

IMEMG aims for harmonisation in IM Assessments

IMEMG
Expert Working Group on IM Policies

- 1. IMEMG EXPERT WORKING GROUP
“IM Policies”**
- 2. THE GOALS FOR THE IM TEST STANDARDS**
- 3. TEST STANAGs COMPARATIVE ANALYSIS**
- 4. CONCLUSIONS / SUGGESTIONS**

1. EXPERT WORKING GROUP ON IM POLICIES

- CREATION

- 25th November 2003

- MEMBERSHIP

- representatives from 11 member companies

- AWE
 - BAE SYSTEMS
 - Eurenco France
 - Giat Industries
 - MBDA.F
 - MBDA.UK

- Protac
 - Rheinmetall
 - Roxel France
 - Snecma SPS
 - TDA

- TERMS OF REFERENCE

- To review and compare the IM policies of the OCCAR nations and that of USA, paying special attention to munition assessment procedures.
- To undertake a technical analysis of the testing procedures, practices and assessment methodologies adopted by each country.
- To propose ways in which national requirements can be harmonised.

2. Goals for the IM Test Standards

STANAG 4439 - AOP 39

NATIONAL POLICIES

**Object &
Configuration (THA)**

Tests

Tests set-up

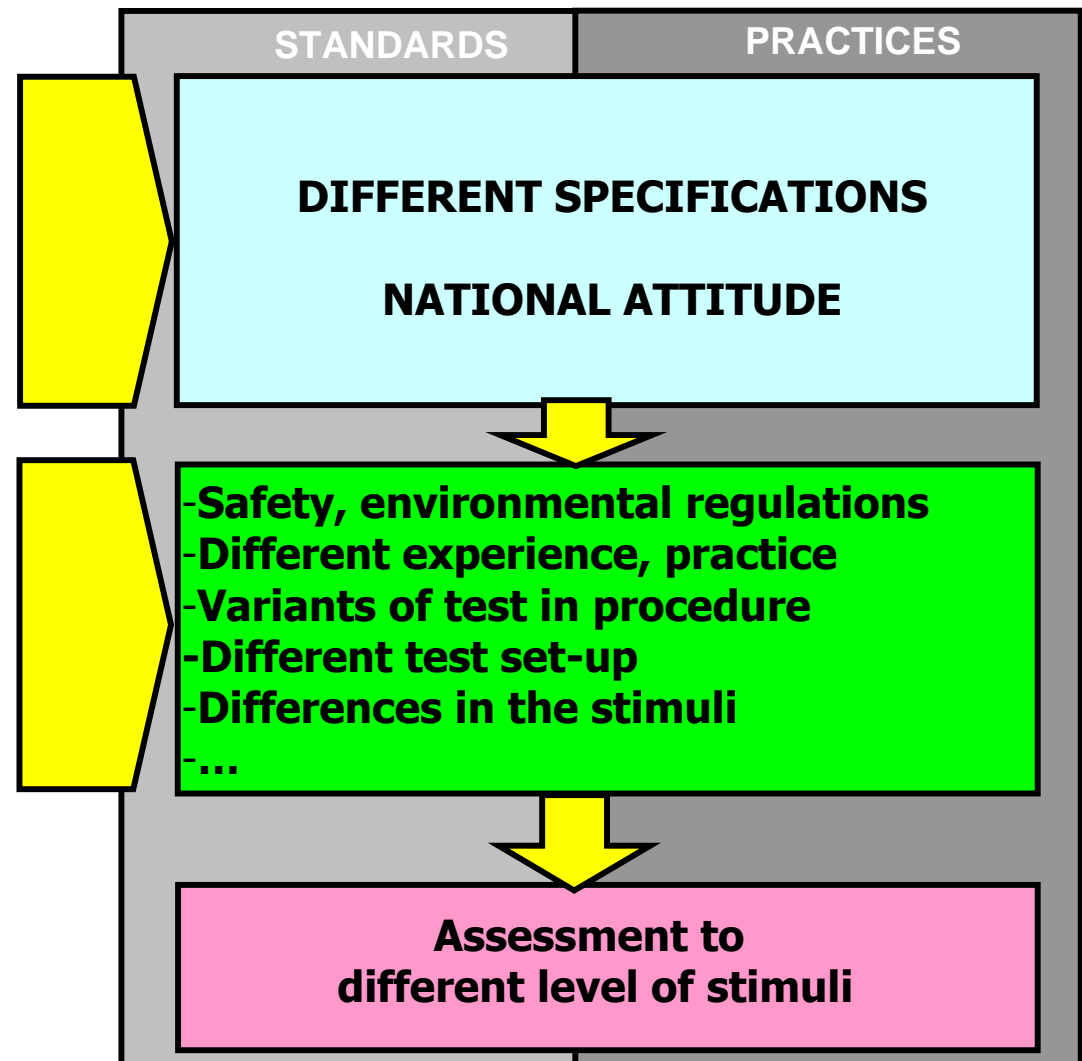
Instrumentation

Stimuli

Results

Classification (I,...,V)

IM ASSESSMENT LOGIC



Situation of the IM test STANAGS

- HARMONISATION IS ONGOING
 - Real progress in harmonisation.
 - New editions of STANAGs and AOP.
- BUT
 - Non uniform approach to the assessment of a munition for a stimuli.
 - Assessment methodology of munitions not fully shared between agencies or nations.
 - Need to repeat assessment, testing to a stimuli.

Comparison of the different national practices for STANAG's relative to 4439

OCCAR Nations

