



**WORKING PAPER**

**DANGEROUS GOODS PANEL (DGP)  
WORKING GROUP MEETING (DGP-WG/16)**

**Montreal, 17 to 21 October 2016**

- Agenda Item 5: Specific work items identified by the Air Navigation Commission:**  
**5.3: Mitigating risks posed by the carriage of lithium batteries by air (ANC job card DGP.003.01)**

**SEGREGATION REQUIREMENTS FOR LITHIUM BATTERIES**

(Presented by A. Stubblefield)

**SUMMARY**

This working paper invites the DGP to consider additional segregation requirements in Part 7 relating to lithium batteries and flammable materials.

**Action by the DGP-WG:** The DGP is invited to provide feedback and any other applicable information to be considered in the development of a future Working Paper on this issue.

**1. INTRODUCTION**

1.1 During the twenty-fifth meeting of the Dangerous Goods Panel (DGP/25, Montreal, 19 to 30 October 2015), the panel considered DGP/25-WP/23 “Mitigation Measures for Lithium Batteries on All-Cargo Aircraft”. Although time for discussion of DGP/25-WP/23 was limited, there was strong support for considering additional mitigation measures to reduce the risk posed by the transport of lithium batteries as cargo. Enhancing segregation requirements for such batteries was one such additional measure that the panel agreed to further consider (see paragraph 5.6 of DGP/25-WP/52).

1.2 Establishing segregation requirements for lithium ion batteries and flammable liquids is supported by the findings of the Republic of Korea’s Aviation and Railway Accident Investigation Board (ARAIB) and the U.S. National Transportation Safety Board (NTSB) following the investigation of the July 28, 2011, in-flight fire and crash of Asiana Airlines Flight 991 which resulted in the death of both pilots. After a thorough analysis concluded that the proximity of flammable liquids to the lithium ion batteries had contributed to the severity of the incident, the report issued by ARAIB included the following safety recommendation:

*Ensure that flammable liquid dangerous goods (Class 3) and lithium batteries (Section 1, 1A)153) which are bearing the "Cargo Aircraft Only (CAO)" label are segregated and loaded on separate ULDs.(See ARAIB/AAR1105 - p. 189).*

1.3 On February 9, 2016, NTSB issued a corresponding official Safety Recommendation (A-16-001) recommending that "...Class 3 flammable liquids and fully regulated Class 9 lithium batteries be physically segregated when stowed on board an aircraft such that packages containing these materials may not be placed on the same or adjacent pallets or ULDs." This recommendation was derived from the ARAIB's investigation of the Asiana Airlines Flight 991 accident, in which the NTSB assisted.

1.4 Segregation of flammable liquids from specific dangerous goods is already provided for within the Technical Instructions in Part 7;2.2.1. The current Technical Instructions include a requirement to segregate flammable liquids from oxidizing materials. Specifically, Table 7-1 requires that Class 3 — flammable liquids and Division 5.1 — oxidizing substances "...may not be stowed next to or in contact with each other, or in a position which would allow interaction in the event of leakage of the contents."

1.5 The requirement for segregation of flammable liquids from oxidizing substances is derived from the fact that oxidizing substances readily burn in the absence of oxygen and can provide fuel to a fire involving the flammable liquids. Providing for separation reduces the likelihood of a fire involving both materials simultaneously and thereby reduces risk. A similar reduction in risk would be gained by requiring segregation of flammable materials and lithium ion batteries.

1.6 The recommendation from NTSB is to stow packages of flammable materials and lithium batteries on the aircraft so that they may not be placed on the same or adjacent pallets or ULDs. This concept is utilized in "Table 7-2. Separation of explosive substances and articles":

"An "x" at the intersection of a row and column indicates that explosives of these divisions and compatibility groups must be loaded into separate unit load devices and, when stowed aboard the aircraft, the unit load devices must be separated by other cargo with a minimum separation distance of 2 m. When not loaded in a unit load device, these explosives must be loaded in not different, no-adjacent positions and separated by other cargo with a minimum separation distance of 2 m."

1.7 It is recognized that there are ongoing efforts to improve the safety of lithium battery transport, and that no single action can by itself mitigate all risk. However, through a layered approach, risk can be substantially reduced. Requiring lithium batteries to be segregated from flammable materials would enhance safety by increasing the opportunity that in the event of a fire involving either dangerous good, safety systems could address the hazard posed by the individual flammable materials or the lithium batteries, rather than the cumulative effects of a fire involving both goods simultaneously. In communications on this issue, the NTSB has indicated that enhancing segregation is the most effective and readily implementable mitigation to address safety issues associated with carrying lithium batteries in conjunction with other flammable materials as cargo on aircraft and could complement any additional safety measures.

## 2. ACTION BY THE DGP-WG

2.1 The DGP is invited to provide feedback and any other applicable information on this issue. Based on feedback received, a proposal may be considered for submission at a future meeting.

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