equalize pressure in the event of a depressurization. Anything over 1 psi would activate the blowout panels, compromising the cargo compartment's integrity.

As these results indicate, the shipment of even a small number of primary lithium batteries presents a significant risk to a passenger aircraft. Therefore, it is appropriate to rely on the results from the FAA report to prohibit small shipments of primary lithium batteries.

ALPA expresses concern that primary lithium batteries may still be shipped by cargo only aircraft, including bulk primary lithium battery shipments that would continue to be excepted from many of the requirements of the HMR, including stringent packaging standards, quantity limits, and pilot notification. ALPA contends that the current HMR requirements for the shipment of primary lithium batteries by cargo aircraft are inappropriate for a commodity posing a great enough risk to warrant PHMSA's taking emergency action to prohibit the batteries aboard passenger aircraft. ALPA recommends the bulk shipment of primary lithium batteries should be governed by regulations consistent with those in place for commodities that pose a similar risk.

ALPA also suggests the risk associated with primary lithium batteries and cells is unique within the dangerous goods transportation system because an improperly packaged or damaged shipment of batteries can catch fire. ALPA states once a shipment of lithium batteries has been damaged, there is a significant likelihood that the batteries will self-initiate, ignite, and catch fire, overcoming the on-board fire suppression capabilities and likely causing the loss of the aircraft and all passengers and crew aboard. ALPA suggests bulk shipments of primary lithium batteries and cells should only be transported aboard cargo aircraft if they are subject to all of the applicable hazard communication requirements of the HMR and packaged to prevent damage, short circuiting, and in such a way that the batteries withstand the heat from an unsuppressed cargo fire.

The Teamsters state PHMSA failed to address the safety concerns of cargo-only aircraft transporting primary lithium batteries and cells. They state the hazardous properties of primary

lithium batteries do not depend on the mode of transportation or (in transportation by air) on the type of aircraft or transportation service. The Teamsters suggest that, until these hazards and the risk they pose can be mitigated by improved packaging standards, specific labeling/marketing requirements, strict quantity limitations, and appropriate hazard communications standards (including pilot notification), primary lithium batteries should not be transported aboard either passenger or cargo-only aircraft.

As stated in the IFR, PHMSA and FAA agree the greatest risk to public safety is in passenger carrying operations. For that reason, we did not extend the prohibition in the IFR to cargo-only aircraft. Therefore extending the prohibition to cargo operations is beyond the scope of this rulemaking.

*c. Marking and Labeling Requirements.* The IFR amended § 173.185 of the HMR to require cargo shipments of small and medium primary lithium batteries and cells, which are excepted from classification as Class 9 hazardous materials, to be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT." This requirement applies to shipments of small and medium lithium batteries in all modes of transport.

McDowell Research, Ltd (McDowell) asks whether the IFR (and the proposed final rule) permit placement of the "Cargo Aircraft Only" label on packages of primary lithium batteries and cells that display the "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" markings. McDowell states there should be a similar, if not identical, statement on the shipping papers, or more specifically, the air waybill, for all air shipments of primary lithium batteries in this category to prevent such shipments from being inadvertently loaded aboard a passenger aircraft.

FedEx states that if the requirements in the IFR are adopted, PHMSA must require shippers to indicate whether the primary lithium battery shipment is nonrechargeable or rechargeable. FedEx states the proper shipping name for "Lithium batteries UN 3090" does not indicate whether the lithium batteries shipments are rechargeable or non-rechargeable. In addition, FedEx requests PHMSA require shippers to indicate whether the primary lithium battery is large or small. FedEx states that currently, the proper shipping names for "Lithium batteries contained in equipment, UN 3091" or "Lithium

batteries packed with equipment, UN 3091" do not indicate whether the lithium battery is large or small. FedEx expresses concern that a carrier has no reasonable way of knowing if the lithium battery is large or small. FedEx is also concerned with the proliferation of markings or other minimal requirements when dangerous goods shipments are otherwise not regulated and are excepted from the regulation. FedEx states marking a package "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" will only cause confusion, delay shipments and impede commerce. FedEx recommends the use of Cargo Aircraft Only labels for the shipment of lithium batteries subject to the final rule.

URS Corporation suggests PHMSA remove the marking requirement "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" for packages transported by highway, rail, and vessel with no air transportation involved. URS Corporation states the required markings are not sufficiently visible for transporters to divert packages of primary lithium batteries and cells to cargo aircraft only and that certain transporters that do not accept hazardous materials shipments may refuse to accept packages of equipment containing lithium batteries that are marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT." Another commenter states that without any identification requirements on the documents, it is quite possible that cargo may be transferred from an intended cargo flight to a passenger flight once the cargo is loaded into a unit load device (ULD). The commenter states that, because much, if not all, cargo within ULDs is no longer visible, the only means to identify prohibited primary lithium batteries is not available.

Under the HMR, an offeror of a hazardous material must provide the aircraft operator with a signed shipping paper containing the quantity and a basic shipping description of the material being offered for transportation (i.e., proper shipping name, hazard class, UN or NA identification number, and packing group); and certain emergency response information (See Part 172, Subparts C and G). Additional information may be required depending on the specific hazardous material being shipped (see § 172.203). Further, when a package containing a hazardous material is offered for transportation by air and the HMR prohibit its

transportation aboard passenger-carrying aircraft, the words "Cargo aircraft only" must be entered after the basic description (see § 172.203(f)). A copy of this shipping paper must accompany the shipment it covers during transportation aboard the aircraft (see § 175.35).

In addition to the shipping paper accompanying each hazardous materials shipment, an aircraft operator must provide the pilot-in-command of the aircraft written information about hazardous materials on board the plane (§ 175.33). For each hazardous materials shipment, this information must include: (1) Proper shipping name, hazard class, and identification number; (2) technical and chemical group name, if applicable; (3) any additional shipping description requirements applicable to specific types or shipments of hazardous materials or to materials shipped under ICAO requirements; (4) total number of packages; (5) net quantity or gross weight, as appropriate, for each package; (6) the location of each package on the aircraft; (7) for Class 7 (radioactive) materials, the number of packages, overpacks or freight containers, their transport index, and their location on the plane; and (8) an indication, if applicable, that a hazardous material is being transported under terms of an exemption. This information must be readily available to the pilot-in-command during flight. In essence, the notification of pilot-in-command (NOPC) provides the same information to emergency response personnel as a shipping paper for transportation by rail or public highway.

The HMR provides exceptions from the packaging and hazard communication requirements in the HMR for small and medium-size lithium batteries and cells (when transported by highway or rail). When the lithium content of the battery or cell does not exceed certain limits, the batteries and cells must be packaged in strong outer packagings and in a manner to protect against short circuit; however, such shipments are exempted from all other requirements in the HMR, including hazard communication requirements. Without hazardous communication markings on excepted packages, carriers will be unaware of the presence of primary lithium batteries and cells and may inadvertently transport primary lithium batteries and cells aboard passenger-carrying aircraft.

