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Research and Development to Protect Soldiers from Landmines and Improvised Explosive Devices

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Problem

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Problem

http://landmineshivaids.ws/Background

- Landmines and Improvised Explosive Devices (IEDs) remain a major threat for military vehicles, their occupants and other assets
- Warfare shifting from conventional to unconventional tactics and weapons
- Improvised nature of IEDs make it difficult to predict terminal effects
- Traditional methods of protection need to be adapted or new technologies developed

Problem

IEDs have become the number one choice of attack by subversive elements because:

- Remote detonation methods (no exposure)
- Ease of manufacture
- Surprise element (improvised nature)
- Hidden deployment
- Lack of countermeasures / protection
- Massive psychological effect on morale
- Disruption of logistics
- Devastating terminal effect

(U) AFRICOM IED Incidents: August 2012

https://info.publicintelligence.net/JIEDDO-MonthlyIEDs-AUG-2012.pdf

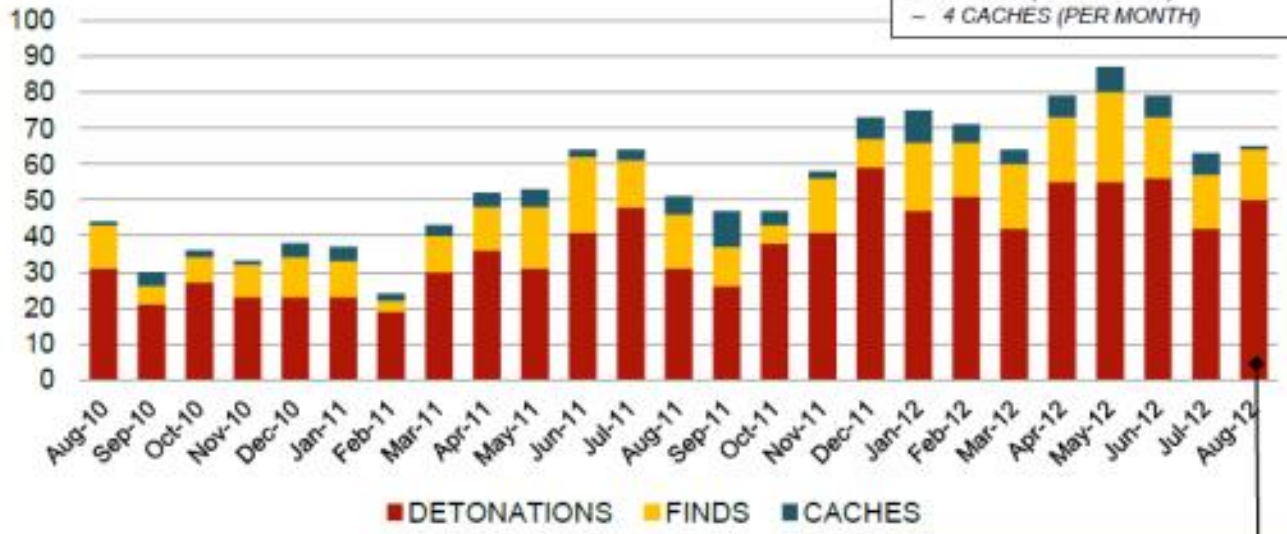
Attack the Network – Defeat the Device – Train the Force

- **65 TOTAL INCIDENTS**
  - -- 50 IED DETONATIONS
  - -- 14 IED FINDS
  - -- 1 CACHE
- **50 IED DETONATIONS**
  - -- 29 WITH CASUALTIES (58%)
  - -- 21 W/NO CASUALTIES (42%)
- **164 TOTAL CASUALTIES**
  - -- 72 KILLED
  - -- 92 WOUNDED
- **COCOM TOP 3 (AUGUST 2012)**
  - -- SOMALIA (24 INCIDENTS)
  - -- NIGERIA (24 INCIDENTS)
  - -- ALGERIA (6 INCIDENTS)

(U//FOUO)

