

- Need for the change
- Overview of new test approaches
 - Specific approaches in following presentations
- Overview of changes to the Standards
- Path Forward

Recognition that FCO Test requires update

Environmental and Economic pressures already changing procedures



- Recognition that these changes will affect other standards, HC and qualifications



i.e.

STANAG 4297 (AOP-15)

STANAG 4123 (AASTP-3)

STANAG 4439 (AOP-39)

UN Tests 6c and 7g

**Fuel Fire Experts (FFE)
Work group formed**

Fuel Fire Experts Meetings

Formulate a draft specification that includes guidelines for test procedures & appropriate calibration methods to be used for FCO testing that uses an allowable alternate fuel such as propane

“Where environmental concerns dictate, alternate fuel such as propane, or natural gas may be used if testing verifies that the overall test item heating rate, uniformity of spatial heating to the test item and type of radiation heat transfer duplicate those of the hydrocarbon fuel fire.”



(AOP-39 edition 3,
Annex H)



External Fire, Fast Heating test

- The purpose of the workshops is to discuss alternative means to perform the Fuel Fire testing in a more environmental friendly and cost effective way.
 - Growing international interest and participation over the course of 3 meetings
 - Expert measurements on pool fires and alternate fire tests

- Current STANAG has two test procedures
 - Standard “Pool” fire
 - Mini Fuel Fire Test
- Approach is to add an Alternate procedure
 - General enough to allow multiple approaches
 - Specific on the important parameters
 - ◆ Accepted and reasonable minimums
 - ◆ Calibrated
 - ◆ Verified

- The agreement of nations recorded in STANAG 4240.
- The test procedures will be within the Allied Ordnance Publication (AOP)
 - Working title: AOP-xx, External Fire – Munition Test Procedures.
 - The agreement of nations to use the AOP is recorded in STANAG 4240

Fire Testing Results

Testing has verified that the uniformity of spatial heating for both gas and hydrocarbon fuel pool fires can be acceptable

Gas and liquid fuel fires can produce comparable absolute temperatures and heat flux

Testing and modeling has shown that the radiative and convective components of both fuel types are not equivalent, but...

The total heating of the test item can be equivalent when the correct test setup is used

- Hearth must be large enough for test item +
 - Account for wind and variability
- Calibration of the hearth design required
 - Heat Flux
 - Uniform temperature distribution

Once calibrated, measurement of heat flux
not required unless changes made

- Current Standard Test Temperature
 - 550°C within 30 seconds after ignition
 - An average flame temperature of at least 800°C
- Proposed Alternate Test Temperature
 - 550°C within 30 seconds after ignition
 - An average flame temperature of at least 800°C
- Proposed Alternate Test; Flux Calibration
 - *Minimum peak / average of 100 kW/m² for one minute after a temperature of 550°C is achieved*

- Pool fire

- *Suitable*: Liquid hydrocarbon fuels are: JP-4, JP-5, Jet A-1, AVCAT (NATO F-34 or F-44), commercial kerosene (Class C2 / NATO F-58)
- Propose allowance of other fuels if heat flux measurements demonstrate acceptable values
 - ◆ Commercial Diesel (Class C2 / NATO F-58)
- Currently 4 Thermocouples in horizontal plane
 - ◆ Data recorded at every 5 seconds or better (0.2 Hz)
- Propose 6 Thermocouples at every second (1Hz)
 - ◆ The two additional 40 – 60 mm above and below item

- Wind is a significant variable
 - Temperature and Flux
 - Consistent engulfment of test items
 - To both Standard and Alternate test procedures
- Wind Screens improve the situation
 - Should determine affect on fragment mapping & video
- STANAG restricts test environment wind speed to below 10 Km/hr
 - Measured inside wind barriers – if used

Is this adequate? Should it be lower?



- AOP and STANAG drafts planned to be released for review this fall
- Comparison trials continuing and proposed
- Final FFE (IV) Sep 2014 Sweden





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QUESTIONS



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