Applying the current hazard communication standards for an excepted shipment of lithium batteries would have the additional effect of regulating these batteries as a Class 9

material. The marking requirement adopted in the IFR informs properly trained carrier personnel of package transport restrictions for passenger aircraft, even if loaded in a ULD. We continue to believe it is necessary to require the marking for all modes of transport, not just aviation, because the required marking is likely to be the only visible indication that the package is forbidden for transportation by passenger aircraft. The multimodal requirement is necessary because many goods travel in different modes, and package restrictions must be identifiable in case a package is routed to aircraft transportation.

In its comments, FedEx suggests excepted packages of primary lithium batteries should also bear the "Cargo Aircraft Only" label so that these packages are more readily identifiable by air carrier employees. Although the HMR provides relief from the labeling requirements of Part 172, Subpart E, nothing precludes a shipper from voluntarily applying the "Cargo Aircraft Only" label, because it is not inconsistent with the nature of the shipment. However, the display of the "Cargo Aircraft Only" label by itself (without accompanying hazard class labels or a hazardous materials shipping paper) could cause confusion to accepting carriers of all transportation modes. Those who wish to voluntarily apply the "Cargo Aircraft Only" label on excepted packages of primary lithium batteries are encouraged to coordinate with all parties in their transportation chain.

NEMA states the labeling requirements for primary lithium batteries and cells impose unreasonable requirements for certain types of lithium battery shipments. For example, NEMA suggests marking of small packages containing one or a few batteries would be impossible with the mandated font size. In addition, marking of packages with multiple languages may lead to difficulty in meeting the mandated font size.

The marking provisions adopted in the IFR and this final rule require the outside of each package containing a primary lithium battery or cell to be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" on a background of contrasting color, in letters: (i) At least 12 mm (0.5 inch) in height on packages having a gross weight of more than 30 kg (66 pounds); or (ii) At least 6 mm (0.25 inch) on packages having a gross weight of 30 kg (66 pounds) or less. In addition, § 172.304 requires markings to be durable; printed only in English;

printed on or affixed to the surface of the package; displayed on contrasting background; unobscured by labels or attachments; and located away from any other marking that could substantially reduce their effectiveness. Consistent with other marking requirements in the HMR, and in order to address the problems associated with marking smaller packages, we have revised the HMR to allow for a more appropriate font for smaller packages. In addition, to provide an alternative mark that is consistent with the adoption of the new shipping description in the international requirements, we are allowing packages to be marked "LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT."

d. *Weight Restrictions for Primary Lithium Batteries.* In accordance with the IFR, primary lithium batteries or cells packed with or contained in equipment may be transported aboard passenger carrying aircraft under Special provisions A101 and A102. Special provision A101 and Special Provision A102 state the net weight of the package for a primary (non-rechargeable) lithium battery or cell contained in equipment may not exceed 5 kg (11 pounds).

NEMA recommends PHMSA either eliminate this restriction on products shipped with or contained with primary lithium batteries and cells or clarify the weight restrictions for primary lithium batteries and cells. NEMA also states PHMSA should expand the provision relating to products to cover lithium batteries shipped with accessories or other non-hazardous materials.

Intel Corporation (Intel) recommends PHMSA either rescind or significantly modify the IFR to make it inapplicable to shipments of small primary lithium batteries and cells contained in equipment. Based on its longstanding experience shipping products containing small primary lithium batteries, Intel contends no further restrictions on shipments of primary lithium batteries is warranted. In the alternative, Intel states any further restrictions on shipments of primary lithium batteries on passenger aircraft should include rational thresholds based on the weight of the batteries, not the weight of packages.

The IFR imposed a limited prohibition on offering for transportation and transportation of primary lithium batteries and cells as cargo aboard passenger-carrying aircraft and equipment containing or packed with large primary lithium batteries. We do not believe that any additional exceptions should be provided. We do

concur with those commenters who recommend the exception for primary lithium batteries contained in equipment and batteries packed with equipment should be the same. On September 28, 2006, we issued a correction to Docket HM–224E, 71 FR 56894. In the correction, we revised Special Provision A101 by changing the gross weight limitation to a net weight limitation. Because the requirements in A101 and A102 are now essentially the same, we are removing A102 and replacing references to A102 with A101. We are also clarifying that the net weight limitations in 188, A101, and A104 apply to the total net weight of the lithium batteries in the package.

*e. Secondary Lithium Batteries.* In the IFR, the existing package quantity limitation in § 173.185 of the HMR applicable to secondary lithium batteries or cells packed with or contained in equipment was relocated without change from column 9 of the Hazardous Materials Table (HMT) to Special Provisions A103 and A104. In accordance with Special Provision A103, an inner package of secondary lithium batteries or cells, packed with equipment is authorized aboard passenger carrying aircraft so long as the inner package does not exceed a gross weight of 5 kg (11 pounds). In addition, Special Provision A104 authorizes the transportation of a secondary lithium battery or cell contained in equipment aboard passenger carrying aircraft in packages not exceeding a net weight of 5 kg (11 pounds) of primary lithium batteries.

PRBA and other commenters suggest PHMSA separate the provisions in the HMR governing the transportation of primary lithium cells and batteries from those governing secondary lithium cells and batteries. To alleviate any confusion, PRBA suggests PHMSA incorporate into the HMR a new section specific to secondary lithium cells and batteries.

As noted earlier, the UN Recommendations have been recently revised by adding new shipping names for lithium metal and lithium-ion batteries. PHMSA will take these commenters' suggestions under consideration when it considers adding these new names into the HMR. We believe that it would be premature to adopt new requirements at this time.

*f. Life-Saving Appliances.* Section 173.219(a)(3), as amended by HM–215G (69 FR 76044), requires life-saving appliances containing lithium batteries to be transported in accordance with § 173.185 of the HMR. In accordance with Special Provision A101, a primary lithium battery or cell packed with or

contained in equipment is forbidden for transport aboard a passenger carrying aircraft unless: (1) The battery or cell conforms with the requirements and limitations of § 173.185(b)(1), (b)(2), (b)(3), (b)(4) and (b)(6) or § 173.185(c)(1), (c)(2), (c)(3) and (c)(5); (2) the package contains no more than the number of lithium batteries or cells necessary to power the intended piece of equipment; (3) the equipment and the battery or cell are packed in a strong packaging; and (4) the net weight of the batteries in the package does not exceed 5 kg (11 pounds). Packages conforming to the requirements of this Special Provision are excepted from all other requirements of the HMR.

