Technology Work Session for the South African Army; Hosted by the CSIR

FULL SPECTRUM PROTECTION

Ballistic and Explosive Device Protection

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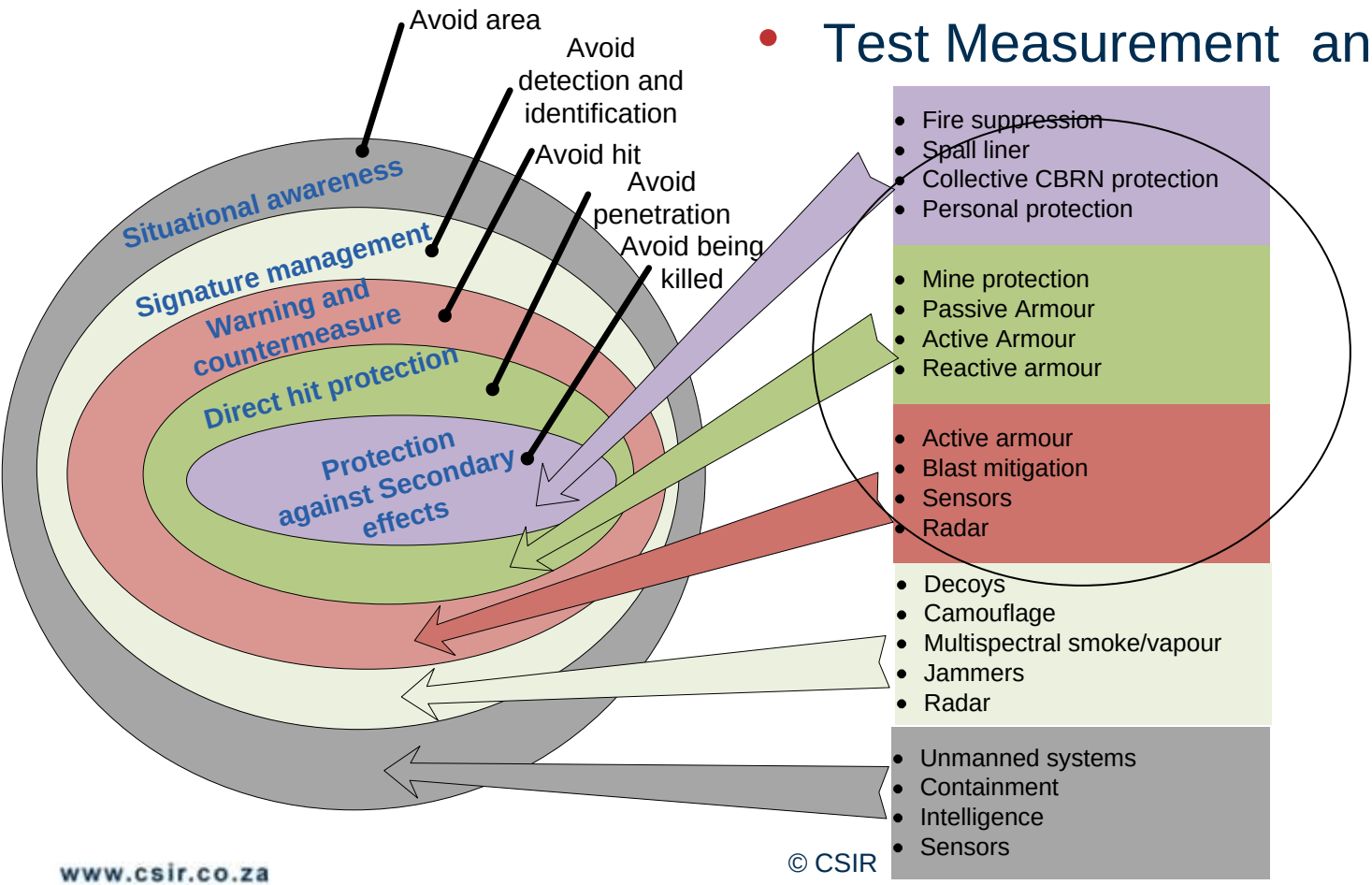
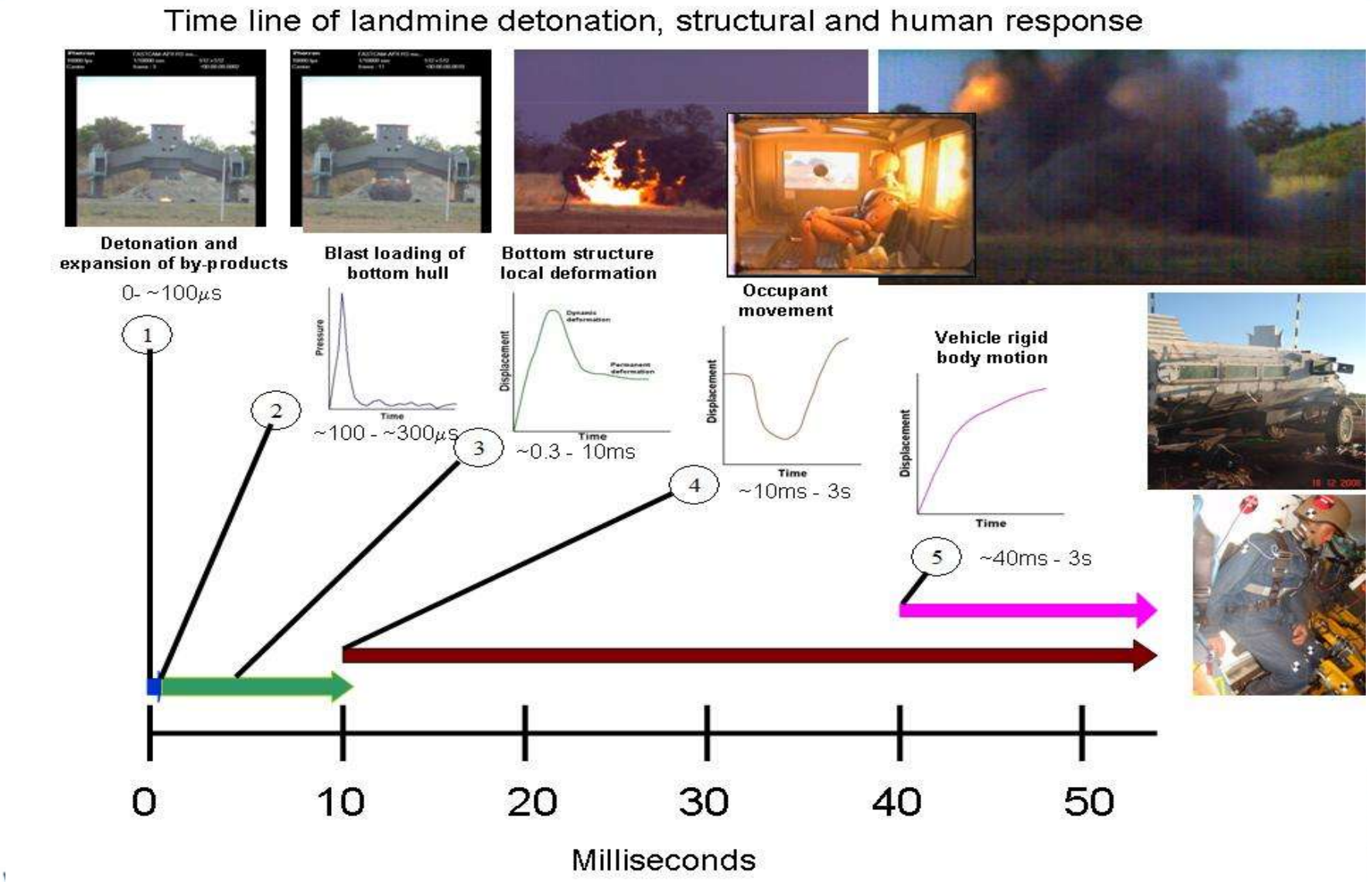
OUTLINE

