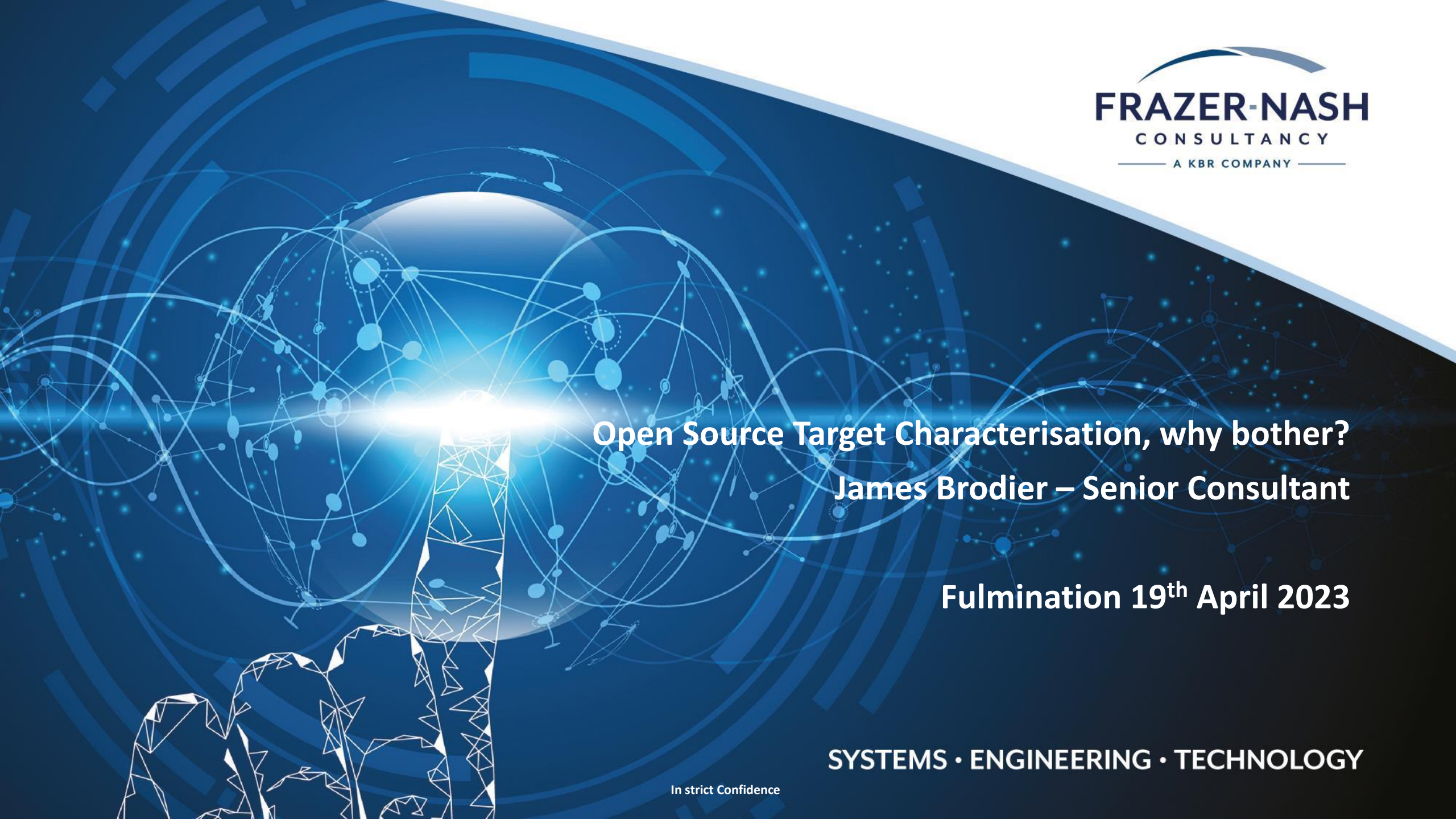

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Open Source Target Characterisation, why bother?

