

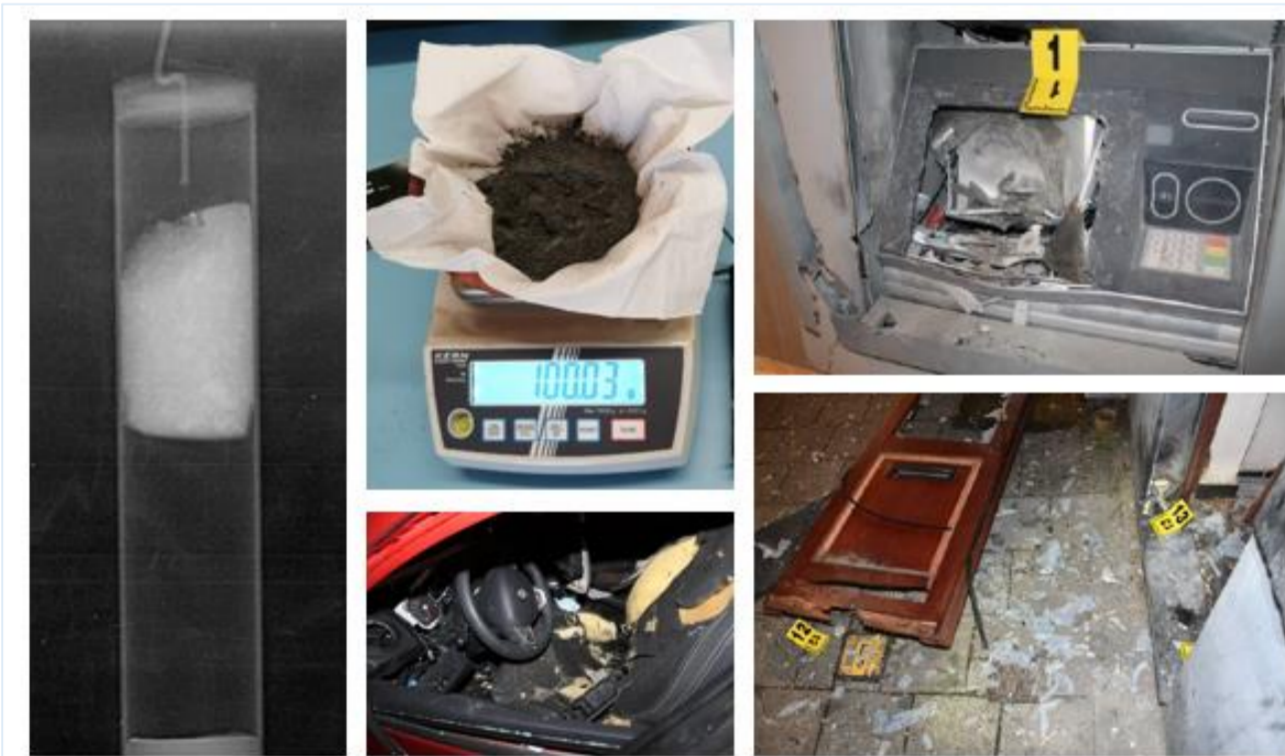


Home Made Explosives (HME)

How to understand the threats and model the risk ?