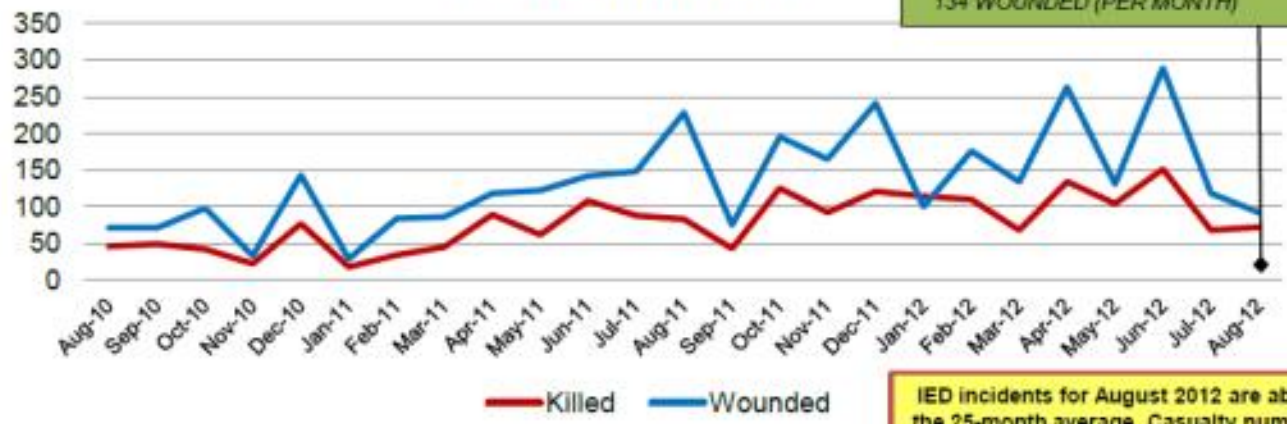
IED INCIDENTS

AFRICOM 25-MONTH AVG: 55
-- 38 DETONATIONS (PER MONTH)
-- 13 FINDS (PER MONTH)
-- 4 CACHES (PER MONTH)



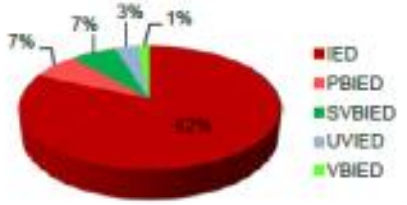
IED CASUALTIES

AFRICOM 25-MONTH AVG: 213
79 KILLED (PER MONTH)
134 WOUNDED (PER MONTH)

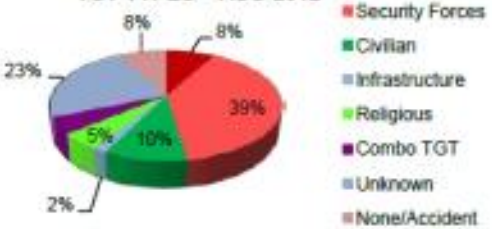


IED incidents for August 2012 are above the 25-month average. Casualty numbers are below the 25-month average.

