



IM Multi Effect Warhead Concept for Brimstone 3

IMEMTS 2019

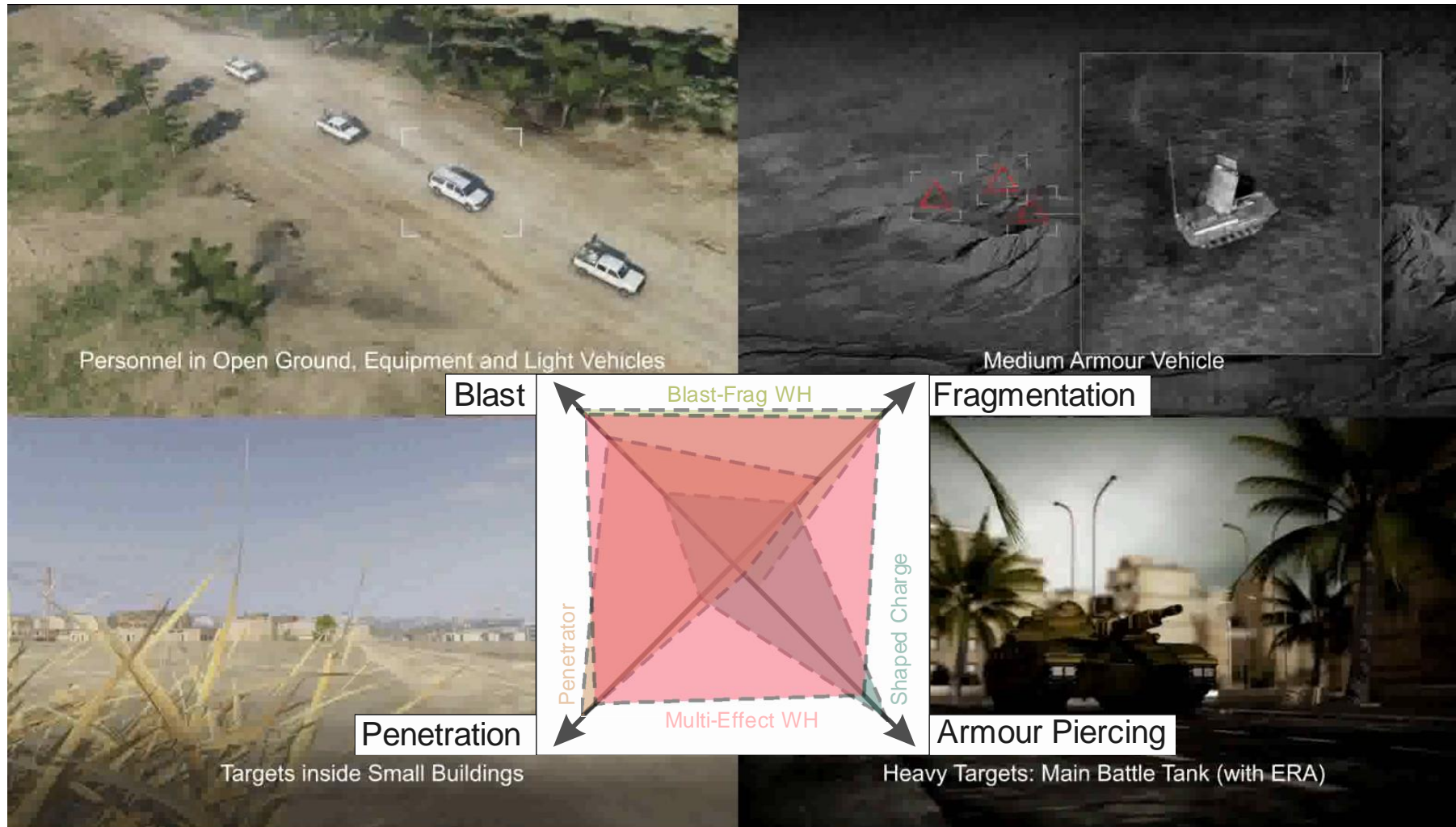
Dr.-Ing. Reiner Gleichmar



- Multi Effect Warhead (MEW) – design to defeat ...
- Multi Effect → Multiple Modes
- Multiple Modes → Multiple Aspects / Challenges
- Typical IM Requirements / manageable and challenging Aspects for MEW
- Fragment Impact
- Slow Cook-Off and IM Venting
- Conclusion