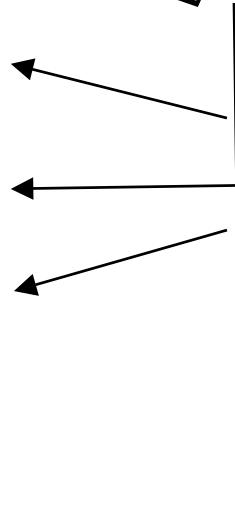


United Kingdom

GERMANY

FRANCE

...USA



STANAG 4439 / AOP 39

Fuel Fire

Slow heating

Bullet impact

Fragment impact

Sympathetic reaction

Shaped Charge Impact



*How to
Sing together ?*

3. STANAG IM Tests Comparative Analysis

- Fuel Fire
- Slow heating
- Bullet Impact
- Fragment Impact
- Sympathetic Reaction
- Shaped Charge Impact

FUEL FIRE; STANAG 4240 Ed 2

INTERPRETATION:

- Arrangement not enough accurately described
- Acceptance criteria of the test not defined.

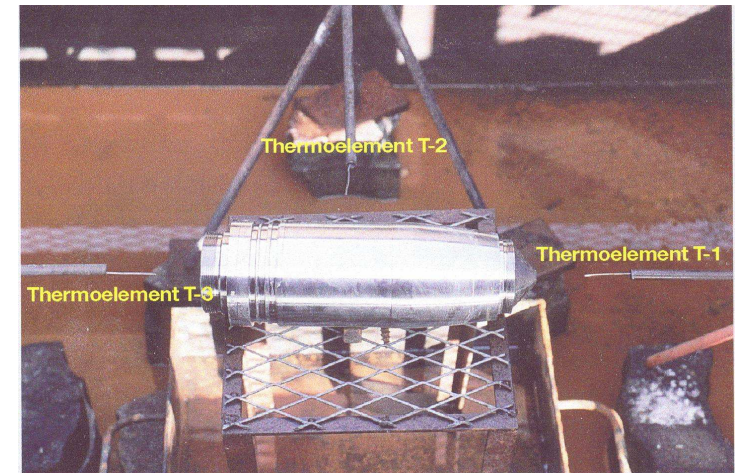
NATIONAL APPROACHES and PRACTICES:

- **UK:** Mini fuel fire sometimes taken – 6 thermocouples normally used
- **GERMANY:** Mini fuel fire sometimes taken – 4 thermocouples normally used
- **FRANCE:** Mini fuel fire not used by the French Authorities – the minimum number of thermocouples seems not enough

REMARKS:

- To avoid misinterpretation the test arrangement should be described precisely in the test report

EXAMPLE OF FUEL FIRE TESTS



SLOW HEATING TEST - STANAG 4382 ed 2

INTERPRETATION:

- Wide range of gradient heating (3,3°C/h to 25°C/h)
- Various test set ups and possible thermal gradients in the oven

NATIONAL APPROACHES and PRACTICES:

- **UK :** more often in absence of THA ; 3,3°C/h is used
number and position of thermocouples can vary
- **GERMANY:** generally 3,3°C/h used depending on the ammunition
air exchange is illustrated with a diffuser. Blast gauges not always possible
- **FRANCE:** invariably 3,3°C/h – it is considered that a thermal gradient in the oven
can modify the level of reaction; various thermal exchanges.