IED TYPES – AUG 2012



TGT TYPES – AUG 2012



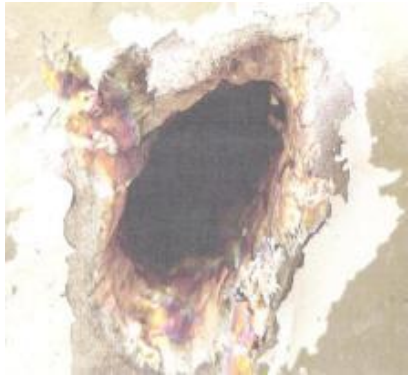
Source: Global IED Relational Database

** IED incidents occurring in Afghanistan and Iraq are not included in this database**

Problem

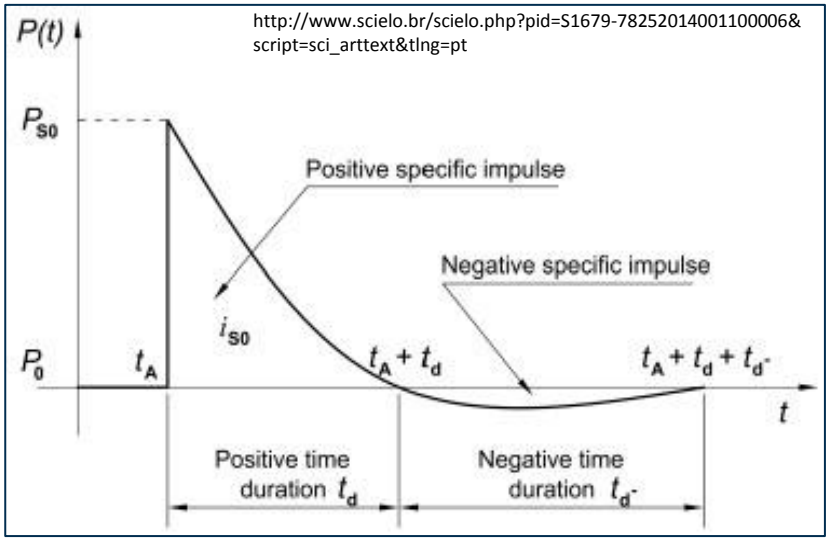

Jan 2013

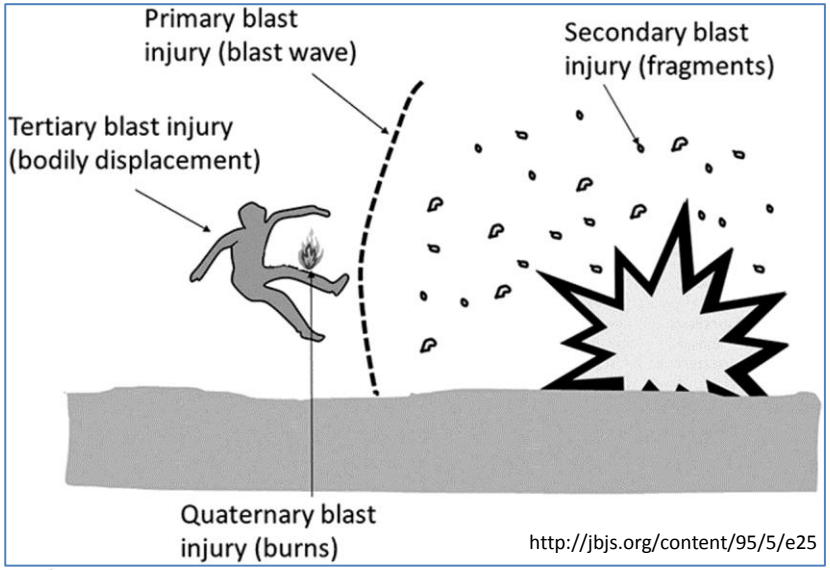

AU3712
3712




https://en.wikipedia.org/wiki/Improvised_explosive_device

Problem





Before a solution can be devised, the damage mechanisms need to be understood.

For research purposes, divided into 3 classes:

- Blast
  - Large explosive content
  - Shock, pressure, impulse transfer
  - Bio-trauma
  - Enhanced effects (temperature, increased impulse)
  - Structural failure
- Penetrative
  - Directional (EFP, SC)
  - Indiscriminate (fragmentation)
- NBC (“Dirty bombs”)
  - Explosive dispersion of chemical, biological or nuclear material

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Case Study

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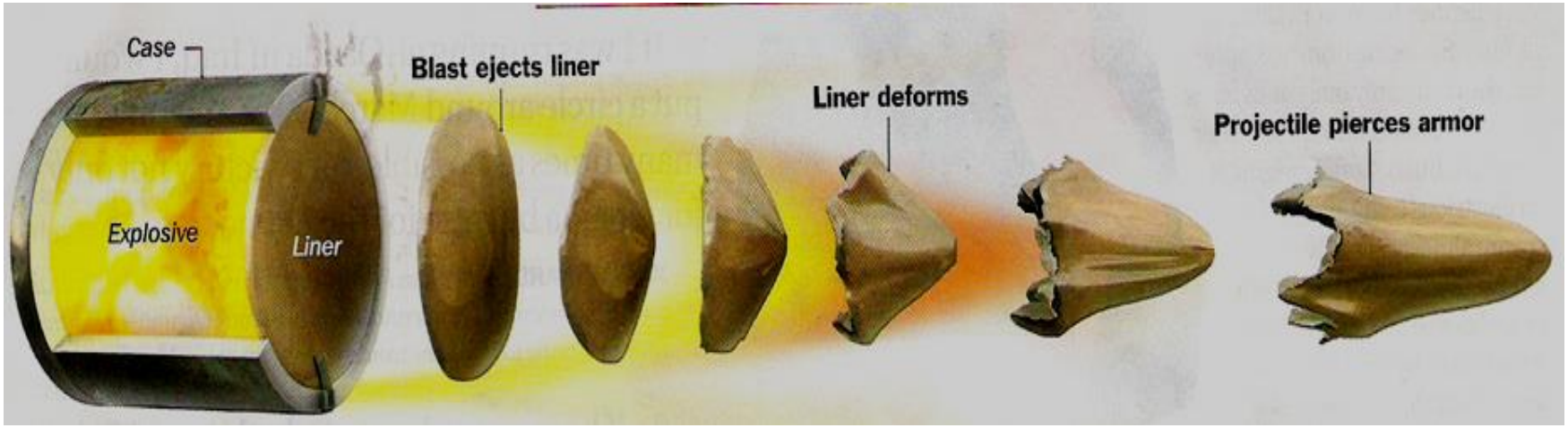
Case Study

