Technology for a Changing World

Saab Group Presentation

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Tandem Warhead

A Challenge for Fuze Design

History

Evolution of the multi-purpose, disposable weapon system

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Carl-Gustaf

Archive footage of the early development of the recoilless anti-tank rifle

Carl-Gustaf

- **Weight 8.5 kg**
- **Length 1065 mm**
- **Range 400-700m**

- **Ammunition**
  - HE (High Explosive)
  - HEAT (High Expl. Anti-Tank)
  - HEDP (High Expl. Dual Purpose)
  - illumination, smoke, etc

Also known as “Charlie G” or “the Goose”

AT4

- **Weight 6,7 kg**
- **Length 1016 mm**
- **Range 300m**
- **CS (Confined Space)**

- **Ammunition**
  - HEAT (High Expl. Anti-Tank)
  - HP (High Penetration)
  - Tandem Multi-target projectile

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Tandem Warhead Multi-Purpose Projectile

An Overview

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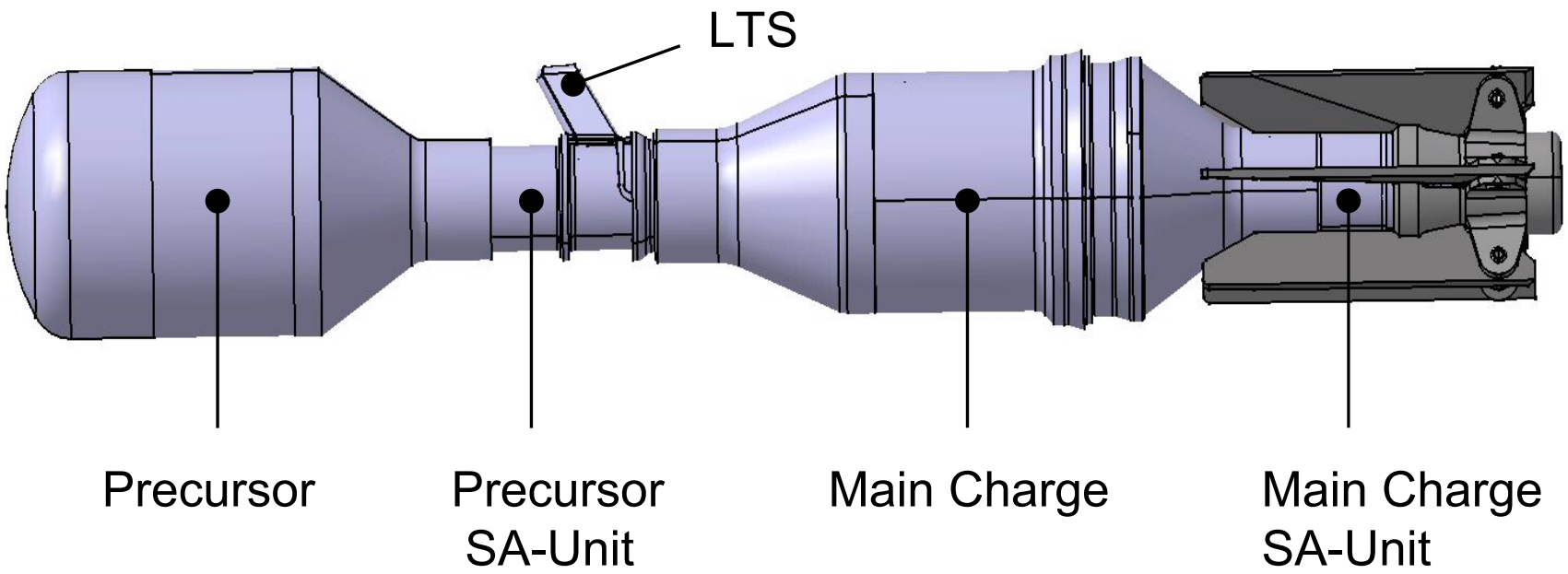
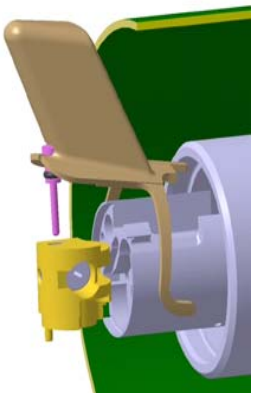
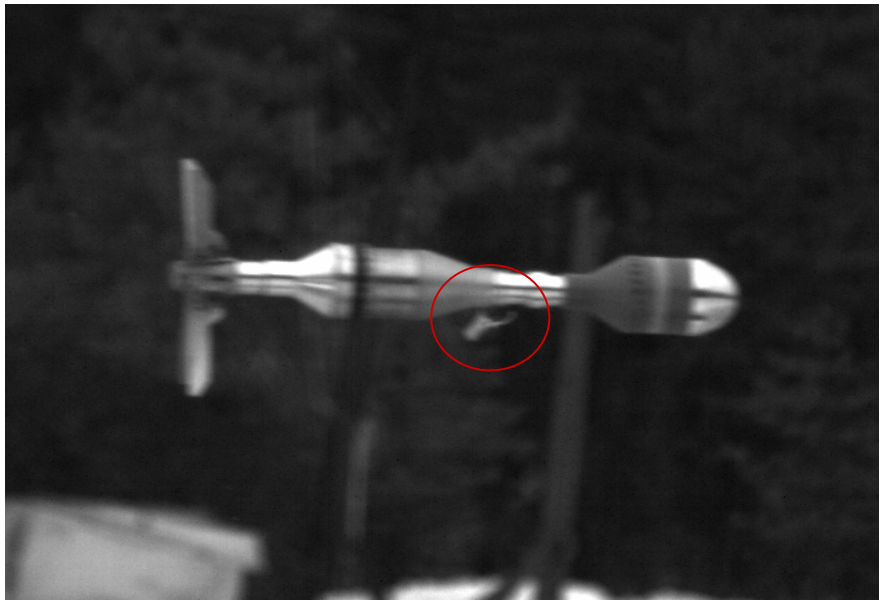
Tandem projectile overview