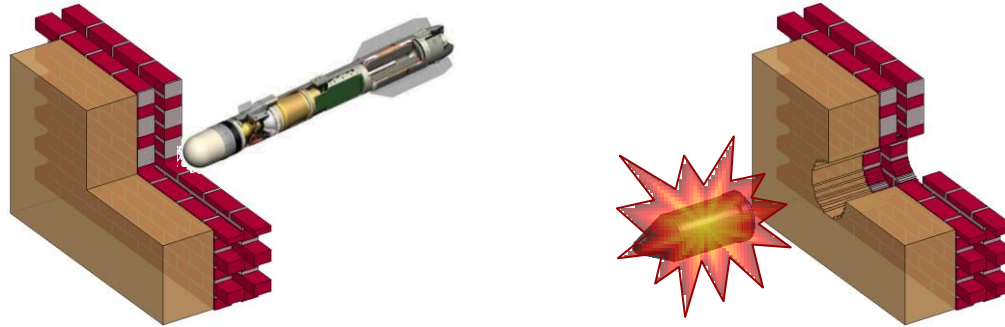
Multi-Effect Warhead – design to defeat





Multi Effect → Multiple Modes

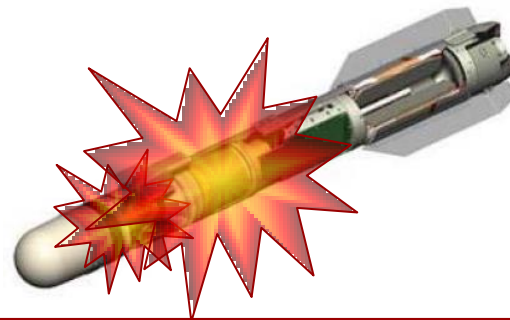
Emplacement
Mode



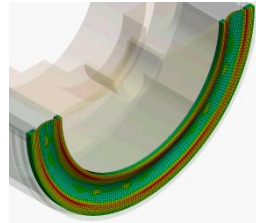
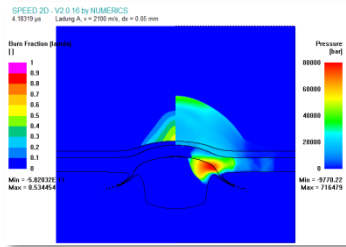
Anti-Tank
Tandem SC Mode



Blast and
Fragmentation
Mode

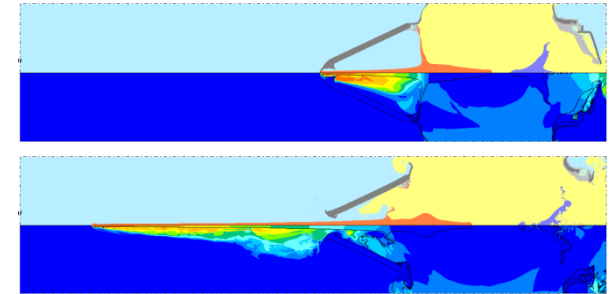
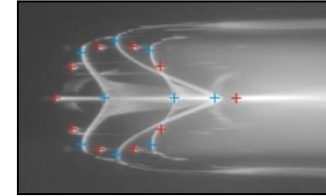
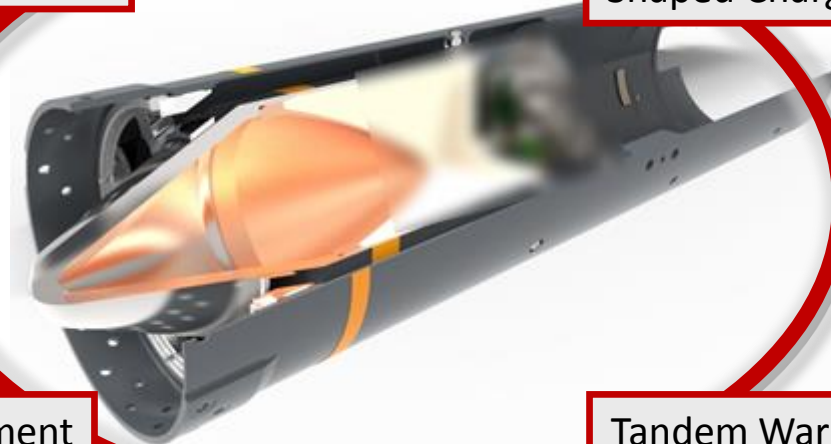


