International Civil Aviation Organization

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WORKING PAPER

DANGEROUS GOODS PANEL (DGP)

TWENTIETH MEETING

Montréal, 24 October to 04 November 2005

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 2007-2008 Edition

PACKING GROUP I FOR CORROSIVE SUBSTANCES; SULPHURIC ACID, SODIUM HYDROXIDE SOLUTIONS, ETC

(Presented by H. Okayama)

1. INTRODUCTION

1.1 In the Table 3-1 Dangerous Goods List, you will find the detailed provisions for an entry of UN 1824, **Sodium hydroxide solution**, as follows.

Sodium hydroxide solution,	UN 1824, Class 8, Corrosive, A3,
	Packing Group II Y809/0.5L 809/ 1L 813/30L
	Packing Group III Y819/1L 819/5L 821/60L

As a daily routine of our position to make decision of classification or identification upon receiving inquiries or consultation from shippers and freight forwarders, we come across with the most cases that are such a solution having its pH value of over 11.5, which figure is a standard of judgment we are using to assign Packing Group I according to an interpretation of OECD Guidelines for Testing of Chemicals No. 404, Acute Dermal Irritation/Corrosion, 1992.
On this solution with a little percentage of Sodium Hydroxide such as 20% or 10 %, its pH value becomes more than 11.5. And very often we find cases of pH value of 13 or 13.5, that should be assigned to “High Danger” of Packing Group I based on our interpretation of the said OECD Giudelines.

On the other hand, however, there is no provision of “High Danger” of Packing Group I for this substance of UN 1824, Sodium hydroxide solution on the ” blue pages”, as indicated above.

We feel some kind of contradiction on this situation and we feel very skeptical of what the provisions of Packing Group for this substance on the Dangerous Goods List.

1.2 In the case of entries of " UN 1830 and UN 2796 **Sulphuric Acid**", you will find the detailed provisions as follows.

Sulphuric acid with more than 51% acid, UN 1830, Class 8, Corrosive,
Packing Group II Y 809/0.5L 809/1 L 813/30 L

Sulphuric acid with not more than 51% acid, UN 2796, Class 8, Corrosive,
Packing Group II Y809/0.5L 809/1L 813/30L

There is no provisions for "High Danger" of Packing Group I for the above **Sulphuric acid**, even though we come across with so many cases of the substances with a pH value of 2 or less than 2. Then, we feel the same contradiction as the above **Sodium Hydroxide Solution**, why there is no Packing Group I for **Sulphuric acid**.

1.3 There are some more entries we should consider adopting provisions of "High Danger" of Packing Group I, as follows.

a) **Potassium hydroxide solution,** UN 1814, Class 8, Corrosive, A3,
Packing Group II Y809/0.5L 809/1L 813/30L
Packing Group III Y819/1 L 819/5 L 821/60 L

b) **Hydrochloric acid,** UN 1789, Class 8, A3,
Packing Group II Y809/0.5L 809/1L 813/30L
Packing Group III Y819/1 L 819/5 L 821/60L

c) **Nitric acid,** other than red fuming, with not more than 20% nitric acid, UN 2031, Class 8, Corrosive, Packing Group II Y 807/0.5L 807/1L 813/30L

d) **Nitric acid,** other than red fuming, with not more than 70% nitric acid, UN 2031, Class 8, Corrosive, State Variations AU1, CA7, GB3, IR3, NL1, US3, A1,
Packing Group II FORBIDDEN 813/30L

1.4 We understand that the provisions of these entries in the Dangerous Goods List are based on the "UN Recommendations", and the OECD Guidelines indicates only the range of "corrosive" property next to "irritation" but the grouping of Packing Group I, II and III., that is not more than pH 2 or not less than pH 11.5 unless the test of using animal is conducted. Therefore, when any substance shows either not more than pH 2 or not less than pH 11.5, we have made it a rule to assign Packing Group I to such a substance with consideration of safety factor. But in such a case we feel so strange whenever we come across with the case that has no Packing Group I. We assume that most cases of Packing Group II at the severest for those substances are based on the actual experiments the "UN Recommendations" conducted by using animal. However, when you consider the following accidents caused by "Corrosive" substances, we suppose you feel restless with the current condition of provisions focusing on "medium danger" of Packing Group II, not on "high danger". There are typically three accidents of aircraft caused by "Corrosive Substances" in the past as follows, as far as we know.

a) In January 1996, Boeing 747-200 Freighter of Southern Air Transport suffered the spill from a shipment of "Mercury"(UN 2809 Class 8, PG III 803/35kg, 803/35kg) while operating a flight from Bogota to Miami. The spilled Mercury in more than than 2kg roamed throughout the aircraft's fuselage and other areas over the next few weeks, and caused severe damage to the

structural integrity of the aircraft, which were found during a routine B Check. After all, the decision was taken to declare the aircraft as "damaged beyond repair" and US$ 40 million freighter was written-off as result of roaming Mercury.

b) Early in 1996, DC-8F operated by an African carrier suffered a spill of "Mercury". But this aircraft survived as the spill was contained, although the aircraft was out of service for a substantial period of time. All cost concerned including the cost of damage had to be born by the operator.

c) On 15 March 2000, Airbus A330-300 of a certain airline suffered the spill from a shipment of chemical goods in 2 tons contained in large number of canisters, during the flight from Beijing to Kuala Lumpur. This spill caused corrosive damage primarily to the aircraft cargo- hold, wing-box structure and landing gear The shipment's destination was Chennai, India. After all the six- year-old aircraft was declared a constructive total loss and written off.

Besides the above examples, there is a Deutsche Lufthansa's video-tape called " Properties of Dangerous Goods", which shows properties and characteristics of 9 classes of Dangerous Goods respectively by having a demonstration of testing and experiment.

1.5 In these scenes, it shows a testing piece of aluminium which is mostly used as the material of aircraft, dipped into the solution of **Hydrochloric Acid**. As soon as it is dipped into the solution, it responses in a second with initiating "corrosion" by causing the surface transformed with many bubbles of metallic colour. Almost the same phenomenon can be seen, on the other hand, when the same testing piece of aluminium is dipped into the condensed alkalized solution.

2. PROPOSAL

Since acidic or alkali substances which has the characteristics of effecting aircraft fuselage to the extent of damage to the structural integrity in such a short time are assessed as Packing Group II or III on the current regulations, we would like to ask you to give some consideration on reviewing the condition of provision of the substances which have acid/alkali reserve from the viewpoint of air transport.

2.1 We would like to suggest you to study placing the additional provision of "High Danger"of Packing Group to the above entries or making the current packing instruction or maximum quantity per package changed to a more severe ones, since even with a small percentage of purity, such as 10% or 5%, these substances become easily in the range of pH value either by not more than 2 or not less than 11.5 and effect easily the structural integrity of aircraft.

2.2 It looks somewhat strange both UN 1830 and UN 2796 of **Sulphuric acid** have exactly the same condition of provisions in Packing Group, Packing Instruction, and Maximum Net Quantity per Package. Especially both of these have Packing Group II only, which leaves the users skeptical. Please check and study if there must be some difference between them, including the range of Packing Group I, II and III.

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