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**COMMITTEE OF EXPERTS ON THE TRANSPORT OF
DANGEROUS GOODS AND ON THE GLOBALLY
HARMONIZED SYSTEM OF CLASSIFICATION
AND LABELLING OF CHEMICALS**

Sub-Committee of Experts on the
Transport of Dangerous Goods

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Item 3 of the provisional agenda

LISTING, CLASSIFICATION AND PACKING

Proposal for a review of the UN Test Series 7

Transmitted by the expert from the United Kingdom

Introduction

1. UN Test Series 7 is used to test extremely insensitive detonating substances (EIDS) and articles containing EIDS and is aimed primarily at military explosives. The military community has spent a lot of resources over the past 30 years or so developing less vulnerable High Explosives and munitions containing them as part of the Insensitive Munitions (IM) initiative but there are very few articles that have been classified as Division 1.6.
2. The description of Division 1.6 in 2.1.1.4 is:

"Extremely insensitive articles which do not have a mass explosion hazard.

This division comprises articles which contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

***NOTE:** The risk from articles of Division 1.6 is limited to the explosion of a single article".*

With such an assignment the military can, for example, transport the Division 1.6, Compatibility Group N (articles containing only extremely insensitive detonating substances) explosives under the same exemptions as Division 1.4 explosives in European land transport under the provisions of ADR. This would also considerably assist military storage of the insensitive munitions because of the reduced safety distances needed in storage at depots and magazines.

Insensitive munitions

3. Insensitive munitions (IM) are being excluded from Division 1.6 because they contain explosives that do not meet the criteria for EIDS in that they will not meet all of the requirements of Test Series 7a to 7f. These tests were designed to deal with a certain type of weapon system such as cased bombs and are not applicable to the majority of insensitive munitions now used by the military. The North-Atlantic Treaty Organization (NATO) determines whether an explosive article is an insensitive munition using NATO publication AOP39 which contains Test Series 7 tests or equivalent tests. The United Kingdom, and some other NATO members, has a large missile with many tens of kilos of high explosive which meets all of the IM criteria but the explosives in it will not meet the EIDS criteria. There are other munitions which would also not pass all the Test Series 7 tests but do meet the NATO AOP39 tests.
4. The AOP 39 tests are carried out on the munitions and are listed below:

STANAG 4240 – Fast Heating
STANAG 4241 – Bullet Impact
STANAG 4382 – Slow Heating
STANAG 4396 – Sympathetic Reaction
STANAG 4496 – Fragment Impact

In order to meet the IM criteria, the required response to all the tests (except for Sympathetic Reaction) should be burning only. For Sympathetic Reaction there should be no detonation of the acceptor munition and no reaction worse than explosion.

Test Series 7

5. The main problem with classifying as 1.6 seems to be with Test 7a, the EIDS Cap Test and Test 7b, the EIDS Gap Test. The difficulty with Test 7a is that military munitions contain an explosive train inside them and part of that includes a shock sensitive booster which would not pass the Cap Test but would pass the NATO AOP39 criteria. The issue with Test 7b is the threshold level which is such that nearly all explosives are excluded except for Triaminotrinitrobenzene (TATB). Modern Polymer Bonded Explosive (PBX) materials have been shown to be incapable of detonating without a very strong shock stimulus and modern munition design is capable of ensuring that there is no credible stimulus that can detonate the PBX compositions in a munition. These PBX materials were not available when Test Series 7 was finalised at the UN many years ago.

Proposal

6. The expert from the United Kingdom proposes that there should be a short overview of Test Series 7, in particular tests 7a to 7f, by the Working Group on Explosives on the basis of this paper to determine whether a more comprehensive review is justified. If that is the conclusion, the United Kingdom Ministry of Defence would be willing to host an inter-sessional informal working group to assist in a review of Test Series 7, to ensure that military munitions are assigned to the most appropriate Hazard Division based on the negligible probability of accidental initiation or propagation.
7. It is suggested that there should be:
 - (a) Substance tests to demonstrate low explosiveness and consistency of response; and
 - (b) Article tests to demonstrate the invulnerability of the munition to credible accident stimuli.

One possible scheme could involve:

- 7a: A test to demonstrate low explosiveness of the explosive substances (inability to transition from deflagration to detonation)
 - 7b: A test to determine the reaction of the explosive substances to an external fire when the material is confined
 - 7c: A test to determine the reaction of the (confined) explosive substances to an environment in which the temperature is gradually increases
 - 7d: Article external fire test
 - 7e: Article slow heating test
 - 7f: Article fragment impact test
 - 7g: Article Stack Test.
8. The expert from the United Kingdom welcomes the views of other experts on this issue.