Multi-Effects → Multiple Modes → Multiple Aspects / Challenges



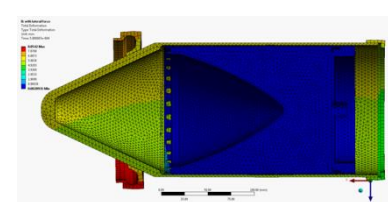
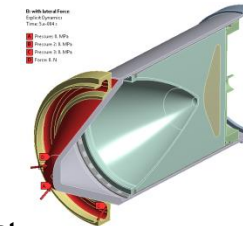
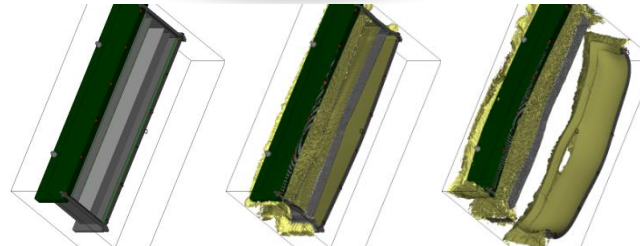
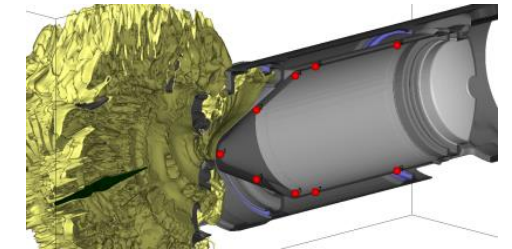
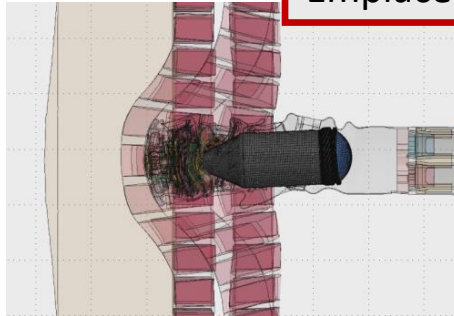
IM Compliance

