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Cost-efficient test methods in the insensitive munitions (IM) program

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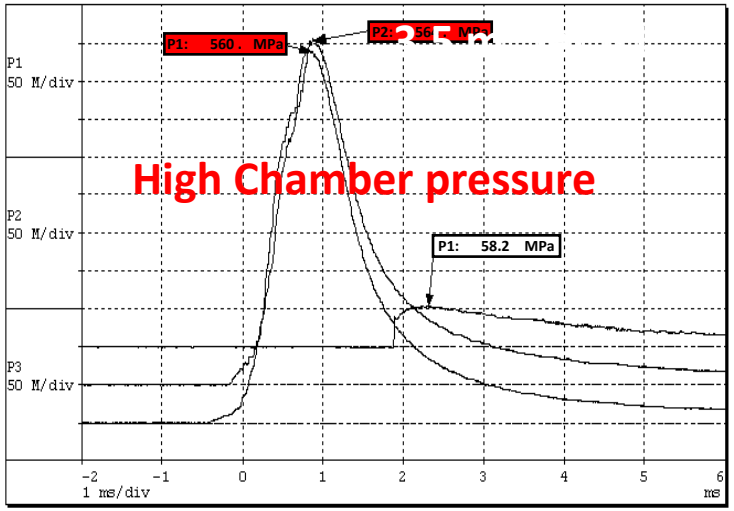
Introduction

Increased demand (from industry and regulatory bodies alike) for more cost-efficient and more environment-friendly testing.

- Fast cook-off (FCO) test. - High fuel costs
  - High time rate
  - Environmental impact
- Fragment impact (FI) test - Equipment wear



Fast cook-off with liquid propane gas (LPG)

- Fuel cost reductions
- Shorter run times

} 30 – 40% lower costs in single tests.

- Good flexibility (up to 4 tests a day).
- Improved evaluation of the tested object's reaction sequence (high speed video).
- Less testing to evaluate design solutions
- Environmental friendly

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- Ignition of the system is remote and uses electric sparks.
- Matched to the set temperature requirements detailed in STANAG 4240.
- The equipment is best suited for testing small, complete weapon systems or subsystems from large configurations.

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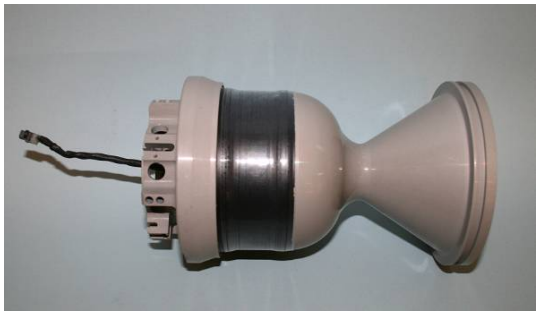
Verifying the LPG system

During the development phase the equipment was verified by comparative testing using three IM qualified products:

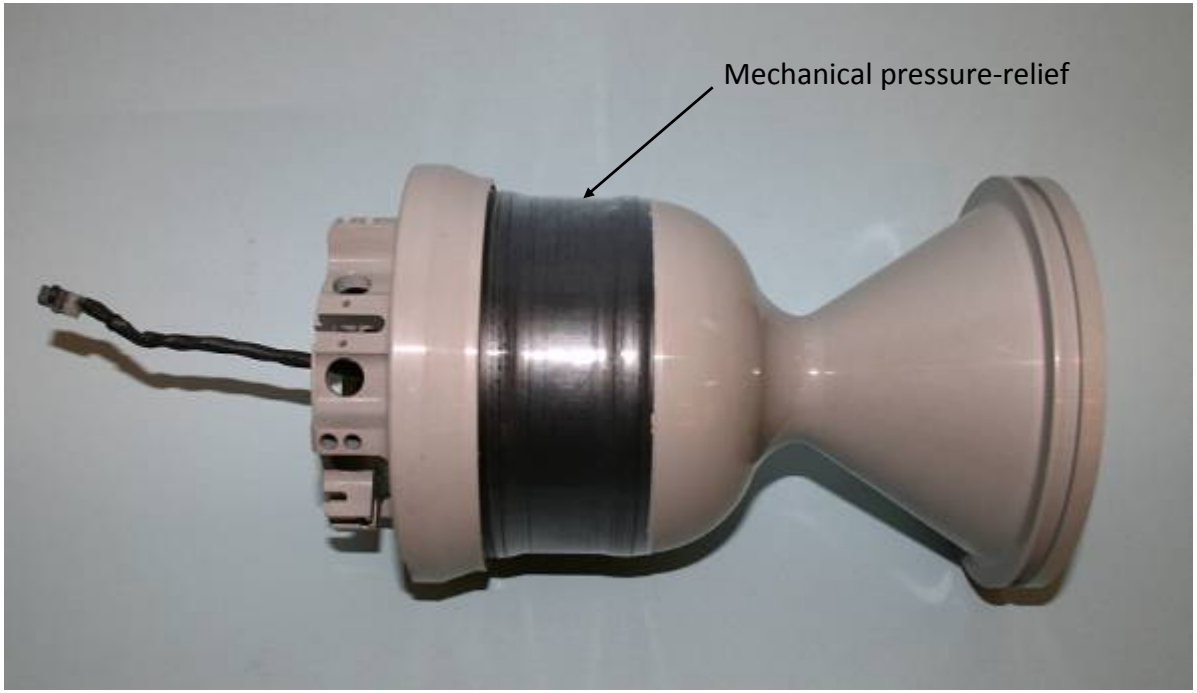
1. 40 mm, L70 LK cartridge case assembly.


2. Launch Rocket on the New Light Antitank Weapon (NLAW) system.
3. Flight motor – NLAW system.


NLAW launch rocket test

- Mechanical pressure-relief IM solution.
- The design generates a reaction that is classified as a Type IV, deflagration under NATO AOP-39 using Jet A1.



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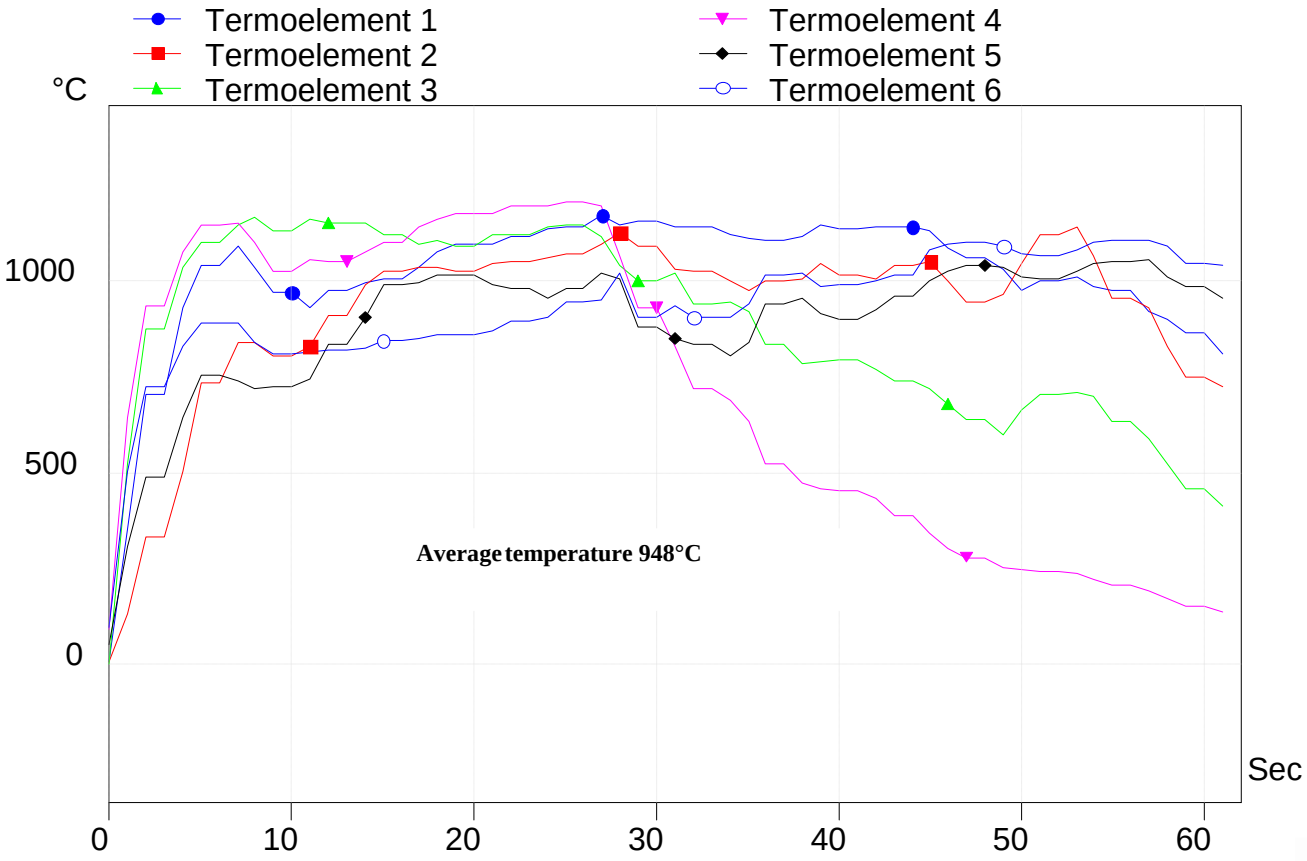
Temperature registration

