



WORKING PAPER

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

Montréal, 1 to 5 October 2018

Agenda Item 2: Managing air-specific safety risks and identifying anomalies

2.3: Develop proposals, if necessary, for amendments to the to the Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284SU) for incorporation in the 2021-2022 Edition

SEPARATION OF EXPLOSIVE SUBSTANCES AND ARTICLES

(Presented by P. Tatin)

SUMMARY

This working paper proposes to define an acceptable method of compliance regarding separation of packages containing explosives substances and articles with different compatibility groups.

Action by the DGP-WG: The DGP-WG is invited to provide their views and to consider the proposal for amendment presented in the appendix of this working paper.

2. INTRODUCTION

1.1 Part S-7;2.3 of the Supplement to the Technical Instructions provides guidance on the separation of explosive substances and articles. A note at the beginning of the paragraph indicates that although the safety of explosive substances and articles would be enhanced by transporting each type separately, authorities need to consider the practicalities and economic factors when granting approvals or exemptions, and a proper balance in the interest of safety needs to be maintained. Having said that, it appears that in practice, authorities have to grant approvals and exemptions which mixing several types of explosive substances and articles for transport.

1.2 Part S7;2.3 states that explosives of Class 1 may be loaded together depending on their “compatibility group”, and they are considered compatible if they can be transported together without significantly increasing either the probability of an accident or, for a given quantity, the magnitude of the effects of such an accident.

1.3 Table S-7-1, which is extracted below, provides guidance for the separation of packages containing explosives with different compatibility groups. Part S-7;2.3.6 explains that an “x” at the intersection of a row and column indicates that explosives of these compatibility groups must be separated. Part S-7;2.3.6 also explains that the method of separation (e.g. the minimum distance between incompatible explosives and/or separation of incompatible explosives with other cargo) must be approved by the competent authority, taking into account the danger of transmission of detonation between the different explosives.

Table S-7-1. Separation of explosive substances and articles

<i>Compatibility group</i>	A	B	C	D	E	F	G	H	J	K	L	N	S
A		x	X	x	x	x	x	x	x	x	x	x	X
B	x		X	x	x	x	x	x	x	x	x	x	
C	x	x				x	x	x	x	x	x	x	
D	x	x				x	x	x	x	x	x	x	
E	x	x				x	x	x	x	x	x	x	
F	x	x	X	x	x		x	x	x	x	x	x	
G	x	x	X	x	x	x		x	x	x	x	x	
H	x	x	X	x	x	x	x		x	x	x	x	
J	x	x	X	x	x	x	x	x		x	x	x	
K	x	x	X	x	x	x	x	x	x		x	x	
L	x	x	X	x	x	x	x	x	x	x	1)	x	X
N	x	x	x	x	x	x	x	x	x	x	x		
S	x										x		

1.4 Explosives substances and articles are required to be separated in accordance with Table 7-2 of the Technical Instructions, which is extracted below.

. . . Table 7-2. Separation of explosive substances and articles

<i>Division and compatibility group</i>	1.3C	1.3G	1.4B	1.4C	1.4D	1.4E	1.4G	1.4S
1.3C			x					
1.3G			x					
1.4B	x	x		x	x	x	x	
1.4C			x					
1.4D			x					
1.4E			x					
1.4G			x					
1.4S								

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 into different, non-adjacent loading positions and separated by other cargo with a minimum separation distance of 2 m.

2. PROPOSAL

2.1 “In flight” versus “On ground”

2.1.1 The two tables shown above seem to be relevant in practice to address principally storage and loading on the ground (in a warehouse for instance) and/or before loading on the aircraft. The main concern regarding safety is the applicability of these separation principles in flight, on board an aircraft.

2.1.2 In case of a malfunction of any explosive substance or article carried on board an aircraft during flight, and considering the potentially catastrophic consequence of an explosion on the integrity of the aircraft, when this one is almost or fully loaded with Class 1 shipments, we think that it doesn't really make sense to introduce separation with regards to the danger of transmission of detonation between the different explosive material.