MEW
Shaped Charge



Emplacement

Tandem Warhead

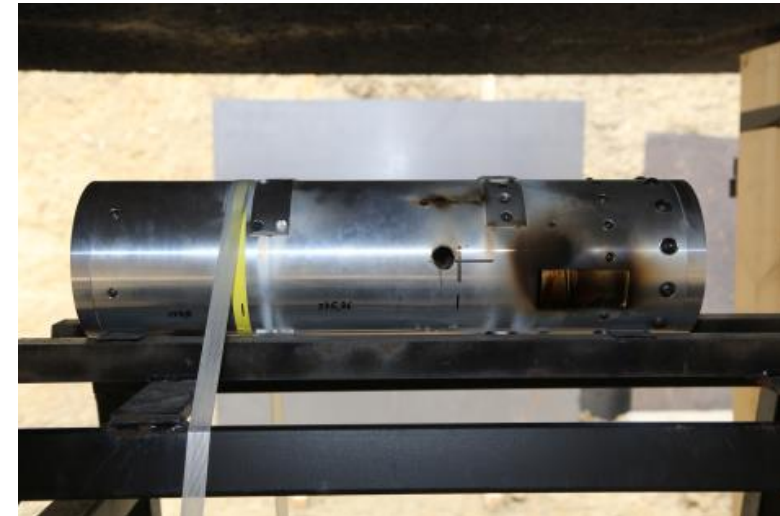
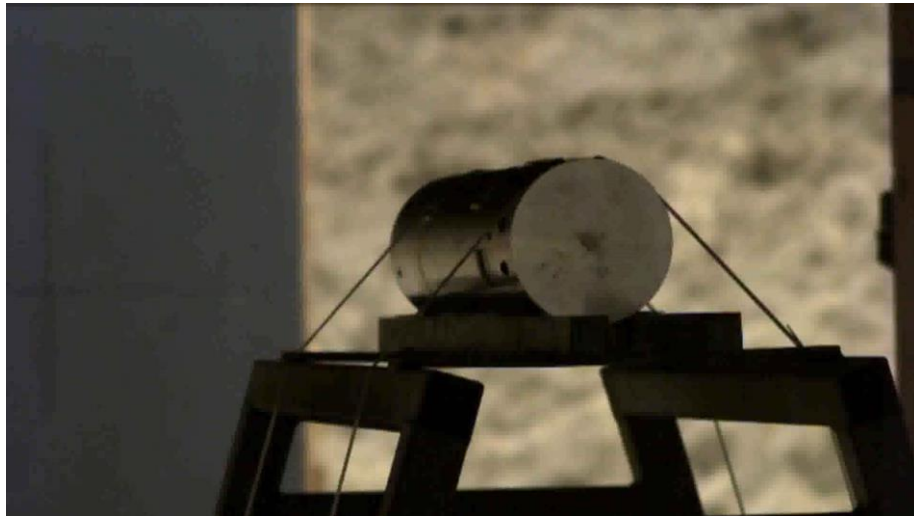
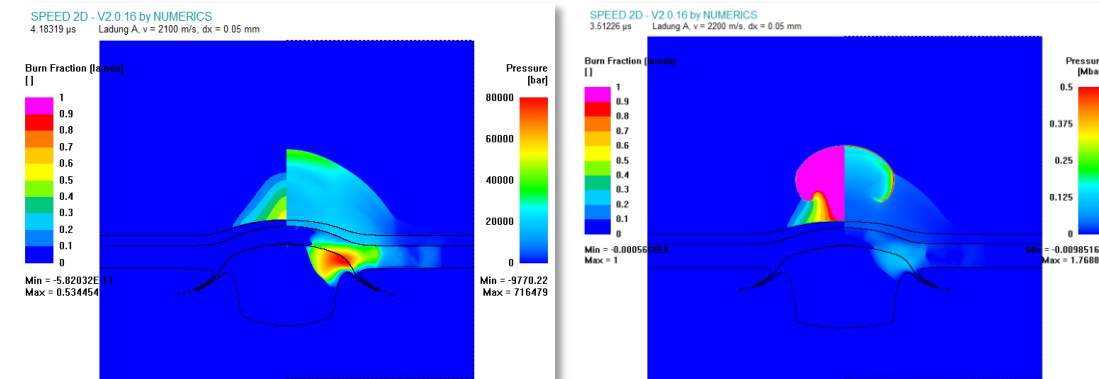




- Defined IM threats and required response level according to STANAG 4439

Threat	Full Scale Test Procedure in accordance with	Desirable: No response more severe than
Magazine/store fire or aircraft/vehicle fuel fire (Fast Cook-Off - FCO)	STANAG 4240	Type V (Burning)
Fire in an adjacent magazine, store or vehicle (Slow Cook-Off - SCO)	STANAG 4382	Type V (Burning)
Small arms attack (Bullet Impact - BI)	STANAG 4241	Type V (Burning)
Fragmenting munition attack (Fragment Impact - FI)	STANAG 4496	Type V (Burning)
Reaction propagation in magazine, store, air-craft or vehicle (Sympathetic Reaction - SR)	STANAG 4396	Type IV (Deflagration)

- SPEED simulations with History Variable Reactive Burn (HVRB) initiation model
- HE parameters calibrated through gap tests, critical diameter and corner turning tests
- Full scale testing on MEW (Penetrator SC)