- From the start of the fire sequence to the temperature at the object reaching 550°C satisfied the 30-second requirement.
- Temperature was calibrated to the desired value (> 800°C).



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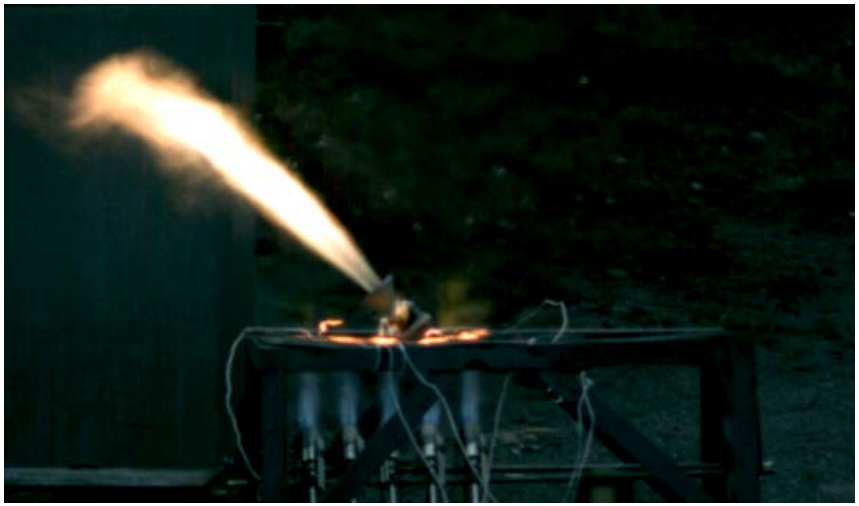
Results after performing test

- Pieces were recovered > 15m from the point of reaction.
- The recorded sound pressure was at the same level within the limit value of < 5kPa at 5m
- The radiation intensity was not registrable 15 m from the object.
- After the reaction, no damage to the witness plates was observable.



LPG Test of launch motor for the NLAW system reaction no.1

LPG Test of launch motor for the NLAW system reaction no.2

- The object split into < 3 pieces.
- Recovered pieces bore witness to the balanced functioning of the mechanical pressure-relief IM solution.

Remaining parts of the Launch motor after FCO test with Jet fuel.

Remaining parts of Launch motor after FCO test with LPG.

High velocity Fragment Impact (HFI) test equipment

- Demand for fragment impact (FI) testing is growing ever more rapidly.
- Higher fragment speed (2,530±90 m/s) according to STANAG 4496 is requested.

- Increased lifetime
- Standard components used

} Cost reduction

Gun system

- Two smooth-bored, 40 mm, L/70 barrels.
- vacuum system in the barrel to increase velocity.