- Two charges means two separate fuzes.
- Possible arming conditions include launch acceleration, Launch Tube Sensor, Inner ballistic pressure, rocket motor acceleration (if available).
- The mechanical structure of the projectile is part of the fuze system



Launch Tube Sensor





Acceleration forces the Launch Tube Sensor to come off and extract the locking pin from the interrupter

High speed footage of projectile approx. 2m from the muzzle. The Launch Tube Sensor can be seen falling off.

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Multi Target Capabilities

A shaped-charge precursor and an EB warhead combined with two selectable firing modes (blast mode and breach mode), allows the system to be used on wide range of targets.

Buildings
Breach mode

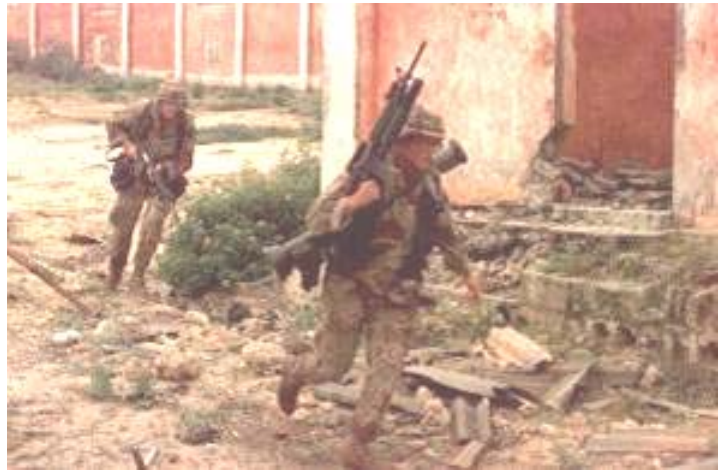
Buildings
Blast mode

Bunkers and
Fortifications

Light Armoured
Vehicles

Adapted for Urban Combat

- Short and low weight
- Short arming distance (15 m)
- Fire From Enclosure



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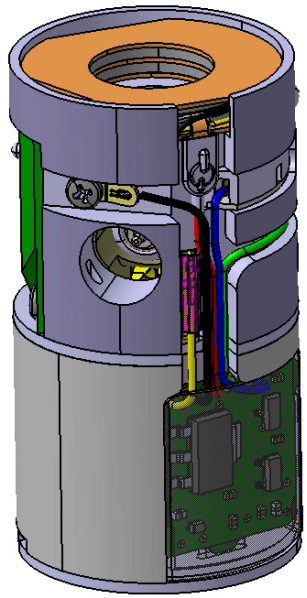
Challenges