DBC Marine Safety System Ltd. Requests clarification of the exception as it applies to life-saving equipment. Several commenters state the net effect of the IFR is to prohibit the carriage of life saving appliances on passenger aircraft; these commenters recommend a change to § 173.185 to include an exception for this type of device on passenger aircraft. Commenters state they know of no incidents or safety issues involving primary lithium batteries in life-saving appliances that warrant limitations on their transportation. Commenters state that life-saving equipment is carefully stowed, that the batteries are enclosed within the equipment, and, accordingly, that the risk of a mishap is very low.

It was our intent to provide life saving appliances the same exceptions that are provided in Special Provision A101 for equipment packed with or containing lithium batteries. Therefore, in order to clarify the applicability of the HMR for lifesaving appliances, in this final rule we have revised § 173.219 to allow life saving appliances containing lithium batteries to be transported in accordance with § 173.185 of the HMR, and Special Provisions 188, 189, and A101 as applicable.

### III. Rulemaking Analysis and Notices

#### A. Statutory/Legal Authority for This Rulemaking

This final rule is published under authority of Federal Hazardous Materials Transportation Law (Federal Hazmat Law; 49 U.S.C. 5101 *et seq.*) and 49 U.S.C. 44701. 49 U.S.C. 5103(b) authorizes the Secretary of Transportation to prescribe regulations for the safe transportation, including security, of hazardous material in intrastate, interstate, and foreign commerce. Title Section 44701 authorizes the Administrator of the Federal Aviation Administration to promote safe flight of civil aircraft in air

commerce by prescribing regulations and minimum standards for practices, methods, and procedures the Administrator finds necessary for safety in air commerce and national security. Under 49 U.S.C. 40113, the Secretary of Transportation has the same authority to regulate the transportation of hazardous materials by air, in carrying out § 44701, that he has under 49 U.S.C. 5103.

#### B. Executive Order 12866 and DOT Regulatory Policies and Procedures

This final rule is a significant regulatory action under section 3(f) of Executive Order 12866 and, therefore, was formally reviewed by the Office of Management and Budget. This final rule also is a significant rule under the Regulatory Policies and Procedures of the Department of Transportation (44 FR 11034). The following sections address the costs and benefits of the measures adopted in this final rule, but separately proposed in Dockets HM–224C and HM–224E.

#### Docket HM–224C

In conducting the regulatory analysis for Docket HM–224C, we focused on the risks posed by the transport of lithium batteries by aircraft. Because most shipments are transported by air, and many by passenger aircraft, the consequences of a fire caused by, or involving, a lithium batteries shipment could be severe. We determined a market failure exists (that is, the safety risks will not be controlled through economic decision-making) for two reasons: (1) Damages resulting from accidents involving the transportation of lithium batteries by air may be imposed on individuals, such as air crews and passengers, who are not parties to the transactions (externality); and (2) air carriers may have inadequate information to determine the risks and costs associated with accidents involving lithium batteries (inadequate or asymmetric information).

The costs associated with performing the required testing for small lithium batteries and the costs of complying with hazard communication and packaging rules for small and medium-size lithium batteries over the five-year analysis period (in current dollars) for all businesses impacted by the final rule is approximately \$26,000,000, or just over \$5 million discounted annually.

The benefits of the final rule are less readily quantified. At a minimum, the benefits include enhanced transportation safety, consistency between U.S. and international regulations, increased compliance, timely movement of goods, and consistent emergency response to

hazardous materials incidents. As part of a comprehensive program for promoting the safe movement of hazardous materials, we believe that these benefits exceed the marginal costs of the final rule. Moreover, when we consider the avoided cost of even a single lithium battery fire aboard an in-flight aircraft, the benefits of the final rule vastly exceed its costs. A copy of the complete regulatory evaluation is available for review in the public docket.

#### Docket HM-224E

The regulatory evaluation for Docket HM-224E reflects the same market failure analysis and considered costs and benefits over a ten-year analysis period. The findings of the benefit-cost analysis are shown in Table 5 of the regulatory evaluation. The cost elements identified include all those related to labeling (materials and labor), alternative transportation costs (delay costs and additional costs associated with shipping batteries and equipment only on cargo aircraft), training costs, and handling costs. These costs will be incurred by both primary lithium battery and equipment manufacturers and distributors. The final rule is expected to impose present-value costs on lithium battery manufacturers and manufacturers of equipment containing lithium batteries of \$12.5 million over 10 years.

The principal anticipated benefits associated with the lithium battery IFR are a reduction in incidents on passenger aircraft resulting from lithium battery fires. PHMSA estimated the number of potential passenger aircraft fires involving primary lithium batteries based on an analysis of incident occurrence in the DOT's Hazardous Materials Incident Reporting System. We anticipate present-value benefits over 10 years to total \$41 million, for a benefit-cost ratio of 3.3:1.

#### C. Executive Order 13132

The final rules have been analyzed in accordance with the principles and criteria prescribed in Executive Order 13132 ("Federalism"). This final rule preempts State, local and Indian tribe requirements but does not propose any regulation that has substantial direct effects on the States, the relationship between the national government and the States, or the distribution of power and responsibilities among the various levels of government. Therefore, the consultation and funding requirements of Executive Order 13132 do not apply.

Federal Hazardous Materials Transportation Law, 49 U.S.C. 5125 expressly preempts inconsistent State,

local, and Indian tribe requirements, including requirements on the following subjects:

(1) The designation, description, and classification of hazardous materials;

(2) The packing, repacking, handling, labeling, marking, and placarding of hazardous materials;

(3) The preparation, execution, and use of shipping documents related to hazardous materials and requirements related to the number, contents, and placement of those documents;

(4) The written notification, recording, and reporting of the unintentional release in transportation of hazardous materials; or

(5) The design, manufacture, fabrication, marking maintenance, recondition, repair, or testing of a packaging or container represented, marked, certified, or sold as qualified for use in transporting hazardous material.

This final rule addresses subject items (1), (2) and (3) described above and, accordingly, State, local, and Indian tribe requirements on these subjects that do not meet the "substantively the same" standard will be preempted.

Federal hazardous materials transportation law provides at § 5125(b)(2) that, if DOT issues a regulation concerning any of the covered subjects, DOT must determine and publish in the **Federal Register** the effective date of Federal preemption. The effective date may not be earlier than the 90th day following the date of issuance of the final rule and not later than two years after the date of issuance. This effective date of preemption is 90 days after the publication of this final rule in the **Federal Register**.

#### D. Executive Order 13175

This final rule has been analyzed in accordance with the principles and criteria contained in Executive Order 13175 ("Consultation and Coordination with Indian Tribal Governments"). Because this rule does not have tribal implications and does not impose substantial direct compliance costs, the funding and consultation requirements of Executive Order 13175 do not apply.

#### E. Regulatory Flexibility Act, Executive Order 13272, and DOT Procedures and Policies

This final rule has been developed in accordance with Executive Order 13272 ("Proper Consideration of Small Entities in Agency Rulemaking") and DOT's procedures and policies to promote compliance with the Regulatory Flexibility Act (Pub. L. 96-354) and to ensure potential impacts of draft rules on small entities are properly

considered. The following sections address the small business impacts of the measures adopted in this final rule, but separately proposed in Dockets HM-224C and HM-224E.