James Brodier – Senior Consultant

Fulmination 19th April 2023

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Contents

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What is meant by Target Characterisation? Our involvement in the field

Data Science

Providing insights from collated and generated data, including Cloud Based Applications and User Led Design

Modelling and software

Application of niche skills and knowledge to solve complex problems, such as performance modelling

Systems Integrator

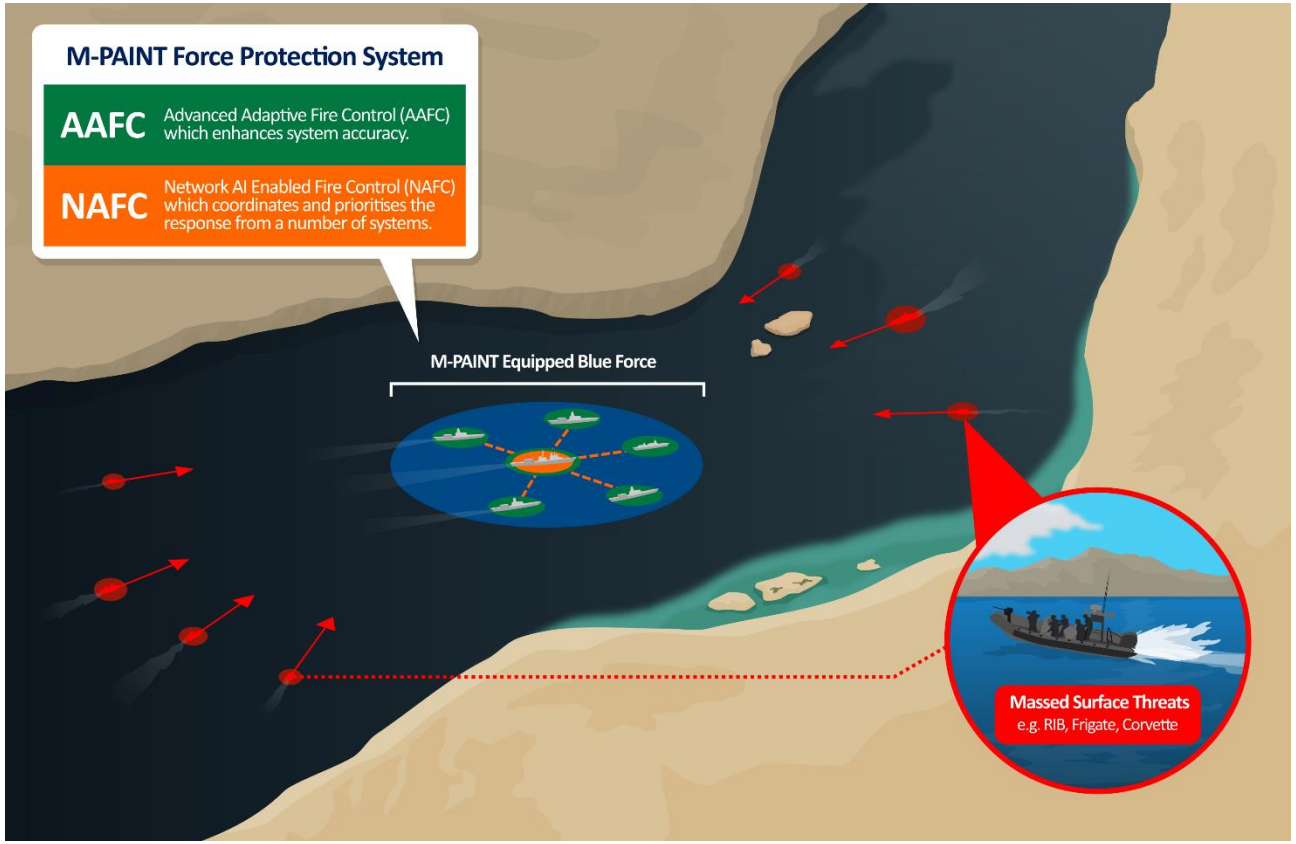
Capability and toolsets that bring together complex systems to solve complex problems