2.2 **Safety and Harmonization**

2.2.1 If the relevancy of the separation of explosive material in flight aboard an aircraft is agreed by States as it is provided by the Table S-7-1 in Part S-7;2.3 of Supplement, the reality for the authorities and air operators is quite different, as this requirement does not provide any common materials.

2.2.2 This could lead to some difficulties, particularly when granting exemptions for forbidden/forbidden Class 1 dangerous goods shipments. As an example, the Authority of the State of departure could approve one method of separation while other Authorities like those of the States of Transit or Destination could request another kind of separation.

2.2.3 To be compliant with all the methods imposed by the different Authorities, an air operator must take into account all the input, and that might not be convenient.

2.2.4 To address this situation, we propose to revise Table S-7-1 by acceptable means of separation. This method has been defined by the French CAA in cooperation with the French competent organization in charge of the classification of explosives (except those dedicated to the forces).

2.2.5 This material is already incorporated in the annex of a guide posted on the French CAA webpage to address exemption process.

3. **ACTION BY THE DGP-WG**

3.1 The DGP-WG is invited to revise Table S-7-1 as shown in the appendix to this working paper.

APPENDIX

**PROPOSED AMENDMENT TO PART S-7 OF THE SUPPLEMENT OF THE TECHNICAL
INSTRUCTIONS**

Part S-7

**STATE'S RESPONSIBILITIES
WITH RESPECT TO OPERATORS**

**(ADDITIONAL INFORMATION
FOR PART 7 OF THE
TECHNICAL INSTRUCTIONS)**

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2.3 SEPARATION OF EXPLOSIVE SUBSTANCES AND ARTICLES

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2.3.6 Table S-7-1 provides guidance for the separation of packages containing explosives with different compatibility groups. An "x" at the intersection of a row and column indicates that explosives of these compatibility groups must be separated. The method of separation (e.g. the minimum distance between incompatible explosives and/or separation of incompatible explosives with other cargo) must be approved by the competent authority, taking into account the danger of transmission of detonation between the different explosives.

Replace Figure S-7-1 with the following new
Figure S-7-1

Table S-7-1. Separation of explosive substances and articles

Compatibility group	A	B	C	D	E	F	G	H	J	K	L	N	S
A		1	1	1	1	1	1	1	1	1	3	1	1
B	1		1	1	1	1	1	1	1	1	3	1	1
C	1	1				2	2	2	2	2	3	2	
D	1	1				2	2	2	2	2	3	2	
E	1	1				2	2	2	2	2	3	2	
F	1	1	2	2	2		2	2	2	2	3	2	
G	1	1	2	2	2	2		2	2	2	3	2	
H	1	1	2	2	2	2	2		2	2	3	2	
J	1	1	2	2	2	2	2	2		2	3	2	
K	1	1	2	2	2	2	2	2	2		3	2	
L	3	3	3	3	3	3	3	3	3	3		3	3
N	1	1	2	2	2	2	2	2	2	2	3		
S	1	1									3		

Figure 1 at the intersection of a row and a column:

If explosive substances and articles of these compatibility groups are loaded into separate unit load devices (containers or pallets with a net), these unit load devices must be separated by other cargo (not containing dangerous goods) with a minimum separation distance of 2 m.

When not loaded in unit load devices (for instance packages or overpacks), these explosives must be loaded into different, non-adjacent loading positions and separated by other cargo (not containing dangerous goods) with a minimum separation distance of 2 m.

Figure 2 at the intersection of a row and a column:

If explosive substances and articles of these compatibility groups are loaded into containers, the containers may be adjacent, assuming that separation is then made by the containers themselves.

When not loaded into containers (for instance packages, overpacks and pallets with a net), these explosives must be separated with a minimum separation distance of 2 m.

Figure 3 at the intersection of a row and a column:

Explosives in Compatibility Group L must not be transported with explosives in other compatibility groups. Furthermore, explosives in Compatibility Group L may only be transported with the same type of explosives within Compatibility Group L.

Cell shaded grey:

No separation required.

Note 1.— Explosive substances and articles must not be loaded in unit load devices with any other dangerous goods.

Note 2.— Explosives must be secured in the containers (stowed and protected).

Note 3.— Explosives of Division 1.1 should be loaded in containers.