#### Docket HM-224C

The Regulatory Flexibility Act of 1980 requires agencies to evaluate the potential effects of their proposed and final rules on small businesses, small organizations and small governmental jurisdictions. Section 603 of the Act requires agencies to prepare and make available for public comment a final regulatory flexibility analysis (FRFA) describing the impact of final rules on small entities. Section 603 (b) of the Act specifies the content of a FRFA. Each FRFA must contain:

1. A succinct statement of the need for, and objectives of, the rule.

2. A summary of the significant issues raised by the public comments in response to the IRFA, a summary of the assessment of the agency issues, and a statement of any changes made in the proposed rule as a result of such comments.

3. A description and an estimate of the number of small entities to which the rule will apply or an explanation of why no such estimate is available.

4. A description of the projected reporting, recordkeeping, and other compliance requirements of the rule, including an estimate of the classes of small entities that will be subject to the requirement and the types of professional skills necessary for preparation of the report or record.

5. A description of the steps the agency has taken to minimize the significant adverse economic impact on small entities consistent with the stated objectives of applicable statutes, including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each of the other significant alternatives to the rule considered by the agency was rejected.

AN FRFA describing the impact of this final rule on small entities is available for review in the public docket. The FRFA projects the total cost over the five-year analysis period (in current dollars) for all small businesses impacted by this rule is \$26,463,004. On an annual basis, this is \$5,292,601, equating to an average annual cost per lithium battery manufacturer or distributor of \$71,285 and an average annual cost to small electronics companies of \$2,121. Costs are associated with new testing requirements for certain currently excepted batteries and new hazard communication and packaging

requirements. Considering the danger of a fire aboard an aircraft, the benefits of this rule could likely be in the hundreds of millions of dollars. At a minimum, the benefits of this rulemaking include enhanced transportation safety, consistency between U.S. and international regulations, increased compliance, timely movement of goods, and consistent emergency response to hazardous materials incidents. Summarized below is a brief discussion on each element of the FRFA prepared for this final rule.

*Need for the final rule.* Since 1999, there have been several incidents involving lithium batteries in air transportation. At least four of those incidents involved lithium battery fires; one incident required medical treatment for two workers. All of these incidents resulted in fires that were discovered either just before or just after transportation aboard aircraft. To address this problem, the United Nations Committee of Experts revised the UN Recommendations on the Transport of Dangerous Goods (UN Recommendations) to require new packaging and hazard communication measures for shipments of lithium batteries and cells. The International Civil Aviation Organization's Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO Technical Instructions) and International Maritime Dangerous Goods Code (IMDG Code) were revised to reflect these changes.

Requiring lithium battery designs to be tested in accordance with the UN Test Manual is the internationally accepted method to ensure that lithium cells and batteries are sufficiently robust to withstand normal conditions of transport. However, the HMR currently provide an exception for testing small lithium batteries. In addition, the HMR provide significant exceptions from packaging and hazard communication requirements for small- and medium-size batteries. (A battery's size is determined by its lithium content.) The incidents referenced above suggest the HMR exceptions for small- and medium-size lithium batteries do not adequately protect against fire risks resulting from short circuits or damage to the batteries. Due to these exceptions, the current requirements do not provide for accurate communication of the hazards associated with lithium batteries.

*Summary of comments to the IRFA.* FEDCO Electronics, Inc., and PRBA express concern over the IRFA estimate of potential costs to test currently excepted lithium batteries. SkyBitz, FEDCO, and SION Power contend the

testing cost per design ranges from \$20,000 to \$134,000 and the testing for a complete line of batteries would cost between \$500,000 and \$750,000 for primary lithium batteries and substantially more for rechargeable batteries. Our analysis indicates the costs of the new lithium battery tests are much lower. To obtain information on testing costs, we contacted an independent laboratory currently performing tests on lithium batteries in accordance with the revisions to the UN Test Manual being adopted in this final rule. The laboratory indicated, for a company with multiple battery designs to be tested, the total testing cost per design would be \$6,000. It is our understanding the \$6,000 cost per design covers all of the separate test components in the revisions to the UN Test Manual, including temperature, altitude, vibration, shock, impact, overcharge, forced discharge, and intentional short.

PRBA, FEDCO, SION, Valence Technology, ACR, SkyBitz Inc., EIA, and Intel Corporation request several exceptions to the testing requirements for small lithium batteries. They ask us to include an exception for single cell lithium batteries, an exception for small production runs, and a delay in the effective date of the rule. Based on these comments, we estimate an exception for single-cell lithium batteries would reduce the testing costs imposed on small lithium battery businesses under this rule by an average of \$10,321.61 annually over the 5-year analysis time horizon. An exception tied to small production runs would reduce the estimated costs to small businesses by an average of \$17,029 annually over the 5-year analysis time horizon. The IRFA envisioned a two-year implementation period. Allowing industry an additional two years to implement the rule would not reduce the nominal costs incurred by industry, but, due to the discounting of the cost stream, would reduce the present value costs to the average small business by an average of \$1,576 annually. In response to the comments, in this final rule, we are adopting exceptions for small lithium batteries and for small production runs of lithium batteries. We are also adopting a two-year implementation period.

PRBA, ACR, SkyBitz, and SION Power ask PHMSA to retain the current HMR exception for medium-size batteries. We determined that retaining the exception would result in the elimination of 80% of shipping costs relating to the Class 9 hazardous material shipping requirements and would reduce shipping costs to small businesses affected by the proposed rule

by roughly \$1.3 million in real dollars annually during the five-year analysis timeframe. We elected to retain the exception for the transportation of medium-size lithium batteries transported by ground. The retention of this exception for ground transport reduces the cumulative cost of the final rule for small businesses by \$68,882 per year.

FEDCO and ACR indicate the number of small businesses identified by the IRFA (60 small businesses) should be much higher. In the FRFA we identify 2,239 small businesses potentially affected by this rule. We used a number of resources, including industry association rosters, online databases, and targeted searches to identify these small businesses. Further searches in Dun & Bradstreet data were used, where appropriate, to confirm the categorization of each entity according to Small Business Administration (SBA) size standards. The FRFA includes the original 60 small businesses as lithium battery and cell manufacturers and 2,179 businesses that either manufacture or distribute electronic equipment requiring lithium batteries. Eighty percent of small electronics businesses (1,743) are not subject to the training costs because they already have employees with required HMR or ICAO training or can ship their products by ground. The remaining 20% of small electronics businesses (436) will be affected by the training costs applicable to Class 9 shipping requirements for medium-size batteries.