Engineering Excellence

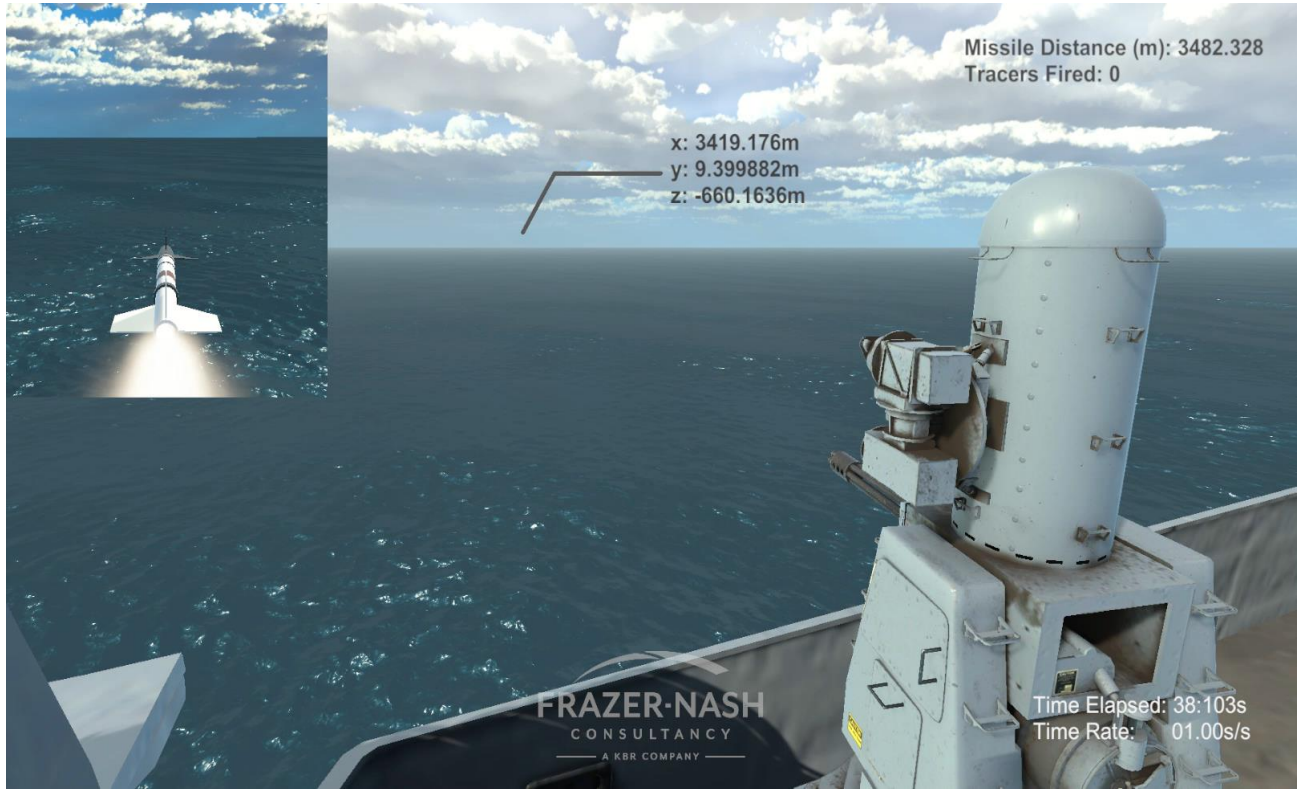
The application of traditional weapon engineering and science in a novel space

What is meant by Target Characterisation?
Maritime Precision Automated Interdiction of Targets (M-PAINT)

Developing a scalable AI-enabled system demonstrating how *automated target detection*, recognition and prioritisation can be used to increase the speed and probability of target defeat.



What is meant by Target Characterisation?
Close In Weapon System Target Engagement



Close In Weapon Systems (CIWS) must compute a very complex firing solution – reliant on control systems estimate of real time temporal parameters for incoming targets.

Frazer-Nash Consultancy developed CIWS performance model, targeting CIWS performance characteristics and efficacy of anti–ship missile manoeuvres.