- Landmine and blast IED protection
- Ballistic protection
- Test Measurement and Evaluation



Landmine and IED protection - timeline

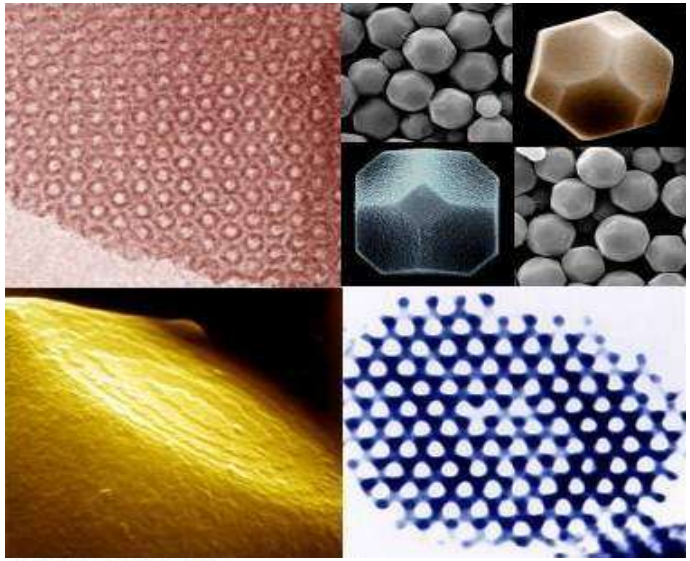


Landmine and IED protection

- Passive protection
  - Measures installed on the vehicle
  - Shape
  - Design guidelines of the 70's
- Active protection
  - Detect explosion
  - Optic and electromagnetic
  - Activate protection measures