1. Context

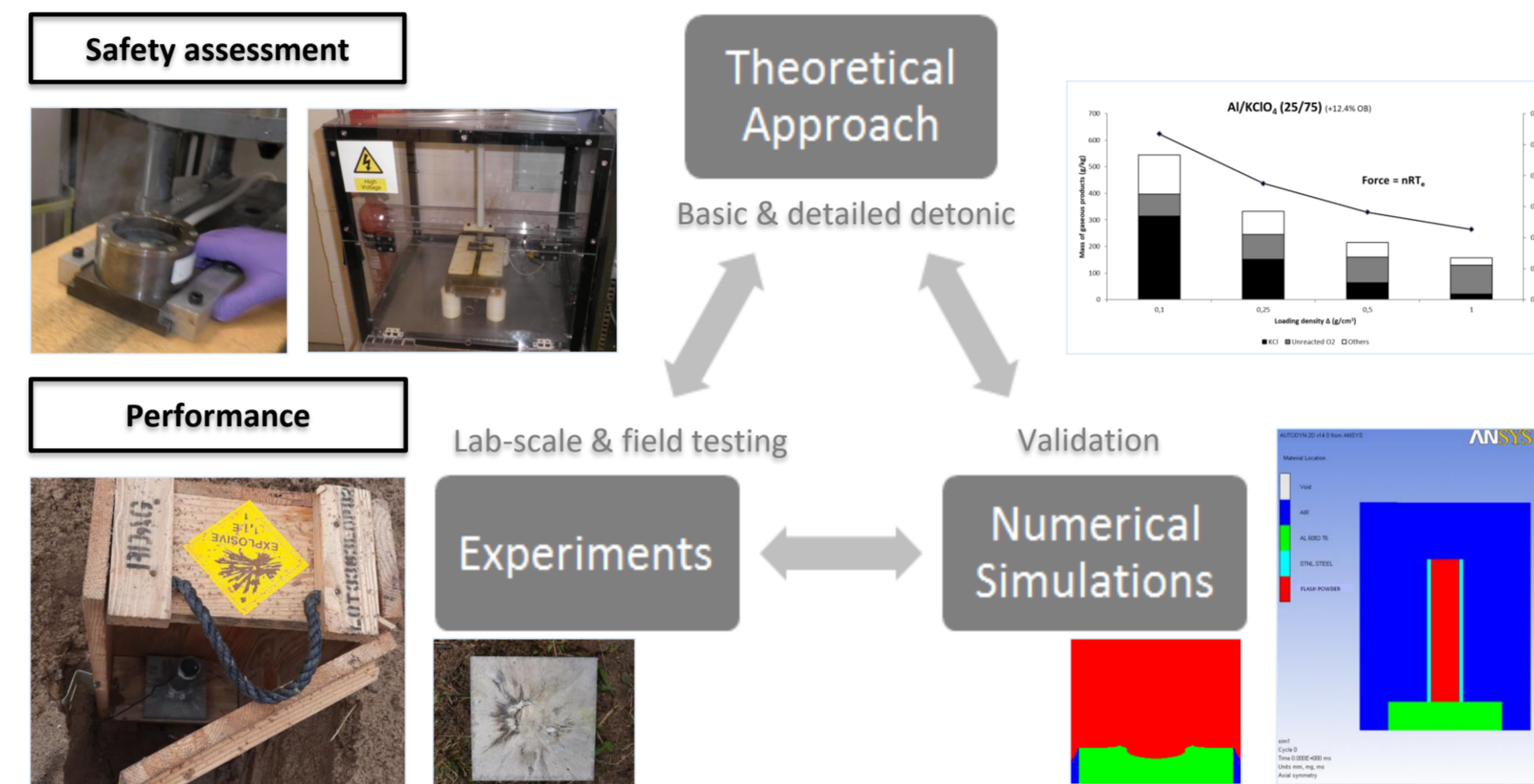
- HME = major public security concern, requiring specific risk assessments for first responders
- Current threat worldwide:
 - ☑ Peroxide explosives synthesis; (study ongoing)
 - ☐ **Mixing of highly energetic pyrotechnics**
- 2nd investigated HME composition: **Flash Powder (FP)**
 - Despite regulations on fireworks and ingredients
 - Non regular use of pyro's : lacking research data



2. Challenges and objectives

- HME vs Explosive performance and safety standards
 - ➔ Extend the knowledge ➔ **understand the threat**
- HME vs standard (ideal) detonation theory
 - ➔ Predict the effects ➔ **model the risk**

