



**WORKING PAPER**

**DANGEROUS GOODS PANEL (DGP)  
MEETING OF THE WORKING GROUP OF THE WHOLE**

**Memphis, 30 April to 4 May 2007**

**Agenda Item 2: Development of recommendations for amendments to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) for incorporation in the 2009/2010 Edition**

**2.7: Part 7 — Operator's Responsibilities**

**DETECTION AND FIRE SUPPRESSION IN CARGO HOLDS**

(Presented by Captain Jiang Rui)

**SUMMARY**

This paper seeks advise on whether or not the working group considers it necessary to require that the hold be equipped with a fire detection system when dangerous goods of classes or divisions 1, 2.1, 3, 4, 5 and lithium batteries are carried on aircraft.

Action by the DGP-WG is in paragraph 4.

**1. INTRODUCTION**

1.1 Last year there was a fire in the cargo hold of an aircraft. The investigation that followed revealed that the fire was caused by the shipment of a lithium battery. Fortunately, the pilot of the aircraft detected the fire before departure as the fire detection system of the cargo hold issued a warning when the aircraft was still on the taxiway. We were lucky that the aircraft was equipped with a fire detection system; otherwise there could have been serious repercussions, maybe just like the 1996 Value Jet accident.

**2. RELATED EXTRACTS FROM ICAO ANNEX AND OTHER REGULATIONS**

2.1 Annex 8 — Airworthiness of Aircraft

**PART III. LARGE AEROPLANES**

**PART IIIA. AEROPLANES OVER 5700 KG FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 13 JUNE 1960 BUT BEFORE 2 MARCH 2004**

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## **CHAPTER 4. DESIGN AND CONSTRUCTION**

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### **4.1.6 Design features**

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- g) *Fire suppression.* For aeroplanes for which the application for certification was submitted on or after 12 March 2000, cargo compartment fire suppression systems, including their extinguishing agents, shall be designed so as to take into account a sudden and extensive fire such as could be caused by an explosive or incendiary device or dangerous goods.

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## **PART IIIB. AEROPLANES OVER 5 700 KG FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 2 MARCH 2004**

### **SUB-PART A. GENERAL**

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#### **A.1 Applicability**

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A.1.2 Except for those Standards and Recommended Practices which specify a different applicability, the Standards and Recommended Practices of this part shall apply to all aeroplanes over 5 700 kg maximum certificated take-off mass intended for the carriage of passengers or cargo or mail in international air navigation.

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### **SUB-PART D. DESIGN AND CONSTRUCTION**

#### **D.2 Systems design features**

Special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

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- g) *Cargo compartment protection.*
- 1) each cargo compartment accessible to a crew member in a passenger carrying aeroplane shall be equipped with a fire suppression system;
  - 2) each cargo compartment not accessible to a crew member shall be equipped with a built-in fire detection system and a built-in fire starvation or

suppression system; and

- 3) cargo compartment fire suppression systems, including their extinguishing agents, shall be designed so as to take into account a sudden and extensive fire such as could be caused by an explosive or incendiary device or dangerous goods.

## 2.2 CCAR121.314 (c)

Each Class D compartment, regardless of volume, must meet the standards of CCAR25.857 and CCAR25.858 for a Class C compartment unless the operation is an all-cargo operation in which case each Class D compartment may only meet the standards in CCAR25.857 for a Class E compartment.

## 2.3 FAR121.314 (c)

After March 19, 2001, each Class D compartment, regardless of volume, must meet the standards of FAR25.857(c) and 25.858 of this Chapter for a Class C compartment unless the operation is an all-cargo operation in which case each Class D compartment may meet the standards in FAR25.857(e) for a Class E compartment.

## 3. CONCLUSION

3.1 As the appendix illustrates, some fires caused by dangerous goods is too quick to make a crash or are impossible to extinguish. It is very important that flight crews get early warning information when there is smoke/fire in the cargo hold, so that they can make a landing as soon as possible to save the aircraft.

## 4. ACTION BY THE DGP-WG

4.1 The DGP-WG is invited to discuss the above and advise:

- a) whether it is already in national regulations that cargo holds must be equipped with smoke/fire detection system for aeroplanes over 5 700 kg in international air navigation; and
- b) whether it considers it necessary to require that when dangerous goods of classes or divisions 1, 2.1, 3, 4, 5 and lithium batteries are carried onboard aeroplanes over 5 700 kg in international air navigation, the hold should be equipped with fire detection system. If this principle is agreed, a transition period of a number of years will be required to allow conversion and retrofitting.