Landmine and IED protection – Technology trends

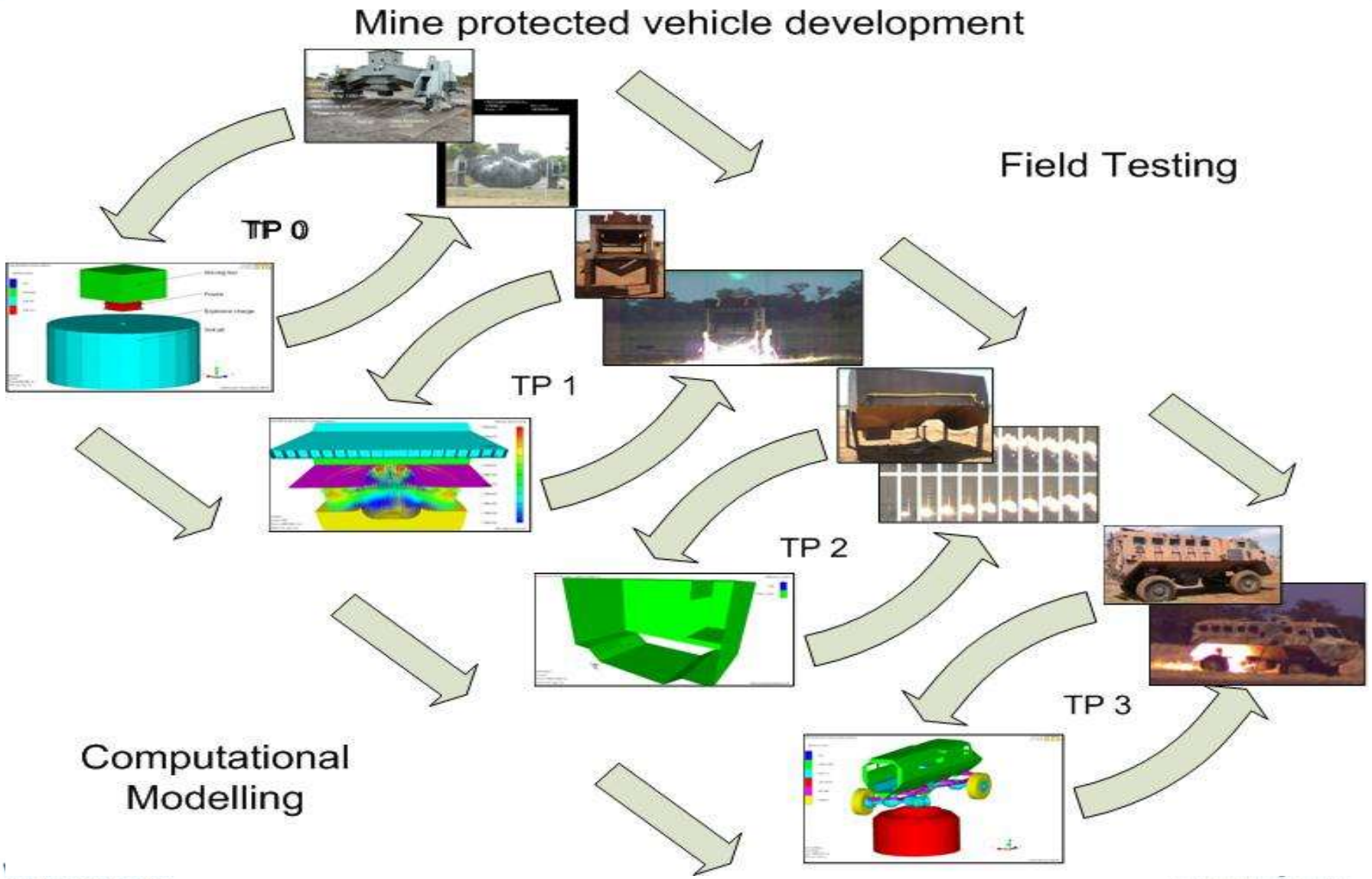
http://www.instablogsimages.com/1/2012/02/16/3d_printing_possible_from_a_3d_image_twjhy.jpg