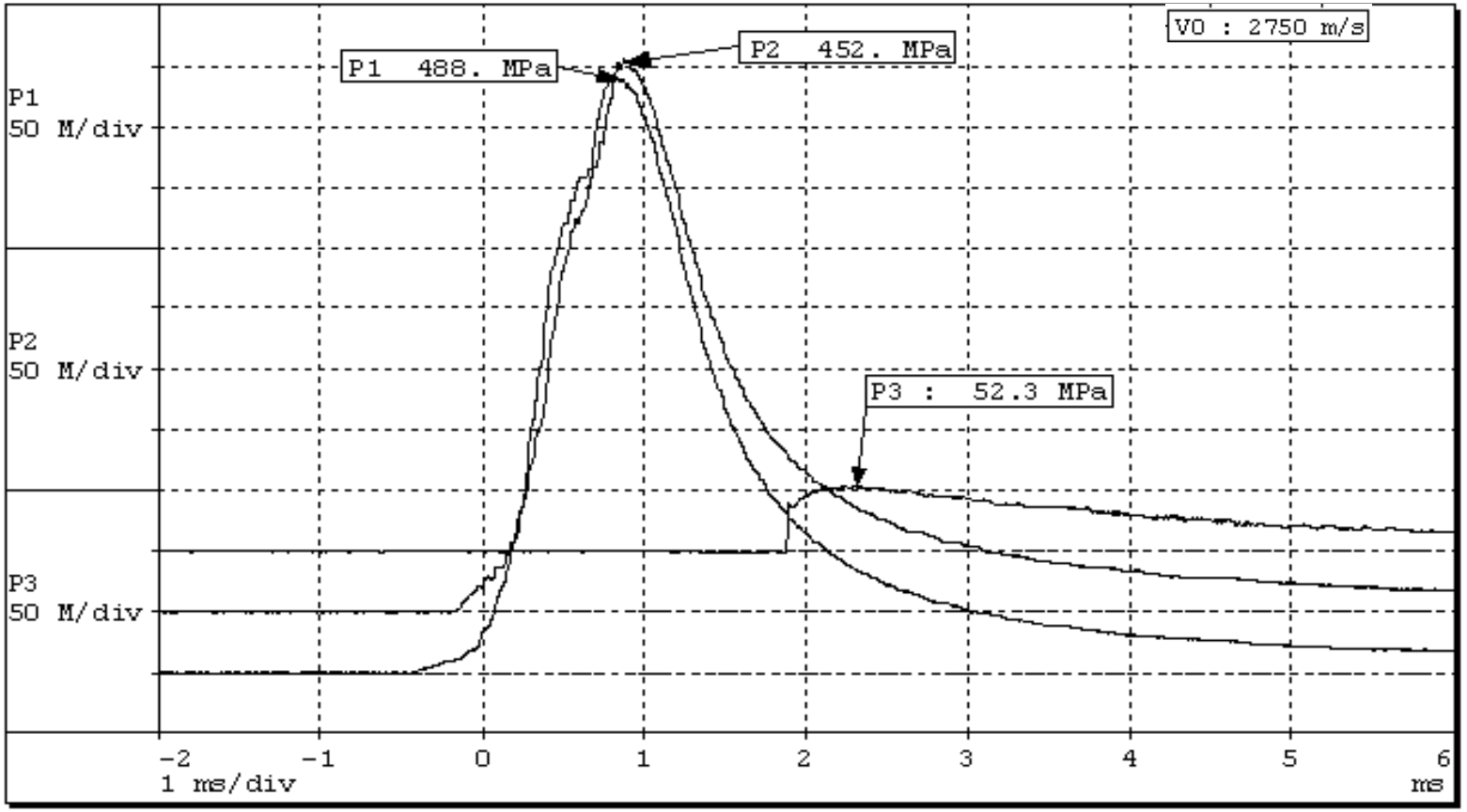
Ammunition

- Ammunition is based on standard components for the 40 mm, L/70 system.
- The fragment is mounted in a sabot divided in to two pieces made of Plexiglas.
- The fragment used is a 14.3mm diameter steel rod with a 160° conical nose according to STANAG 4496.

Plexiglas sabot with standard fragment

Complete FI ammunition assembly

- God muzzle velocities > 2700m/s.
- The fragment's stability and muzzle velocity give a practical firing distance of > 15 m.
- Minimal wear of both the chamber position and the barrel



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Conclusions

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Questions

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