PRBA, ACR, SkyBitz, FEDCO, and SION Power indicate the incremental costs associated with hazardous material shipping requirements would average \$0.05 per small cell or battery, while the incremental costs tied to medium-size and large batteries and cells would equal \$0.31 per battery and \$0.26 per cell. According to the commenters, these costs include all packaging and shipping costs tied to the proposed rule, with packaging costs, hazardous material surcharges, and other costs spread over the number of units shipped. In addition, commenters indicate the IRFA references a FedEx Express hazmat surcharge of \$30 in the testing costs, but it appears PHMSA did not factor that cost into the routine shipping costs. In the FRFA shipping cost estimates are determined on a per-cell or per-battery basis and include all components, including hazmat surcharges. The FRFA includes all costs listed above.

PRBA and FEDCO indicate the training costs used in the IRFA underestimate the true cost of training. In addition, commenters assert we failed

to include all companies subject to training, such as those companies who incorporate lithium batteries into their products, and those who distribute these products. The training cost analysis considers various scenarios provided by small businesses, including secondary manufacturers and distributors, impacted by the proposed rule. One scenario considered the case when an external trainer was brought on-site and delivered the training course for a fee to employees. Another scenario considered the case where an employee traveled to take a "train-the-trainer" course, and returned to deliver the training to on-site employees. A third scenario considered in this study is based on training cost data provided by a single employer that did not share the specifics of its training program. Each cost scenario was impacted by the number of employees requiring training. Companies training a large number of employees typically incurred smaller training costs per employee due to their ability to spread the fixed costs of the "train-the-trainer" course or the external trainer visit across a larger number of employees. Based on input from small businesses impacted by the proposed rule, these assumptions appear reasonable, generating a training cost estimate of \$828,138 over the 5-year time horizon.

*Number of small entities to which the rule will apply.* The FRFA projects the changes being adopted by this final rule will affect 60 lithium battery and cell businesses (manufacturers and distributors) and 2,179 small electronics businesses. The number of small businesses affected was based on the size standards developed by the Small Business Administration and codified in 13 CFR 121.201.

*Reporting, recordkeeping, and other compliance requirements of the rule.* The compliance costs to small businesses subject to this final rule are primarily related to testing battery and cell designs, shipping of both prototypes and final products, and the training required for employees newly classified as hazmat employees. Each of these is discussed separately in the FRFA. Additionally, the FRFA discusses costs for lithium battery and cell businesses and electronics businesses separately. It also discusses the extent to which these additional compliance costs can be passed through the small businesses to their customers.

*Steps to minimize the economic impact on small entities.* The final rule is designed to increase safety for transportation of lithium batteries and cells. Any alternatives to the final rule should result in similar safety benefits

to warrant consideration. We considered the following possible alternatives:

1. Except lithium batteries and cells transported by motor vehicle for the purposes of recycling from Class 9 hazmat requirements.
2. Provide manufacturers with four years, rather than two, to comply with the new testing requirements for existing small lithium battery designs.
3. Adopt a small production run exception.
4. Retain the current exemption from the shipping requirements for medium-size lithium-ion batteries.
5. Increase the lower threshold for medium-size lithium-ion batteries and cells.
6. Except small, single-cell lithium batteries from testing requirements if the cells have already passed the UN T1-T8 tests.
7. Require that small lithium batteries be shipped as Class 9 hazmat but not require testing unless they are being shipped internationally by air.
8. Retain the current exception for medium-size lithium batteries and cells shipped in or with equipment from the Class 9 shipping requirements for all modes.

Out of the eight alternatives listed above, we rejected all but numbers 1, 3, 4, and 6. Our reasons for rejecting four of the eight alternatives hinge on safety concerns and the benefits of harmonization. The adoption of alternatives 1, 3, 4, and 6 will have little to no impact on safety and will provide a cumulative cost savings to the affected small businesses of only \$100,000 per year.

#### Docket HM-224E

The small business impact analysis conducted for Docket HM-224E was included in the regulatory evaluation prepared for the Final Rule and is summarized below. A complete copy of the report is in the public docket for this rulemaking.

Businesses likely to be affected by the final rule in Docket HM-224E are primary lithium battery manufacturers and distributors. For purposes of the small business impact analysis, the definition of "small business" has the same meaning as under the Small Business Act.

Based on the analysis in the regulatory evaluation, we estimate that the 60 small businesses will incur the following per package costs to comply with the this final rule: (1) \$.20 for labels (including label and associated labor costs); (2) \$.80 for alternative transportation costs (\$.32/pound  $\times$  .25  $\times$  10 pounds); (3) \$.60 for costs associated with transportation delays; and (4) \$.90

for handling and customer service costs). Thus, the total per package cost to a small business to comply with this final rule is estimated to be \$2.50.

We believe that overall cost of the rule for small businesses is substantially less than \$2.50 per shipment. It is our understanding many of the small businesses included in the study used cargo aircraft operators, not passenger aircraft cargo service, prior to implementation of the prohibition. To the extent that these small businesses were not shipping via passenger cargo service, the estimated \$2.50 per package cost impact would only be imposed on a fraction of shipments offered for transportation by the small businesses affected by the final rule.

Based on the above analysis, the PHMSA Administrator certifies that the amendments adopted under Docket HM-224E will not have a significant economic impact on a substantial number of small entities.

#### F. Unfunded Mandates Reform Act of 1995

This final rule does not impose any mandate on a State, local, or Native American tribal government and, accordingly, does not impose unfunded mandates under the Unfunded Mandates Reform Act of 1995. The final rule does not result in costs of \$120.7 million or more, in the aggregate, to any of the following: State, local, or Native American tribal governments, or the private sector.

#### G. Paperwork Reduction Act

PHMSA currently has an approved information collection under OMB Control Number 2137-0034, ("Hazardous Materials Shipping Papers and Emergency Response Information" with an expiration date of May 31, 2008. This final rule resulted in a minimal increase in annual burden and costs based on a new information collection requirement regarding the shipment of lithium batteries.

Section 1320.8(d), Title 5, Code of Federal Regulations requires that PHMSA provide interested members of the public and affected agencies an opportunity to comment on information collection and recordkeeping requests. This notice identifies a new information collection request that OMB approved based on the requirements in the rule. PHMSA developed burden estimates to reflect changes in this rule. PHMSA estimates the new total information collection and recordkeeping burden resulting from the rule are as follows:

Hazardous Materials Shipping Papers & Emergency Response Information:  
OMB Control No. 2137-0034:

Total Annual Number of Respondents: 250,000.  
 Total Annual Responses: 260,000,000.  
 Total Annual Burden Hours: 6,500,834.  
 Total Annual Burden Cost: \$6,510,000.

Requests for a copy of this information collection should be directed to Deborah Boothe or T. Glenn Foster, Office of Hazardous Materials Standards (PHH-11), Pipeline and Hazardous Materials Safety Administration, Room 8430, 400 Seventh Street, SW., Washington, DC 20590-0001, Telephone (202) 366-8553.