What is meant by Target Characterisation?
“Pioneering trial to aid AI target recognition”

“Artificial intelligence (AI) for defence applications could be developed more quickly due to an innovative defence community-based approach to trial[s] hosted by the Defence Science and Technology Laboratory (Dstl).”

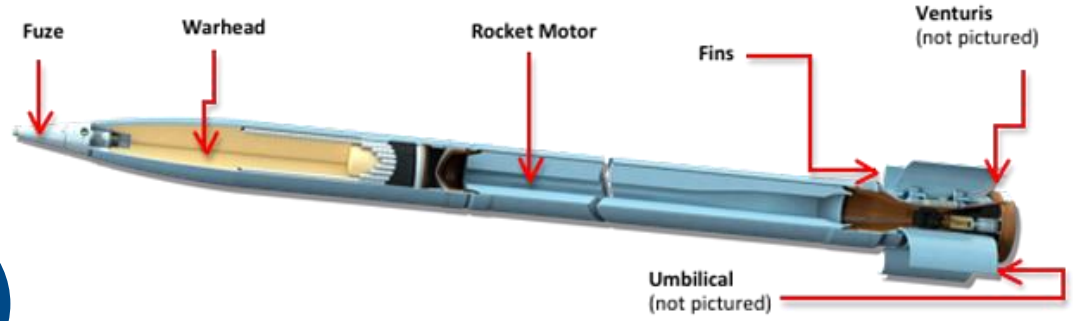
https://www.gov.uk/government/news/dstl-enables-ai-dataset-expansion#

https://www.gov.uk/government/news/dstl-enables-ai-dataset-expansion#

What is meant by Target Characterisation?
High Energy Laser target characterisation – In this case, yes!

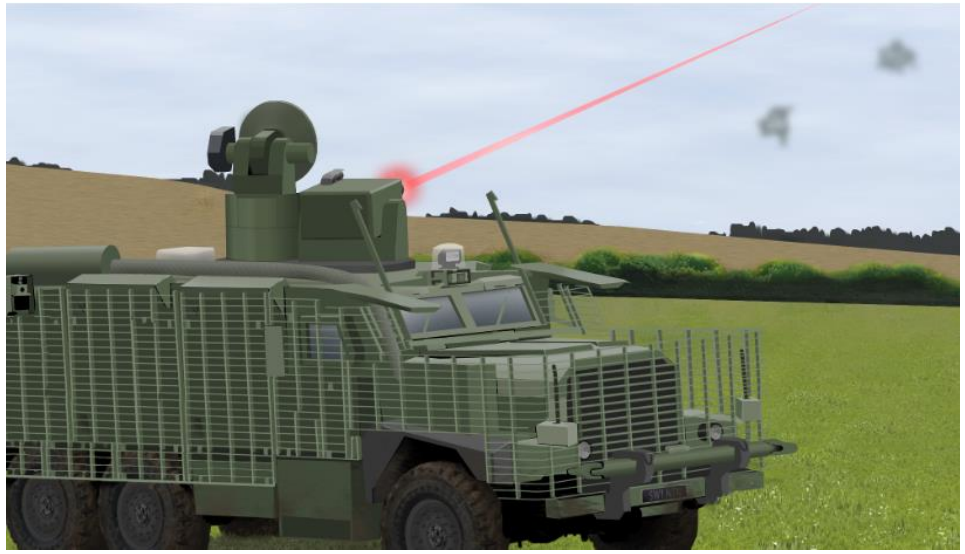
Characterise High Energy Laser (HEL) targets by interrogating their material structures and determining a set of characteristics for each material, aim point and define each targets main defeat mechanism.

Ultimately resulting in dwell times to ‘defeat’ each target for a given set of HEL characteristics.



http://characterisationexplosiveweapons.org/studies/annex-a-122-mm-mbrl/

https://www.dji.com/ch/phantom



https://des.mod.uk/lasers-des-british-army-royal-navy-directed-energy/

Why use opensource data?