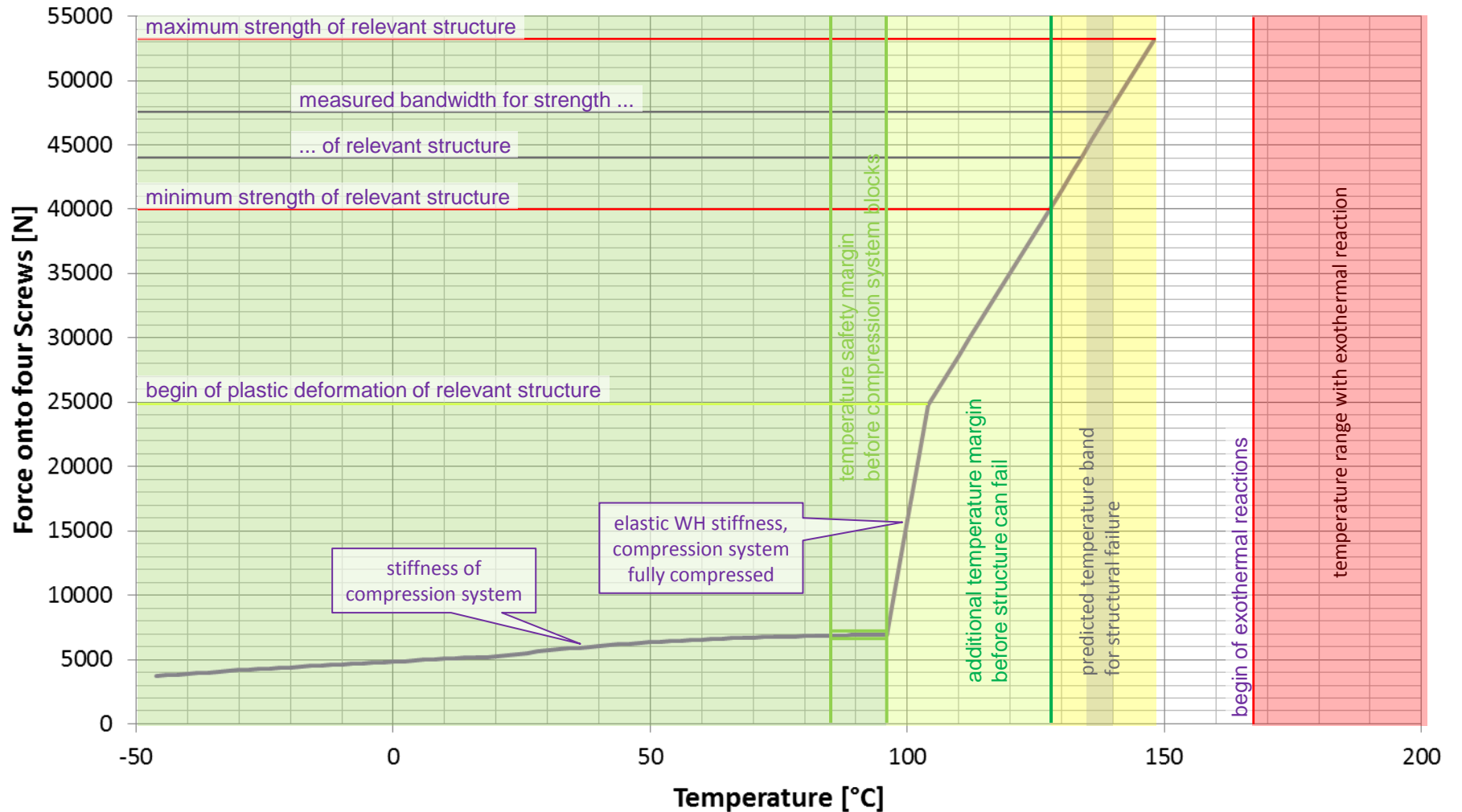


Type V

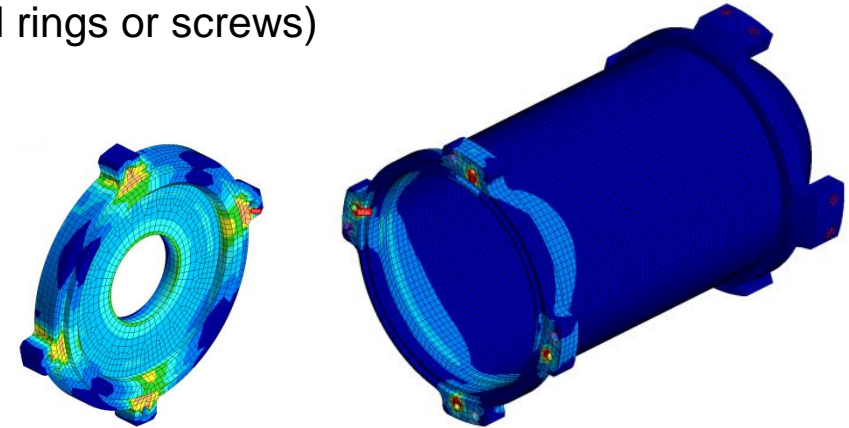
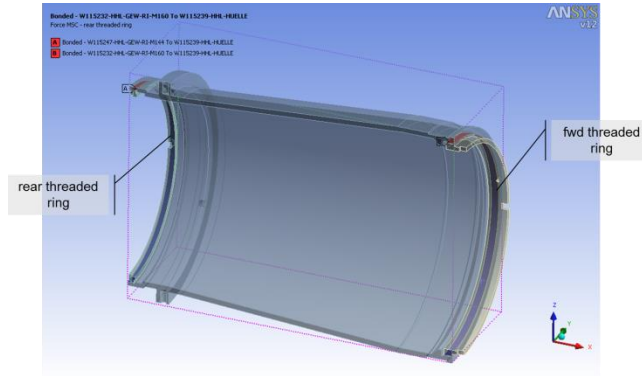
FI test with KS33 (2014)



IM Venting by utilising Compression System with Design to fail