In addition, you may submit comments specifically related to the information collection burden to the PHMSA Desk Officer, OMB, at fax number 202-395-6974. Under the Paperwork Reduction Act of 1995, no person is required to respond to an information collection unless it displays a valid OMB control number.

**H. Environmental Assessment**

The National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321-4347) requires Federal agencies to consider the consequences of major federal actions and prepare a detailed statement on any action significantly affecting the quality of the human environment. There are no significant environmental impacts associated with this final rule.

**I. Regulation Identifier Number**

A regulation identifier number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN number contained in the heading of this document may be used to cross-reference this action with the Unified Agenda.

**J. Privacy Act**

Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70, pages 19477-78), or at <http://dms.dot.gov>.

**List of Subjects**

**49 CFR Part 171**

Exports, Hazardous materials transportation, Hazardous waste, Imports, Incorporation by reference,

Reporting and recordkeeping requirements.

**49 CFR Part 172**

Education, Hazardous materials transportation, Hazardous waste, Labeling, Markings, Packaging and containers, Reporting and recordkeeping requirements.

**49 CFR Part 173**

Hazardous materials transportation, Packaging and containers, Radioactive materials, Reporting and Recordkeeping requirements, Uranium.

**49 CFR Part 175**

Air carriers, Hazardous materials transportation, Radioactive materials, Reporting and recordkeeping requirements.

Accordingly, the interim final rule amending 49 CFR parts 171, 172, 173, and 175 that was published at 69 FR 75207 on December 15, 2004, is adopted as a final rule with the following changes and in consideration of the foregoing, 49 CFR Chapter I is amended as follows:

**PART 171—GENERAL INFORMATION, REGULATIONS, AND DEFINITIONS**

1. The authority citation for part 171 continues to read as follows:

**Authority:** 49 U.S.C. 5101-5128, 44701; 49 1.45 and CFR 1.53; Pub L. 101-410 section 4 (28 U.S.C. 2461); Pub. L. 104-134, section 31001.

2. In § 171.8, definitions for “Aggregate lithium content”, “Equivalent lithium content”, and “Lithium content” are added in appropriate alphabetical order to read as follows:

**§ 171.8 Definitions and abbreviations.**

\* \* \* \* \*

*Aggregate lithium content* means the sum of the grams of lithium content or equivalent lithium content contained by the cells comprising a battery.

\* \* \* \* \*

*Equivalent lithium content* means, for a lithium-ion cell, the product of the rated capacity, in ampere-hours, of a lithium-ion cell times 0.3, with the result expressed in grams. The equivalent lithium content of a battery equals the sum of the grams of equivalent lithium content contained in the component cells of the battery.

\* \* \* \* \*

*Lithium content* means the mass of lithium in the anode of a lithium metal or lithium alloy cell. The lithium content of a battery equals the sum of the grams of lithium content contained in the component cells of the battery.

For a lithium-ion cell see the definition for “equivalent lithium content”.

\* \* \* \* \*

3. In § 171.12, paragraph (a)(6) is added to read as follows:

**§ 171.12 North American Shipments.**

(a) \* \* \*

(6) *Primary lithium batteries and cells.* Packages containing primary lithium batteries and cells that meet the exception in § 172.102, Special Provision 188 or 189 of this subchapter must be marked “PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT” or “LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT.” The provisions of this paragraph do not apply to packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries cells that are contained in or packed with equipment.

\* \* \* \* \*

4. In § 171.24, paragraph (d)(1)(ii) is revised to read as follows:

**§ 171.24 Additional requirements for the use of the ICAO Technical Instructions.**

\* \* \* \* \*

(d) \* \* \*

(1) \* \* \*

(ii) *Primary lithium batteries and cells.* Primary lithium batteries and cells are forbidden for transportation aboard passenger-carrying aircraft. Equipment containing or packed with primary lithium batteries or cells are forbidden for transport aboard passenger-carrying aircraft except as provided in § 172.102, Special Provision A101 of this subchapter. When transported aboard cargo-only aircraft, packages containing primary lithium batteries and cells transported in accordance with Special Provision A45 of the ICAO Technical Instructions must be marked “PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT” or “LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT.” This marking is not required on packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries or cells that are contained in or packed with equipment.

\* \* \* \* \*

5. In § 171.25, paragraph (b)(3) is added to read as follows:

**§ 171.25 Additional requirements for the use of the IMDG Code.**

\* \* \* \* \*

(b) \* \* \*

(3) Packages containing primary lithium batteries and cells that are transported in accordance with Special Provision 188 of the IMDG Code must be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" or "LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT." This marking is not required on packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries and cells that are contained in or packed with equipment.

\* \* \* \* \*

**PART 172—HAZARDOUS MATERIALS TABLE, SPECIAL PROVISIONS, HAZARDOUS MATERIALS COMMUNICATIONS, EMERGENCY RESPONSE INFORMATION, AND TRAINING REQUIREMENTS**

■ 6. The authority citation for part 172 is revised to read as follows:

**Authority:** 49 U.S.C. 5101–5128, 44701; 49 CFR 1.53.

**§ 172.101 [Amended]**

■ 7. In § 172.101, in the Hazardous Materials Table, the following changes are made:

■ a. For the entry "Lithium batteries, contained in equipment", Column (7), Special Provisions, is revised to read "29, 188, 189, 190, A54, A55, A101, A104" and Column (9A) is revised to read "See A101, A104."

■ b. For the entry "Lithium batteries packed with equipment", Column (7), Special Provisions, is revised to read "29, 188, 189, 190, A54, A55, A101, A103" and Column (9A) is revised to read "See A101, A103."

■ c. For the entry "Lithium battery", Column 7, Special Provisions, is revised to read "29, 188, 189, 190, A54, A55, A100."

■ 8. In § 172.102, in paragraph (c)(1), in Special Provisions 134 and 157, the phrase "A102" is amended to read "A101", Special Provision 29 is revised, Special Provisions 188, 189, 190 are added, in paragraph (c)(2) Special Provision A102 is removed and Special Provisions A101, A103, and A104 are revised to read as follows:

**§ 172.102 Special provisions.**

\* \* \* \* \*

- (c) \* \* \*
- (1) \* \* \*

29 For transportation by motor vehicle, rail car or vessel, production runs (exceptions for prototypes can be found in § 173.185(e)) of not more than 100 lithium cells or batteries are excepted from the testing requirements of § 173.185(a)(1) if—

a. For a lithium metal cell or battery, the lithium content is not more than 1.0 g per cell and the aggregate lithium content is not more than 2.0 g per battery, and, for a lithium-ion cell or battery, the equivalent lithium content is not more than 1.5 g per cell and the aggregate equivalent lithium content is not more than 8 g per battery;

b. The cells and batteries are transported in an outer packaging that is a metal, plastic or plywood drum or metal, plastic or wooden box that meets the criteria for Packing Group I packagings; and

c. Each cell and battery is individually packed in an inner packaging inside an outer packaging and is surrounded by cushioning material that is non-combustible, and non-conductive.