Requirements and Demands on Fuze Design



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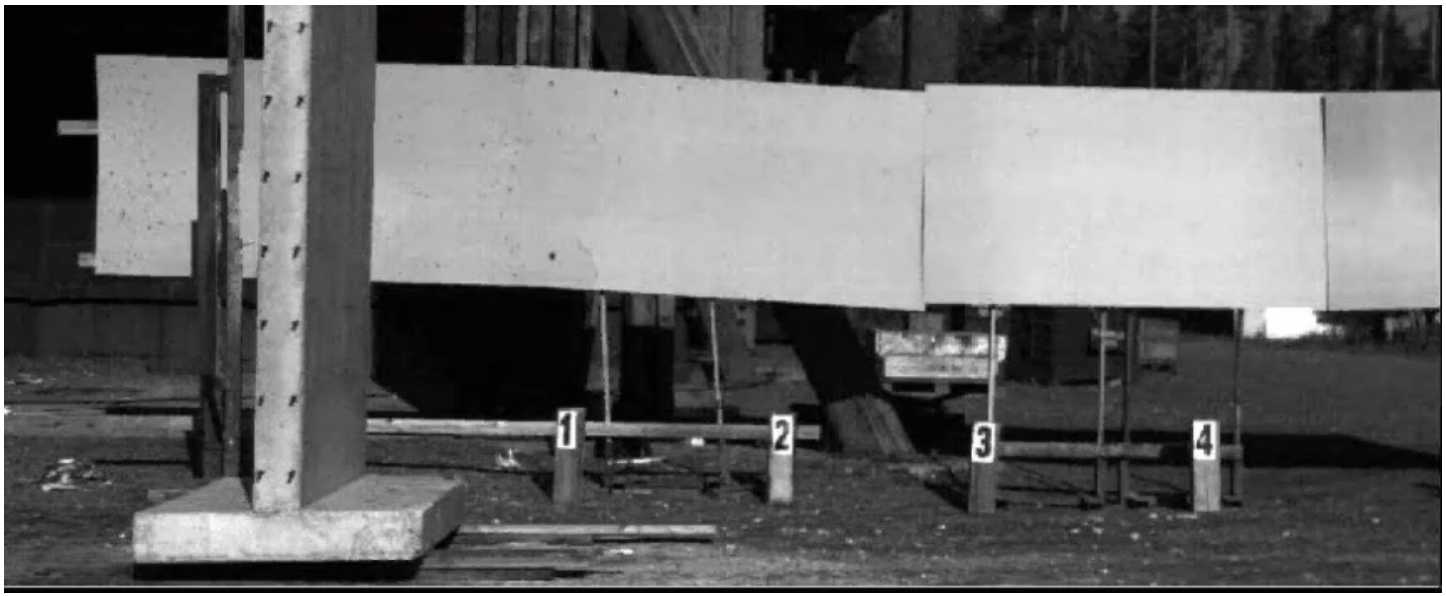
Firing Trail: Live Precursor and Dummy Main Charge



Target: Reinforced Concrete wall

TM30-78, ”Interim Standards for the Construction of Military Operations in Built-up Areas (MOBA) Structures for Weapons Effects Tests”, 1978.

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The dummy warhead has sustained severe damaged due to the impact with the steel reinforcements in the target *(left and middle images)*.

Note the missing fin-assembly and nose-cone, compared to a projectile that passed cleanly through the wall *(right image)*. The fuze must endure the damage and remain operational after the wall breach.

Stresses associated with a wall breach (precursor charge detonation combined with target impact) can reach more then 75 000 g.

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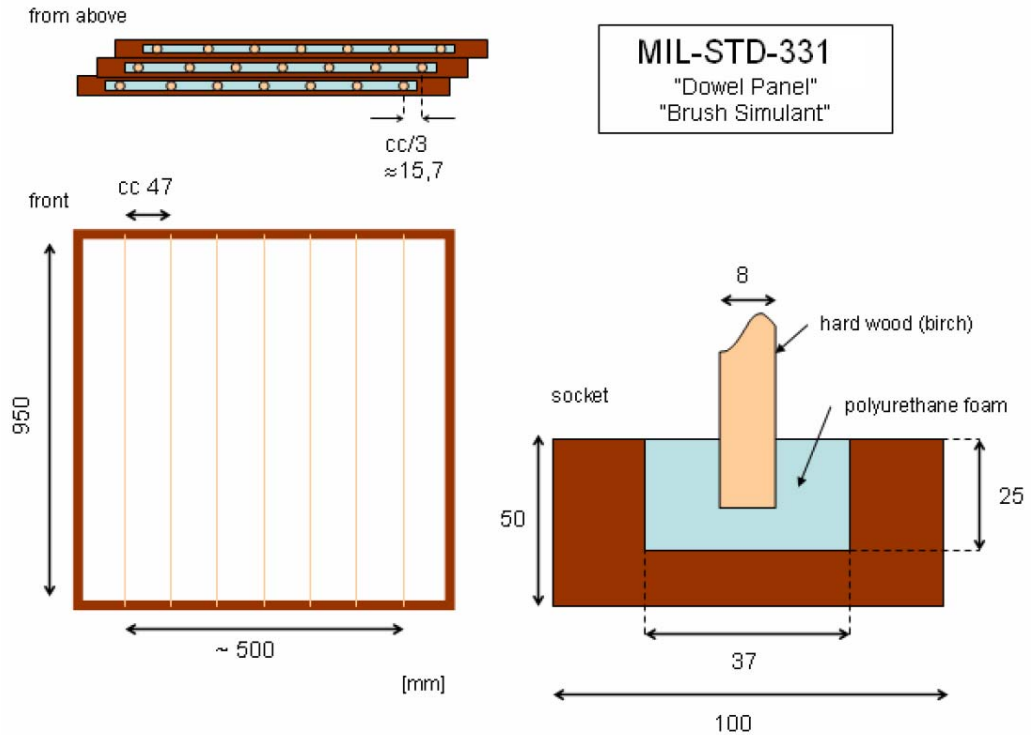
Conflicts with applied Standards

