



## Harmonization and Improvements to Fast Heating Test Procedures

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IMEMG is the European Organisation that brings together the twenty-two leading armament manufacturing groups working with IM technologies. It aims to express the viewpoint of the armament industry with regards to relevant transnational regulations and requirements.

Many modern munitions are designed to be insensitive to outside influences and external aggressions. In order to classify munitions as insensitive, positive results to standard tests that simulate the effect of varied external environments must be accomplished. One such test is the NATO standard Fast Heating (FH) test to simulate munitions behaviour, when submitted to a liquid fuel fire. The FH test as described in STANAG 4240 (edition 2) requires the test munitions to be engulfed in a jet fuel fire. Due to the environmental impact of burning jet fuel and the high cost of performing such a standard test, attempts have been made to replace jet fuel with an alternative method of heating the munitions, in representative conditions. The next standard for Fast Heating testing will include the possibility to perform alternative aggressions provided that they are proved to be representative of fuel fires.

As part of IMEMG, the FCO EWG was mandated to make proposals to harmonize Fast Heating test procedures and evaluate alternative fire risks and opportunities.

In anticipation of the FH standard evolution, experimentation with very different alternative test setups has been conducted throughout the world over the last few years. A comparative review of existing facilities has been undertaken by the IMEMG FCO group based on available scientific publications and internal research work carried out by IMEMG companies : WTD91 (Germany), NSWC (US), NAWCDWD (US), BTC (Sweden), TNO (Netherlands), AIRBUS SAFRAN LAUNCHERS (France), NEXTER (France), DIEHL BGT (Germany), Hirtenberger DS (Austria), etc.

Promising results are shown both in terms of temperatures and heat fluxes levels. In addition extensive comparative live munition trials have also been initiated in the US. On the other hand the diversity of the alternative setups raises the question of the equivalence with standard liquid fuel fires.

Techniques for calibrating alternative fire tests have also been examined. The analysis of the outputs obtained from existing fire heat flux meters found in the literature shows that the generic term “heat flux” may be misleading as different kinds of heat fluxes may be measured : incident radiative heat flux, total absorbed heat flux, incoming convective heat flux, total net heat flux (plus directional or global aspects). It is concluded that harmonized apparatus is necessary to obtain comparable measurements in fire.

The acceptance criteria for new alternative FH fire test facilities are key elements of the future NATO FH test standard. These acceptance criteria shall guarantee the consistency of IM test results across all test methods.