\* \* \* \* \*

188 *Small lithium cells and batteries.* Lithium cells or batteries, including cells or batteries packed with or contained in equipment, are not subject to any other requirements of this subchapter if they meet all of the following:

a. *Primary lithium batteries and cells.* (1) Primary lithium batteries and cells are forbidden for transport aboard passenger-carrying aircraft. The outside of each package that contains primary (nonrechargeable) lithium batteries or cells must be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" or "LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" on a background of contrasting color. The letters in the marking must be:

(i) At least 12 mm (0.5 inch) in height on packages having a gross weight of more than 30 kg (66 pounds); or

(ii) At least 6 mm (0.25 inch) on packages having a gross weight of 30 kg (66 pounds) or less, except that smaller font may be used as necessary to fit package dimensions; and

(2) The provisions of paragraph (a)(1) do not apply to packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries or cells that are contained in or packed with equipment and the package contains no more than the number of lithium batteries or cells necessary to power the piece of equipment;

b. For a lithium metal or lithium alloy cell, the lithium content is not more than 1.0 g. For a lithium-ion cell, the equivalent lithium content is not more than 1.5 g;

c. For a lithium metal or lithium alloy battery, the aggregate lithium content is not more than 2.0 g. For a lithium-ion battery, the aggregate equivalent lithium content is not more than 8 g;

d. Effective October 1, 2009, the cell or battery must be of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria (IBR; see § 171.7 of this subchapter);

e. Cells or batteries are separated so as to prevent short circuits and are packed in a strong outer packaging or are contained in equipment;

f. Effective October 1, 2008, except when contained in equipment, each package containing more than 24 lithium cells or 12 lithium batteries must be:

(1) Marked to indicate that it contains lithium batteries, and special procedures

should be followed in the event that the package is damaged;

(2) Accompanied by a document indicating that the package contains lithium batteries and special procedures should be followed in the event that the package is damaged;

(3) Capable of withstanding a 1.2 meter drop test in any orientation without damage to cells or batteries contained in the package, without shifting of the contents that would allow short circuiting and without release of package contents; and

(4) Gross weight of the package may not exceed 30 kg (66 pounds). This requirement does not apply to lithium cells or batteries packed with equipment;

g. Electrical devices must conform to § 173.21 of this subchapter; and

h. Lithium batteries or cells are not authorized aboard an aircraft in checked or carry-on luggage except as provided in § 175.10.

189 *Medium lithium cells and batteries.*

Effective October 1, 2008, when transported by motor vehicle or rail car, lithium cells or batteries, including cells or batteries packed with or contained in equipment, are not subject to any other requirements of this subchapter if they meet all of the following:

a. The lithium content anode of each cell, when fully charged, is not more than 5 grams.

b. The aggregate lithium content of the anode of each battery, when fully charged, is not more than 25 grams.

c. The cells or batteries are of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria (IBR; see § 171.7 of this subchapter). A cell or battery and equipment containing a cell or battery that was first transported prior to January 1, 2006 and is of a type proven to meet the criteria of Class 9 by testing in accordance with the tests in the UN Manual of Tests and Criteria, Third Revised Edition, 1999, need not be retested.

d. Cells or batteries are separated so as to prevent short circuits and are packed in a strong outer packaging or are contained in equipment.

e. The outside of each package must be marked "LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD AIRCRAFT AND VESSEL" on a background of contrasting color, in letters:

(1) At least 12 mm (0.5 inch) in height on packages having a gross weight of more than 30 kg (66 pounds); or

(2) At least 6 mm (0.25 inch) on packages having a gross weight of 30 kg (66 pounds) or less, except that smaller font may be used as necessary to fit package dimensions.

f. Except when contained in equipment, each package containing more than 24 lithium cells or 12 lithium batteries must be:

(1) Marked to indicate that it contains lithium batteries, and that special procedures should be followed in the event that the package is damaged;

(2) Accompanied by a document indicating that the package contains lithium batteries and that special procedures should be followed in the event that the package is damaged;

(3) Capable of withstanding a 1.2 meter drop test in any orientation without damage

to cells or batteries contained in the package, without shifting of the contents that would allow short circuiting and without release of package contents; and

(4) Gross weight of the package may not exceed 30 kg (66 pounds). This requirement does not apply to lithium cells or batteries packed with equipment.

g. Electrical devices must conform to § 173.21 of this subchapter.

190 Until the effective date of the standards set forth in Special Provision 189, medium lithium cells or batteries, including cells or batteries packed with or contained in equipment, are not subject to any other requirements of this subchapter if they meet all of the following:

a. *Primary lithium batteries and cells.* (1) Primary lithium batteries and cells are forbidden for transport aboard passenger-carrying aircraft. The outside of each package that contains primary (nonrechargeable) lithium batteries or cells must be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" or "LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" on a background of contrasting color. The letters in the marking must be:

(i) At least 12 mm (0.5 inch) in height on packages having a gross weight of more than 30 kg (66 pounds); or

(ii) At least 6 mm (0.25 inch) on packages having a gross weight of 30 kg (66 pounds) or less, except that smaller font may be used as necessary to fit package dimensions; and

(2) The provisions of paragraph (a)(1) do not apply to packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries or cells that are contained in or packed with equipment and the package contains no more than the number of lithium batteries or cells necessary to power the piece of equipment.

b. The lithium content of each cell, when fully charged, is not more than 5 grams.

c. The aggregate lithium content of each battery, when fully charged, is not more than 25 grams.

d. The cells or batteries are of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria (IBR; see § 171.7 of this subchapter). A cell or battery and equipment containing a cell or battery that was first transported prior to January 1, 2006 and is of a type proven to meet the criteria of Class 9 by testing in accordance with the tests in the UN Manual of Tests and Criteria, Third Revised Edition, 1999, need not be retested.

e. Cells or batteries are separated so as to prevent short circuits and are packed in a strong outer packaging or are contained in equipment.

f. Electrical devices must conform to § 173.21 of this subchapter.

\* \* \* \* \*

#### Code/Special Provisions

\* \* \* \* \*

(2) \* \* \*

\* \* \* \* \*

A101 A primary lithium battery or cell packed with or contained in equipment is forbidden for transport aboard a passenger

carrying aircraft unless the equipment and the battery conform to the following provisions and the package contains no more than the number of lithium batteries or cells necessary to power the intended piece of equipment:

(1) The lithium content of each cell, when fully charged, is not more than 5 grams.

(2) The aggregate lithium content of the anode of each battery, when fully charged, is not more than 25 grams.