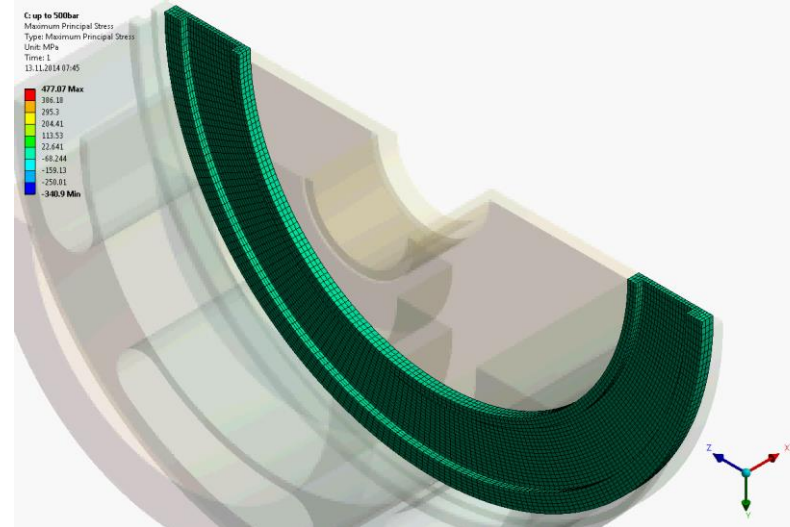
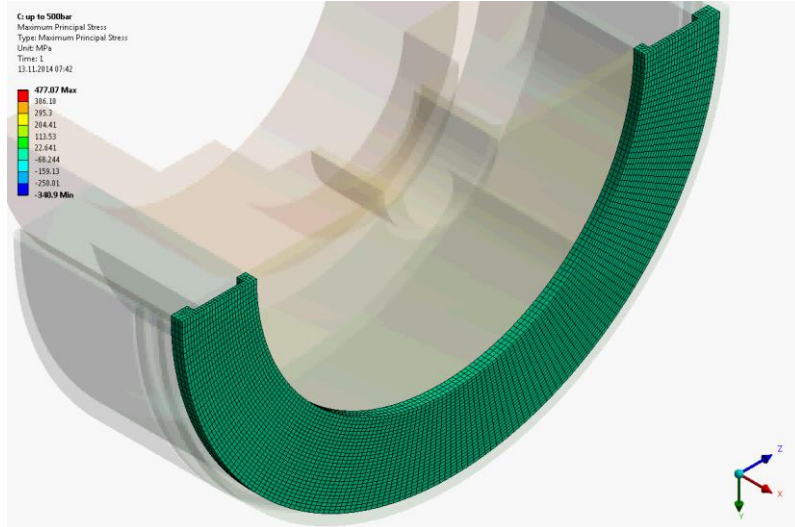
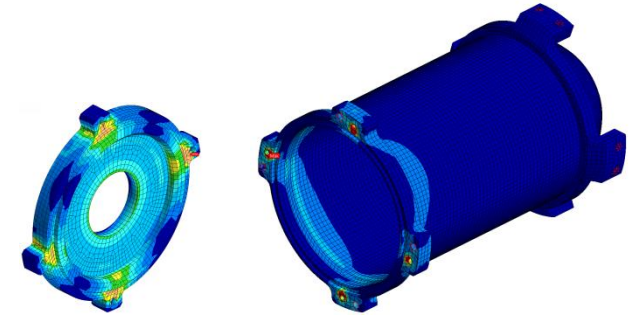
- For warheads with light casing structures (e.g. Brimstone 2 MWC, ...) easier to design mitigation measures (e.g. threaded rings or screws)



