



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

Memphis, 30 April to 4 May 2007

Agenda Item 6: Discussion of miscellaneous dangerous goods issues

ENHANCED REQUIREMENTS FOR TRANSPORT OF OXYGEN, OXYGEN GENERATORS, AND OXIDIZING GASES

(Presented by R. Richard)

SUMMARY

This paper is to provide information to the Panel relative to a recent rulemaking amending the United States Hazardous Materials Regulations to enhance the requirements for the transport of oxygen generators and oxidizing gases in cylinders.

1. INTRODUCTION

1.1 An investigation of the 1996 ValuJet Airlines Flight No. 596 incident determined that one of the probable causes of the crash was a fire in the airplane's cargo compartment initiated and enhanced by the actuation of one or more chemical oxygen generators carried as cargo. Recommendations issued by the U.S. National Transportation Safety Board (NTSB) following their investigation addressed both the initiation of the fire by the improperly packaged generators (which produce external heat when activated) and the possible enhancement of an aircraft cargo compartment fire (of any origin) by the oxygen produced by the generators or other cargo, such as gaseous oxygen in cylinders and other oxidizing agents.

1.2 In response to these recommendations, testing was conducted to evaluate the risks associated with the transport of oxygen aboard aircraft. It was determined that the temperature at which cylinders of compressed oxygen release their contents is well below temperatures that aircraft cargo compartment liners and structures are designed to withstand. When the surface temperature of a cylinder of compressed oxygen reaches approximately 300 °F, the increase in internal pressure causes the cylinder's pressure relief device to open and release oxygen. In addition to the ValuJet tragedy, three accidents and ten incidents involving airplane cargo compartment fires have occurred between 1986 and

2002. While the origin of the fires in these incidents was not always attributable to the presence of dangerous goods, it is clear that an oxidizing gas if released during a fire situation would significantly increase the risks posed by the fire to the aircraft and its occupants.

1.3 Testing further revealed that a sodium chlorate oxygen generator will initiate and release oxygen at a minimum temperature of 600 °F. However, due to variations in designs and in the physical properties of sodium chlorate, it is recommended that oxygen generators not be exposed to temperatures above 400 °F. These additional tests showed that an unprotected oxygen generator can quickly and violently release its contents when exposed to temperatures that can be expected from an aircraft cargo compartment fire.

1.4 The testing conducted also showed that use of a fire and heat resistant outer packaging will significantly lengthen the time a cylinder will retain its contents when exposed to fire or heat. It was therefore recommended that an outer packaging be required designed to provide both thermal and flame penetration protection.

1.5 A final recommendation to further decrease the likelihood of a release was to increase the discharge pressure of pressure relief devices (PRDs) on cylinders used to transport oxygen and other oxidizing gases. Increasing the discharge pressure precludes premature actuation of the cylinder's PRD and helps to ensure that the cylinder's contents are retained during an otherwise controllable cargo compartment fire.

1.6 Based on the results of the testing conducted and in response to these recommendations, the U.S. issued a rulemaking amending the U.S. Hazardous Materials Regulations (Docket No. RSPA-04-17664 (HM-224B)). This rulemaking amended the HMR to:

- require cylinders of compressed oxygen and other oxidizing gases and packages of chemical oxygen generators to be placed in an outer packaging that meets certain flame penetration and thermal resistance requirements when transported aboard an aircraft;
- revise the PRD setting limit on cylinders of compressed oxygen and other oxidizing gases transported aboard aircraft; and

1.7 limit the types of cylinders authorized for transporting compressed oxygen aboard aircraft to allow DOT specification 3A, 3AA, 3AL, and 3HT cylinders, and UN pressure receptacles conforming to ISO specifications 9809-1, 9809-2, 9809-3 and 7866.

2. ACTION BY THE DGP-WG

2.1 It should be noted that the effective date of the amendments in relation to pressure relief devices and authorized cylinder types is October 1, 2007, and the effective date of the amendment relative to the flame resistant outer package is October 1, 2009. The requirements apply to all shipments to, from, or within the United States. The U.S. intends to file a Variation to ensure that States are aware of these new requirements. The DGP is invited to consider whether similar amendments should be made to the Technical Instructions. If there is agreement in principle, a proposal will be made at a future meeting.

2.2 To facilitate review, the Secretary has been provided with Annexes that will be made available on the ICAO DGP Website. A copy of the complete rulemaking is included as Annex 1. The rulemaking includes a summary of changes, safety analysis and justification, responses to comments

received, and complete regulatory text. In addition, the test studies supporting this rulemaking are included as Annexes 2 and 3, and the supporting regulatory evaluation including risk/benefit analysis is included as Annex 4.

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