

VEHICLE MINE & IED PROTECTION



TNO innovation
for life

Designers, producers, and users of vehicles in operations where mines or Improvised Explosive Devices (IEDs) pose a threat, increasingly realise that apart from integrity of the vehicle after detonation of the mine or IED, personnel safety is crucial. We offer you the whole range of capabilities, from experiments to tools and methodologies, to analyse vehicle occupant safety and vehicle integrity for these threats.

BALANCED APPROACH

To solve your problems related to the safety of the occupants, a balanced mix of trials and modelling may be used. We offer you contract research and consultancy:

- Instrumented full-scale trials.
- Component testing.
- Modelling and simulation of occupant safety.
- Design of structures to limit the effects of mines.
- Crash dummy measurements.

TOOLS

Several tools are at your disposal for analysis of the blast effects on personnel. One powerful code is MADYMO, originally developed by TNO for the analysis of occupant safety during car crashes. Instrumented Hybrid III 50%-tile male crash dummies are available to accurately measure the loads in the human body in full-scale experiments. For lateral loads the

ES2 50% tile male side-impact dummy is used. The results of these dummy measurements can be checked with requirements in order to obtain a prediction of the probability of injury. Also, the measurements serve as a validation for the MADYMO output data.



Structural deformation in old truck cabin after a road side IED blast test.

EXAMPLE PROJECTS

- Evaluation and enhancement of the Leopard 2 mine protection capabilities.
- Crash dummy measurements in mine qualification tests with the CV9035 Infantry Fighting Vehicle.
- IED tests with the MB G-wagon and DAF YA 4442 truck.
- Crash dummy response measurements for road side blast IEDs in the ballistic protected SCANIA logistic truck and DAF tractor.
- Investigation of road side and under belly IED effects to M113 and YPR-765 armoured vehicles.
- Definition of requirements on the mine and IED protection capabilities in several vehicle programs and in NATO working groups.

STANDARDS

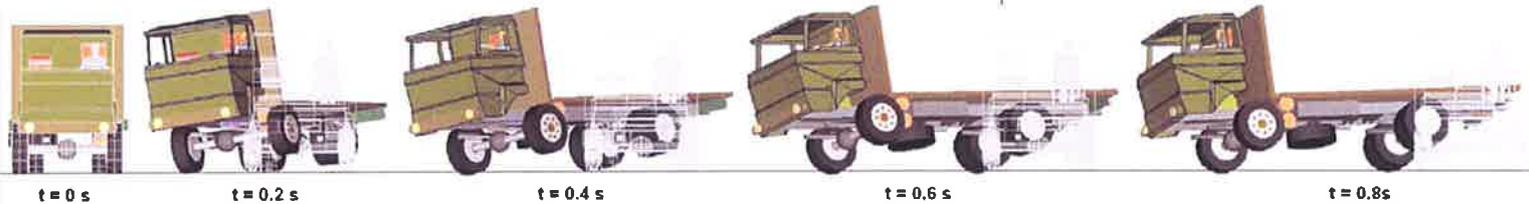
Within the NATO, standards on protection levels of military vehicles are under development. TNO takes part in working groups to define standards for the test procedures and the pass/fail criteria. TNO has the lead in the definition of the injury criteria and the tolerance levels for the test procedures. TNO has the capabilities to evaluate the mine and IED protection levels of a vehicle according to the latest standards.

ADVANTAGE

A continuous effort is put into research on injury criteria, model improvements, the use of the human body model in MADYMO and on the improvement of crash dummy measurements. Doing business with TNO allows you to get the full answer to any question related to vehicle protection in relation to occupant safety and vehicle integrity.



Test with a crash dummy in a truck.



MADYMO simulation of a logistic vehicle for road side IED explosion.



MADYMO Human Body Model.



Moving HYBRID III model.

TNO.NL

TNO

TNO is an independent innovation organisation that connects people and knowledge in order to create the innovations that sustainably boost the competitiveness of industry and wellbeing of society.

TNO focuses its efforts on seven themes including Defence, Safety and Security: TNO works on a safe and secure society by creating innovations for people working in defence organisations, the police, emergency services and industry.

Contact

Rogier Kalkhoven

E rogier.kalkhoven@tno.nl

P +31 888 66 11 97