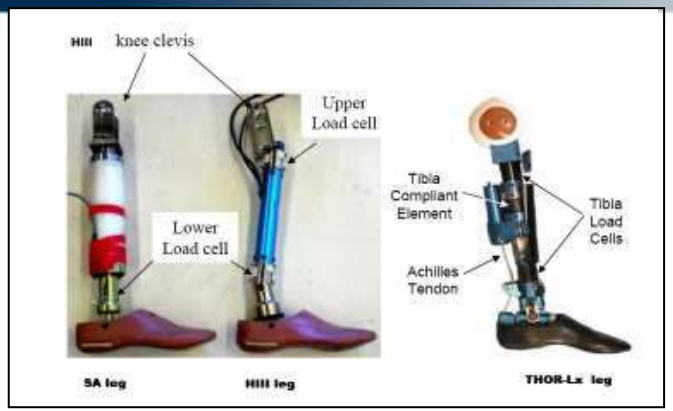
http://www.universetoday.com/wp-content/uploads/2008/07/nanomaterials.jpg

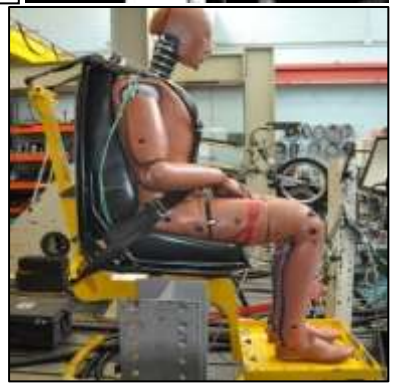
- Manufacturing techniques
  - Laser manufacturing
  - 3D printing
- Materials
  - ARMOX, WELDOX and DOMEX steel types
  - Composite materials from fibre metal laminates to nano-materials

Landmine Protection Development Process



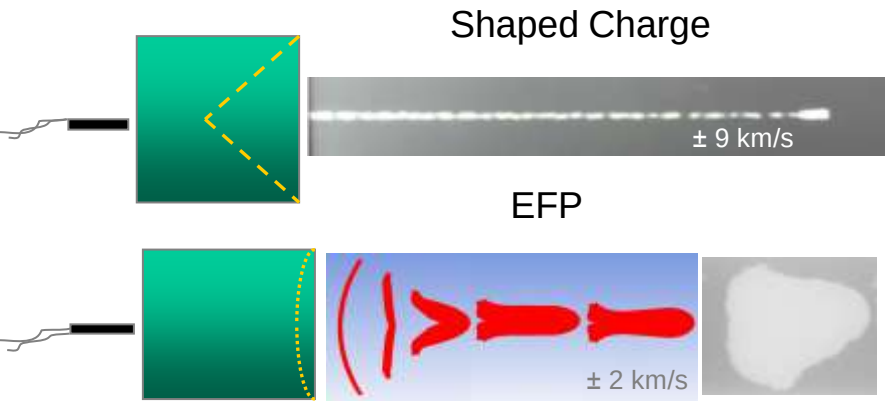
Landmine protection of occupants

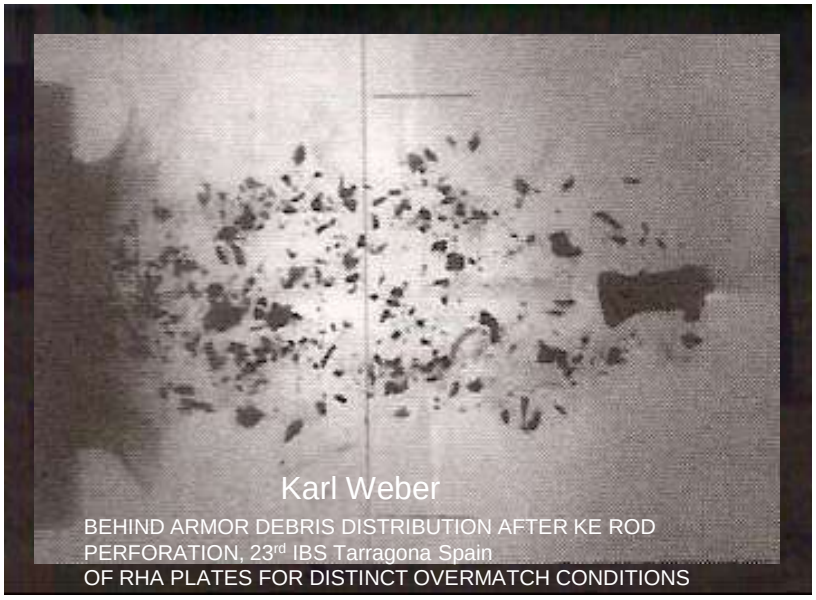




- Human Injury Criteria
  - Most current injury criteria developed through frontal motor vehicle crash accidents
  - Substantially shorter time durations
  - Vertical loading rather than frontal
  - Various legs developed for ATD
  - Extensive research still in progress
- Seat development
  - Critical component of protection
  - Limit transfer of accelerations
  - Test series on vibration and impact