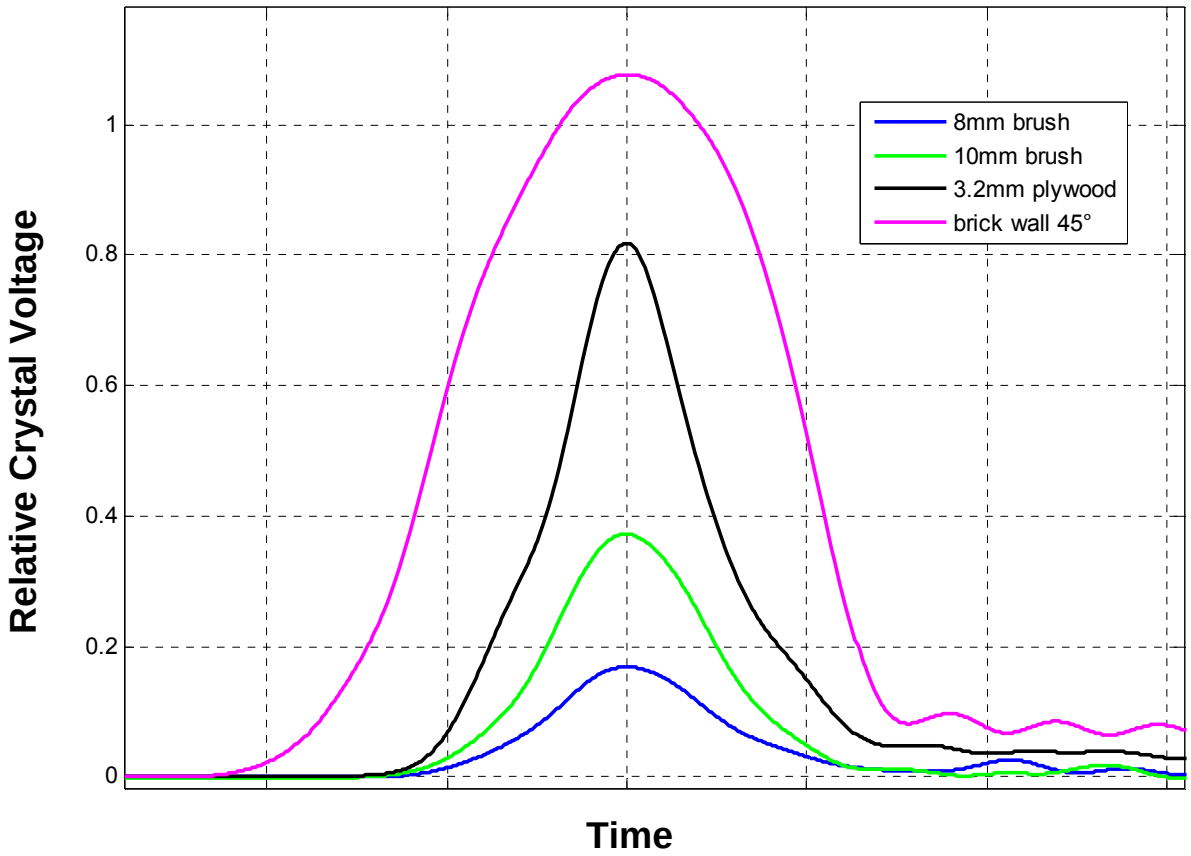
An example: MIL-STD-331, Brush Impact No-Fire Test

- According to standards, brushwood sensitivity should be tested against 5/16 inch hardwood targets.
- For practical reasons actual tests are often done against 1/8 inch plywood.



Brushwood Sensitivity

Telemetric measurements of an actual projectile fired at different targets.
The signal level of the piezoelectric initiation system is shown.



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The Result: a reliable and effective support weapon

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Conclusion

- Hard targets means more durable designs
- Computerised design and modelling is now days far ahead MIL-STD req.
- Analysis say more than testing
- Testing is expensive, must be more effective and focused
- Are the standards in line with the users requirements?

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Summary

- **Are the standards keeping up?**

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