- IM Venting can become very challenging for warheads with strong casings, like MEW Penetrator



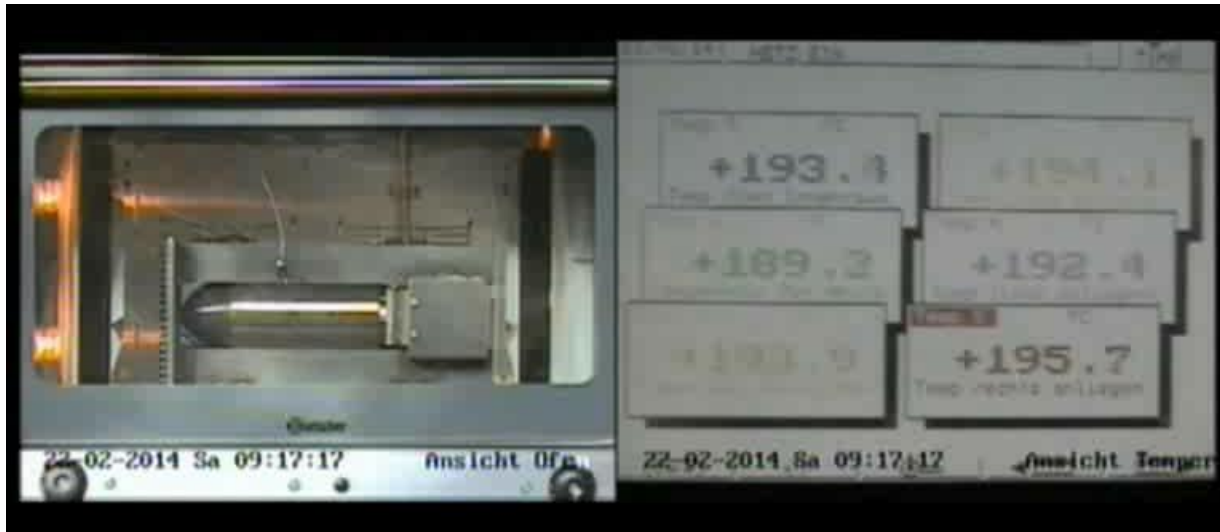
- Two approaches based on compression system
 - mitigating elements, designed to fail (screws, thread rings, ...)
 - if push out not possible:
membrane (venting path)
- FE simulations with ANSYS
- Full scale tests



SCO test with KS32:
Type V (2013)



SCO of MEW Penetrator Charge additionally confined by very strong surrounding structure



SCO test with KS33 (2014)

Type V

- Innovative high-end solution ...
 - optimised liner
 - wave shaper material
 - shock decoupling and
 - optimised tandem charge interaction
- ... for a broad range of targets (real multi-effect)
- convincing lethal effects
 - infrastructure emplacement mode
 - tandem shaped charge vs. MBT
 - blast and fragmentation
- and IM compliance ...

... make ...





*Flexible solutions for an uncertain, but secure future –
Reliable. Customer-oriented. Creating value.*



Christian Euba, Christian Schäfers



Keith Edgson

TDW Gesellschaft für verteidigungstechnische Wirksysteme mbH

Dr.-Ing. Reiner Gleichmar

Technical Advisor System Simulation
Future Systems and System Simulation
D-86523 Schrobenhausen
Germany

+49 8252 996247

reiner.gleichmar@mbda-systems.de

Dr.-Ing. Markus Graswald

Head of
Future Systems and System Simulation
D-86523 Schrobenhausen
Germany

+49 8252 997264

markus.graswald@mbda-systems.de