Ballistic Protection





Threats

- Shaped Charge warheads (RPG, missiles, etc)
- EFP Warheads and IEDs
- Kinetic Energy Projectiles
  - APDSFS
  - Heavy machine gun rounds
  - Small arms
- Fragmentation warheads
  - Artillery shells
  - Mortar shells
  - Grenades

Ballistic Protection

Trophy – Defense Update

Artis Iron Curtain

http://www.economist.com /node/18750636

- Vehicle Protection
  - Shift from 30º frontal arc armour to all round protection due to asymmetric conflict scenarios
  - Three possibilities :
    a. Passive
    b. Reactive
    c. Active
  - Passive currently not practical for lighter armoured vehicles protection due to mass limitations
  - Reactive armour is mass efficient but has collateral damage signature and not effective against all ballistic threats
  - Active armour is researched extensively. Effective against most threats but expensive.

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Ballistic Protection - Other

- Structures and positions
  - Bases and buildings
  - Control and check points
  - Ammunition depots
  - Deployed positions
- Personal Protection
  - Helmets
  - Light weight body armour
  - Bomb disposal gear
  - Equipment for crowd control
  - Anti-personnel mine boot

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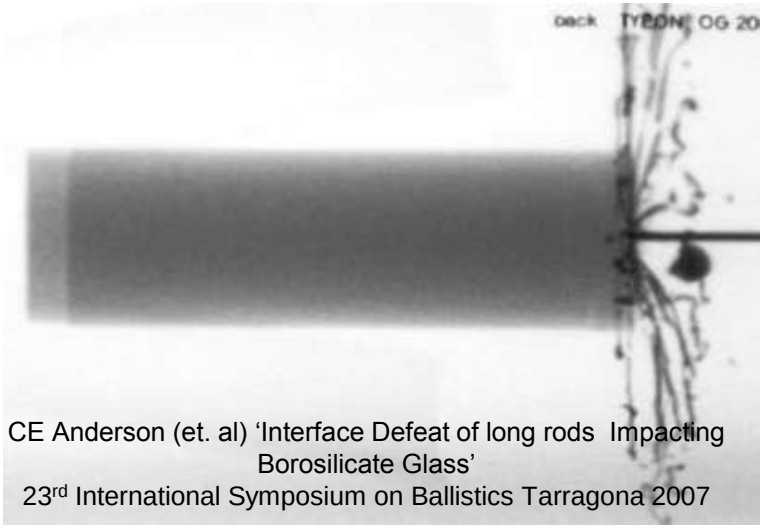
Ballistic Protection - Technology trends

http://news.bbc.co.uk/2/hi/sci/tech/7038686.stm

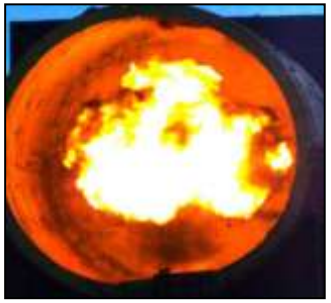


CE Anderson (et. al) 'Interface Defeat of long rods Impacting Borosilicate Glass'
23rd International Symposium on Ballistics Tarragona 2007

- Materials
  - Drive to lighter and stronger for all round protection
  - Very hard steels
  - Ceramics, titanium, polymers and glass
  - Nano-materials, Metal-matrix composites
  - Fibres with thickening shear fluids
  - Rheological liquid armour, amorphous metals
  - Fibre-reinforced concrete for structures
- New Concepts
  - Electric and magnetic armour (active)
  - Active intervention methodologies
  - Interface defeat ceramic armour
  - Transparent armours

Test, Measurement and Evaluation





- Equipment
  - Harsh environment (only one opportunity to measure)
  - Short time duration (in microseconds)
  - High sampling rates
  - Highly qualified and experienced personnel
  - SIIMA, Emily, Cordin, Flash X-Ray
- Landmine validation testing
  - Limited support capability to local industry
  - Test standards
    - RSA-MIL-STD-37 Issue 3
    - AEP-55 Volume 2 Edition 1
  - Evaluate engineering designs against blast loading effects

Thank You

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