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APPENDIX

**BULLETINS RELATED TO POTENTIAL FOR IN-FLIGHT FIRES  
RESULTING FROM LAPTOP BATTERY FAILURES**

Approved by: AFS-200

# SAFO

Safety Alert for Operators  
U.S. Department SAFO 05008  
of Transportation DATE: 12/30/05  
**Federal Aviation** Flight Standards Service  
**Administration** Washington, DC

[http://www.faa.gov/other\\_visit/aviation\\_industry/airline\\_operators/airline\\_safety/safo](http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo)

*A SAFO contains important safety information and may include recommended action. SAFO content should be especially valuable to air carriers in meeting their statutory duty to provide service with the highest possible degree of safety in the public interest.*

**Subject:** Potential for in-flight fires resulting from laptop battery failures.

**Background:** This office was alerted of certain batteries contained within particular make and models of portable laptop computers that could possibly electrically short, overheat, and cause possible smoke and flames. While, according to the identified manufacturer, there is a remote possibility that the affected batteries could result in smoke and flames, the manufacturer is taking extensive action to recall and replace the affected batteries. Users of the subject laptop computers have been advised by the laptop manufacturer not to use their computers on battery power.

**Discussion:** On January 8, 2004, the FAA issued Advisory Circular (AC) 120-80, In-Flight Fires, which discusses the dangers of in-flight fires, with particular emphasis on hidden fires that may not be visible or easily accessed by the crew. The AC provides guidance on how to deal with in-flight fires, emphasizing the importance of crewmembers taking immediate and aggressive action in response to signs of an in-flight fire while stressing the effectiveness of Halon extinguishing agents. In addition, the AC discusses the importance of appropriate crewmember training in dealing with hidden fires. Crewmembers, in particular, should be aware that the potential for smoke emission and fire propagation from high-energy batteries, of any kind, could result from internal short-circuit failures. If detected, arresting or suppression techniques should be followed, as prescribed in the AC.

**Recommended Action:** Directors of safety, directors of operations, chief pilots, training managers, and crewmembers of passenger-carrying airplanes under Title 14 of the Code of Federal Regulations (14 CFR) parts 91, 121; 125, 129, and 135 should be aware of the potential hazard described in this SAFO and should apply the practices of AC 120-80. Operators are reminded to follow their established procedures in contacting their local FAA Flight Standards District Office or their Certificate Management Office to report any incidents of in-flight fires occurring during its operations. Title 14 CFR part 121, section 121.703(a)(2), and part 135, section 135.415(a)(2), as applicable, address reporting requirements for fires [occurring] during flight not protected by related fire-warning system. AC 120-80, In-Flight Fires, may be found at: [http://www.airweb.faa.gov/Regulatory\\_and\\_Guidance\\_Library/rgAdvisoryCircular.nsf/0/ed51f1681e9d8c5e86256e4a00744607/\\$FILE/AC120-80.pdf](http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/0/ed51f1681e9d8c5e86256e4a00744607/$FILE/AC120-80.pdf)

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## **Dangerous Goods Advisory Circular DGAC 2/2004**

### **Extreme Hazard of Lithium Battery Fire**

A recent laboratory test conducted by the U.S. Department of Transport Federal Aviation Administration revealed that lithium battery, which is commonly used in consumer electronic products, can be extremely dangerous if they catch fire onboard aircraft. In short, a lithium battery fire could burn through a cargo hold and breach all defenses. For general information, some of key findings are listed below: -

- i) A relatively small fire source is sufficient to start a lithium battery fire;
- ii) Once a single lithium battery begins to burn, it is hot enough to ignite adjacent batteries;
- iii) Molten lithium battery burns explosively with peak temperature reaching 1400 °F (as a reference, melting point of aluminum is around 1200 °F);
- iv) Fire suppression agent commonly used in aircraft, such as Halon 1301, proved totally ineffectively in suppressing or extinguishing a lithium battery fire;
- v) Molten lithium could perforates cargo compartment liner material; and
- vi) The ignition of lithium battery could release a pressure pulse strong enough to compromise the integrity of cargo compartments.

This Dangerous Goods Office believes that some lithium batteries (sometimes up to thousands in a consignment) could be wrongly consigned for air transport in Hong Kong as non-restricted cargo under the name "Batteries Dry" or others wrongly carried by passengers inside baggage. Now knowing the extreme hazard of lithium battery fire, we hereby remind operators that: -

- i) Vigilance must be exercised in accepting non-restricted cargo consignment claimed to be "Batteries Dry" and lithium battery carried by passengers;

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- ii) For lithium battery consignment, only those satisfying Special Provisions A45 under ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air (TI) can be transported as non-restricted air cargo;
- iii) Lithium battery consignment **NOT** satisfying Special Provisions A45 must be transported as dangerous goods with full compliance of the provisions of ICAO TI especially Packing Instructions PI903; and
- iv) All other lithium battery consignments that are not in compliance with the provisions of ICAO TI are forbidden for air transport.

Should you have any query about this circular, please contact Safety Officers (Dangerous Goods) Ms Cecilia PANG at 2182 1214 or Mr. Eric CHIM at 2182 1221.

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