BULLET IMPACT; STANAG 4241 Ed 2

INTERPRETATION:

- The allowed range of temperature could introduce misunderstanding in the result.
- Two tests are required, one aiming at the largest explosive component, the other aimed at the most shock sensitive explosive component (excluding the booster).
What is meant by booster in this case?

NATIONAL APPROACHES and PRACTICES:

- **UK:** 0.5" AP Ammunition used. Usually lack of THA; so procedure 1 is normally followed
All trials carried out by Land Systems involve single shot.
- **GERMANY:** 0,5" AP Ammunition with 2 weapons (because of the rate of fire and precision of impact)
Problem: bullet's velocity and circle of target area are critical .
- **FRANCE:** Procedure 1 with single shots are mainly used. For procedure 2, the velocity of the bullet is determined as the worst case.

REMARKS: The two procedures are so different that they could lead to two separate STANAGs.

FRAGMENT IMPACT; STANAG 4496 ratification

INTERPRETATION: Ambiguity in the procedure and the chosen aimed points

NATIONAL APPROACHES and PRACTICES:

- **UK :**Projectile velocity given in Procedure 1 (high velocity) has only recently been achieved. A new trials gun has been manufactured.
STANAG doesn't state that tests should be carried out on separate munitions. UK use separate munitions.
- **GERMANY:** As define, the generation of fragment high velocity is expensive and they are not a threat for cannon ammunition.
- **FRANCE:** use a light impact fragment with a simultaneous burst of 3 cubes up to 2000m/s and has a lot experience in the 250g steel sphere up to 2500m/s

REMARKS: The change of the STANAG for using a spherical fragment will give a higher repeatability of the stimulus

SYMPATHETIC DETONATION; STANAG 4396 Ed 2

INTERPRETATION: As the STANAG 4396 does not request a precise description of the test arrangement, the interpretation of the result can be very ambiguous.

NATIONAL APPROACHES and PRACTICES:

- **UK :** Munitions usually initiated by L2A1 detonator onto booster pellet.
- **GERMANY:** Test configuration like in storage. It depends on type of munition and their requirements.
- **FRANCE:** The worst configuration in terms of safety (French regulation) A single test is performed.

REMARKS: The requirement regarding the external confinement is very vague. Type of ignition is not a realistic threat; Ignition i.e. during shape charge attack is more realistic.

SHAPED CHARGE IMPACT; STANAG 4526 Ed 1

INTERPRETATION: The stimulus is not very well defined, if you do not use “rockeye” warhead. The test procedures are not enough specified.

NATIONAL APPROACHES and PRACTICES:

- **UK :** Land Systems have used IBL 755 (50mm) rounds but are now moving to M42 (MLRS bomblet; approx 34mm). THA not always available.
- **GERMANY:** Bomblet DM 1383 is used; if necessary with shielding. Shell in configuration with booster/fuze.
- **FRANCE:** France performs the test with a 62 or a 80mm shaped charge without shields.

REMARKS: The main part of the text is very ambiguous, with conflicting recommendations.

When including the SR-Test, the initiation of the munition is more realistic than in the STANAG 4396 (see SR)

SHAPED CHARGE IMPACT; STANAG 4526 Ed 1

6 propellant charge in Container, Bomblet DM



155 mm Bomblet DM 1383



4 - CONCLUSIONS and SUGGESTIONS

- ➔ The maximisation of benefits to be gained from IM is an international concern which requires common means of interpretation
 - Up to now all the STANAGs referenced into the STANAG 4439 are not precise enough to ensure a common assessment without interpretation.
- ➔ IMEMG suggestions are :
 - To define for every test what are the critical parameters open to interpretation
 - To specify the boundary conditions for test/stimuli parameters in relation to acceptance criteria
 - To describe the test arrangement precisely in the test report to avoid misinterpretation of results
 - To harmonise UN classification and IM testing by choosing a single test, for example the more severe one
- ➔ To facilitate full interoperability, AC 326 and working groups partners (MSIAC) are requested to harmonise IM test STANAG/AOP in line with IMEMG contributions.

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