3. General approach

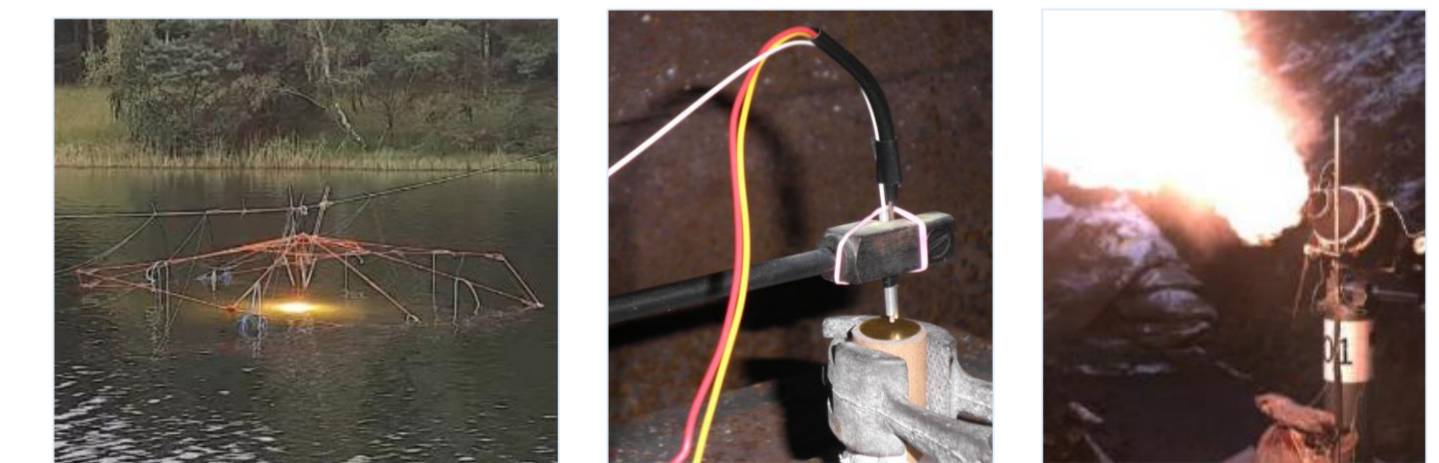


4. Preliminary results

- Safety assessment
 - SS sensitivity testing (impact, friction, ESD)
 - Thermal characterization (DSC, Tol)
- Performance
 - Explo5 predictions
 - Preliminary underwater and free-field firings
- Preliminary testings highlight that FP is fairly easy to initiate (squib) and exhibits a high sensitiveness to ESD. Without additional high explosive boosting material, no detonation was observed, even under heavy confinement, but rather a violent deflagration, with typical fragmentation pattern.

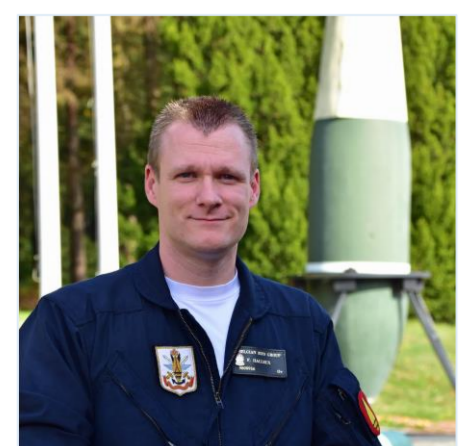
5. What's next

- Detailed characterization (and numerical validation) of FP energetic output: detonability and detonation parameters (VoD, Pdet, brisance), fragmentation (Gurney), power (gas), external thermal effects.
 - Passive optical probes (Optimex)
 - Photon Doppler Velocimetry (PDV)
 - Underwater shock energy (shock pressure) & gas energy (bubble period)
 - Closed Vessel Test (CVT)
 - Heat flux measurement
- FP "TNT equivalence" and "detonation" – discussion
- FP as a "pipe bomb filler" – risk assessment



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The author's battalion, the SEDEE-DOVO, is acknowledged for the support for the experimental campaigns. The Federal Public Service Economy is also acknowledged for the provision of 50kg confiscated flash powder based illegal fireworks.



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