(3) The net weight of lithium batteries does not exceed 5 kg (11 pounds).

A103 Equipment is authorized aboard passenger carrying aircraft if the gross weight of the inner package of secondary lithium batteries or cells packed with the equipment does not exceed 5 kg (11 pounds).

A104 The net weight of secondary lithium batteries or cells contained in equipment may not exceed 5 kg (11 pounds) in packages that are authorized aboard passenger carrying aircraft.

\* \* \* \* \*

#### PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

■ 9. The authority citation for part 173 continues to read as follows:

**Authority:** 49 U.S.C. 5101–5128, 44701; 49 CFR 1.45, 1.53.

■ 10. Section 173.185 is revised to read as follows:

##### § 173.185 Lithium cells and batteries.

(a) *Cells and batteries.* A lithium cell or battery, including a lithium polymer cell or battery and a lithium-ion cell or battery, must conform to all of the following requirements:

(1) Be of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria (IBR; see § 171.7 of this subchapter). A cell or battery and equipment containing a cell or battery that was first transported prior to January 1, 2006 and is of a type proven to meet the criteria of Class 9 by testing in accordance with the tests in the UN Manual of Tests and Criteria, Third Revised Edition, 1999, need not be retested.

(2) Incorporate a safety venting device or otherwise be designed in a manner that will preclude a violent rupture under conditions normally incident to transportation.

(3) Be equipped with an effective means to prevent dangerous reverse current flow (e.g., diodes, fuses, etc.) if a battery contains cells or series of cells that are connected in parallel.

(4) Be packaged in combination packagings conforming to the requirements of part 178, subparts L and M, of this subchapter at the Packing Group II performance level. The lithium battery or cell must be packed in inner packagings in such a manner as to

prevent short circuits, including movement which could lead to short circuits. The inner packaging must be packed within one of the following outer packagings: metal boxes (4A or 4B); wooden boxes (4C1, 4C2, 4D, or 4F); fiberboard boxes (4G); solid plastic boxes (4H2); fiber drums (1G); metal drums (1A2 or 1B2); plywood drums (1D); plastic jerricans (3H2); or metal jerricans (3A2 or 3B2).

(5) Be equipped with an effective means of preventing external short circuits.

(6) Except as provided in paragraph (d) of this section, cells and batteries with a liquid cathode containing sulfur dioxide, sulfur chloride or thionyl chloride may not be offered for transportation or transported if any cell has been discharged to the extent that the open circuit voltage is less than two volts or is less than 2/3 of the voltage of the fully charged cell, whichever is less.

(b) *Lithium cells or batteries packed with equipment.* Lithium cells or batteries packed with equipment may be transported as Class 9 materials if the batteries and cells meet all the requirements of paragraph (a) of this section. The equipment and the packages of cells or batteries must be further packed in a strong outer packaging. The cells or batteries must be packed in such a manner as to prevent short circuits, including movement that could lead to short circuits.

(c) *Lithium cells or batteries contained in equipment.* Lithium cells or batteries contained in equipment may be transported as Class 9 materials if the cells and batteries meet all the requirements of paragraph (a) of this section, except paragraph (a)(4) of this section, and the equipment is packed in a strong outer packaging that is waterproof or is made waterproof through the use of a liner unless the equipment is made waterproof by nature of its construction. The equipment and cells or batteries must be secured within the outer packaging and be packed so as to prevent movement, short circuits, and accidental operation during transport.

(d) *Cells and batteries, for disposal or recycling.* A lithium cell or battery offered for transportation or transported by motor vehicle to a permitted storage facility, disposal site or for purposes of recycling is excepted from the specification packaging requirements of paragraph (a)(4) of this section and the requirements of paragraphs (a)(1) and (a)(6) of this section when protected against short circuits and packed in a strong outer packaging conforming to the requirements of §§ 173.24 and 173.24a.

(e) *Shipments for testing (prototypes).* A lithium cell or battery is excepted from the requirements of (a)(1) of this section when transported by motor vehicle for purposes of testing. The cell or battery must be individually packed in an inner packaging, surrounded by cushioning material that is non-combustible and nonconductive. The cell or battery must be transported as a Class 9 material.

(f) A lithium cell or battery that does not comply with the provisions of this subchapter may be transported only under conditions approved by the Associate Administrator.

(g) Batteries employing a strong, impact-resistant outer casing and exceeding a gross weight of 12 kg (26.5 lbs.), and assemblies of such batteries, may be packed in strong outer packagings, in protective enclosures (for example, in fully enclosed wooden slatted crates) or on pallets. Batteries must be secured to prevent inadvertent movement, and the terminals may not support the weight of other superimposed elements. Batteries packaged in this manner are not permitted for transportation by passenger aircraft, and may be transported by cargo aircraft only if approved by the Associate Administrator prior to transportation.

■ 11. In § 173.219, paragraph (b)(3) is revised to read as follows:

**§ 173.219 Life-saving appliances.**

\* \* \* \* \*

(b) \* \* \*

(3) Electric storage batteries and lithium batteries (Life saving appliances containing lithium batteries must be transported in accordance with § 173.185, and Special Provisions 188, 189, A101, A103 and A104 as applicable.);

\* \* \* \* \*

**§ 173.220 [Amended]**

■ 12. In § 173.220, in paragraph (d), the phrase “Special Provision A102” is amended to read “Special Provision A101”.

**PART 175—CARRIAGE BY AIRCRAFT**

■ 13. The authority citation for part 175 continues to read as follows:

**Authority:** 49 U.S.C. 5101–5128; 44701; 49 CFR 1.53.

■ 14. In § 175.10, paragraph (a)(17) is revised to read as follows:

**§ 175.10 Exceptions.**

(a) \* \* \*

(17) Except as provided in § 173.21 of this subchapter, consumer electronic and medical devices (watches, calculating machines, cameras, cellular

phones, lap-top and notebook computers, camcorders, etc.) containing lithium cells or batteries and spare lithium batteries and cells for these devices, when carried by passengers or crew members for personal use. Each spare battery must be individually protected so as to prevent short circuits (by placement in original retail packaging or by otherwise insulating terminals, e.g., by taping over exposed terminals or placing each battery in a separate plastic bag or protective pouch) and carried in carry-on baggage only. In addition, each installed or spare battery must not exceed the following:

(i) For a lithium metal battery, a lithium content of not more than 2 grams per battery; or

(ii) For a lithium-ion battery, an aggregate equivalent lithium content of not more than 8 grams per battery, except that up to two batteries with an aggregate equivalent lithium content of more than 8 grams but not more than 25 grams may be carried.

\* \* \* \* \*

Issued in Washington, DC, on July 31, 2007, under authority delegated in 49 CFR Part 1.

**Thomas J. Barrett,**  
*Administrator.*

[FR Doc. E7–15213 Filed 8–8–07; 8:45 am]

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