Aim: to develop a protection solution to protect against a medium Explosively Formed Projectile (EFP) IED threat



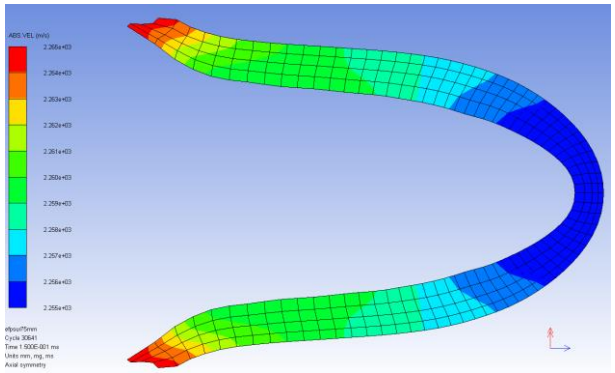
Case Study

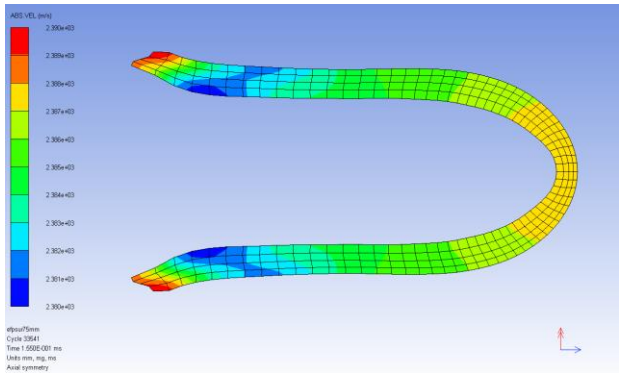
Threat Characterisation:

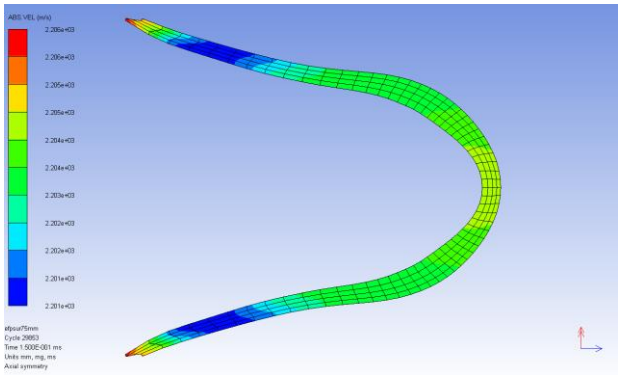
EFPs are usually characterised in terms of the projectile formed:

- Mass
- Speed
- Shape

} kinetic energy over distance → required protection



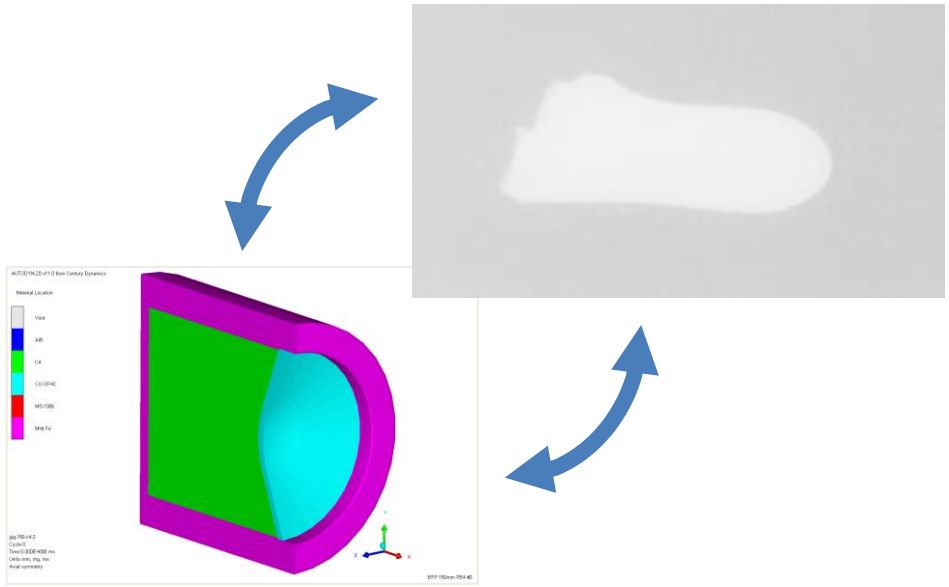




Case Study

For research purposes, it is important to have a ***repeatable*** threat against which protection solutions can be evaluated ⟶ EFP surrogate

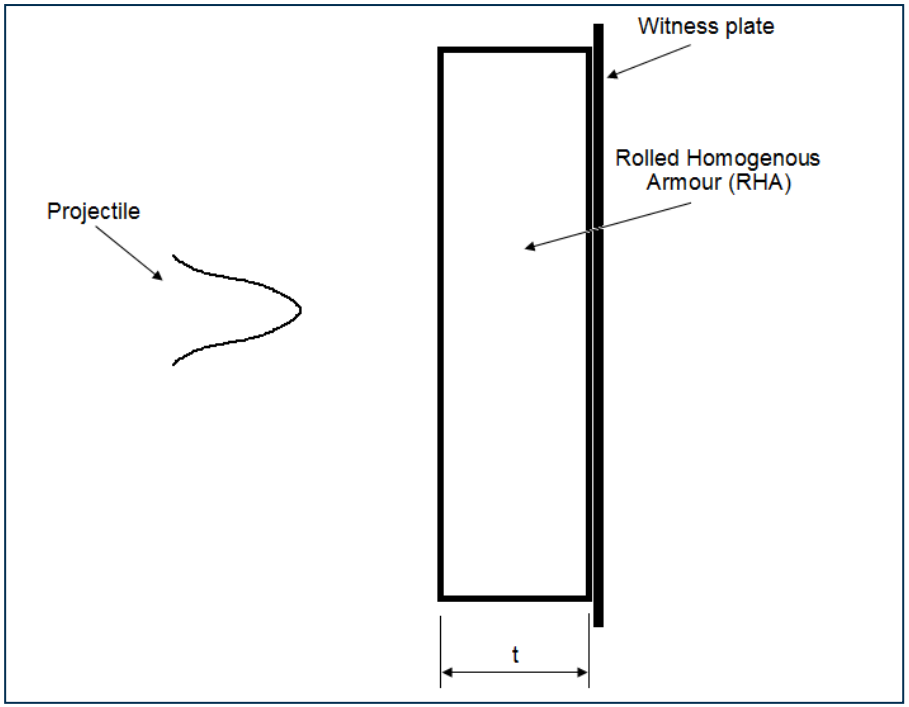
- Initial design
- Computational model
- Modified design
- Prototype manufacture
- Experimental testing
- Modified design
- Final testing



Case Study

- Mass
- Speed
- Shape

kinetic energy over distance → required protection



Case Study

Add-on protection package concept designed based on research into:

- Shock physics
- Threat/target interactions
- Material behaviour
- New materials
- Manufacturing techniques
- Etc.

- Panel effectiveness evaluated in terms of projectile speed and morphology before and after interaction
- Similar iterative modelling and experimental testing process followed until final design achieved

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Conclusion

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Conclusion

- Add-on protection package to protect against EFP IED threat developed and tested
- Case study shows how the R,D&I process was followed to reach a solution that would provide the required protection within the specified mass and dimension budgets.

Conclusion

Thank you

Acknowledgements:

The Landward Sciences
Surrogate & Protection Package Development Team