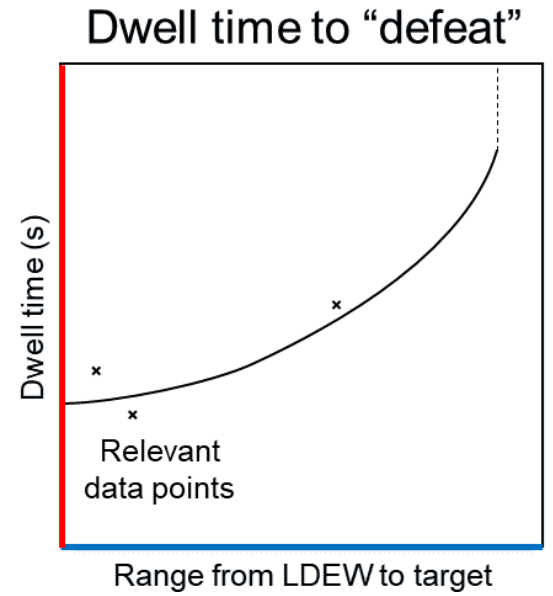
- Time constraints
- Security
- Result Fidelity
- Data management

It's application specific

Dwell time has a different meaning in materials sceince compared to tajectory modelling for example.

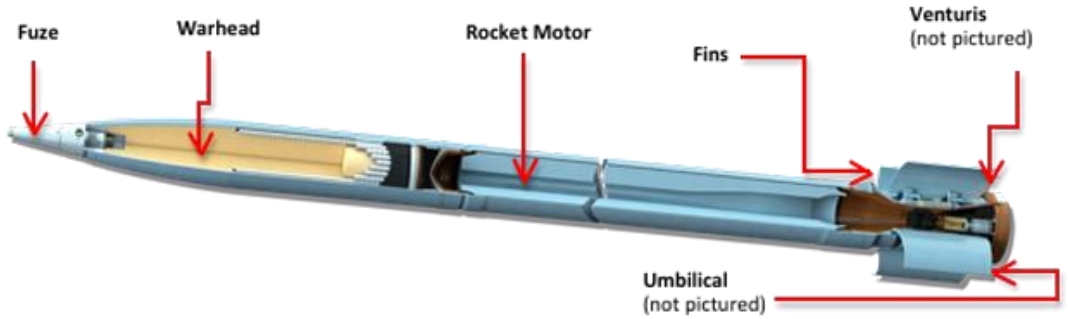
Therefore a risk based approach should be considered.

Reducing uncertainty over time.



Relevant Data → Data formatting → Exploit for different application

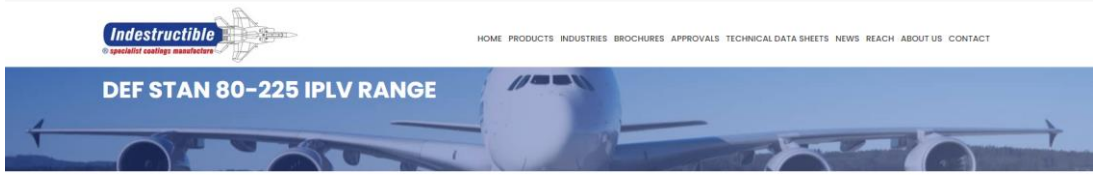
Open-source characterisation approach



http://characterisationexplosiveweapons.org/studies/annex-a-122-mm-mbrl/

- Basic composition and material make up
- Literature search
- Application of knowledge
- SME judgement – including trial and error!

Estimated characteristics include upper and lower bounds to test to sensitivity of the analysis and provide more scientific rigour.



https://indestructible.co.uk/wpdmpro/tds-for-def-stan-80-225-iplv-range/

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Accession Number: AD0755172

Title: Transition from Deflagration to Detonation in Granular Explosives

Descriptive Note:

Corporate Author: NAVAL ORDNANCE LAB WHITE OAK MD

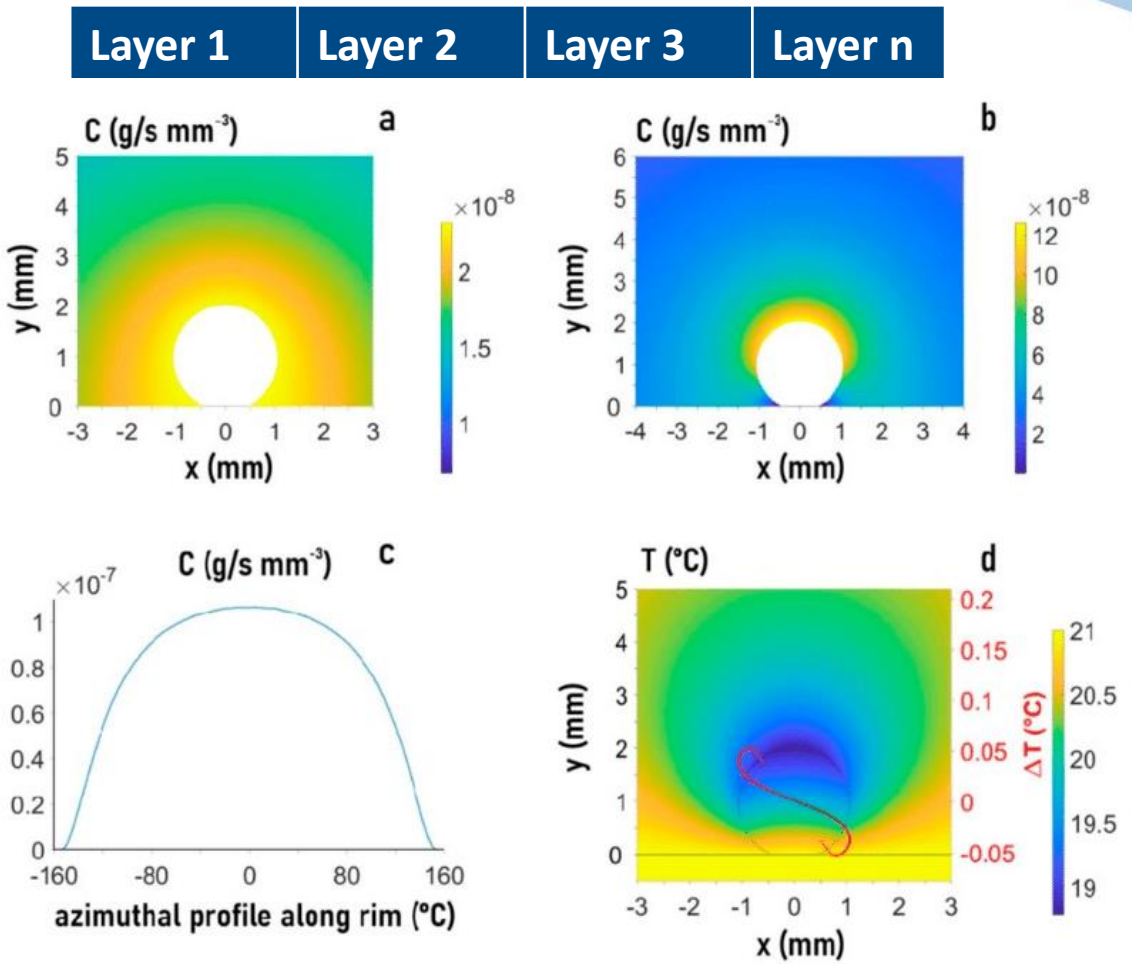
https://apps.dtic.mil/sti/citations/AD0755172

Open-source characterisation approach

How to apply this information?

1. Divide the target into layers, based upon primary material make up;
   - (Don't forget paint coatings!)
   - Structural divides and density changes make natural layer definitions;
2. Define material specification for each layer;
3. Define the energetic materials, including ignition temperatures;
4. Define a hard kill definition and criteria to be met;
5. See how it all stacks up!

Use FEA modelling, or similar, to characterise each HEL target and determine a 'dwell time to defeat' for an engagement scenario.



* Not relevant to subject matter. Merely used as a visual cue. Image taken from 10.3390/mi12020185 under Creative Commons Attribution 4.0 International. FEA of an evaporating droplet.

Open-source characterisation approach - summary

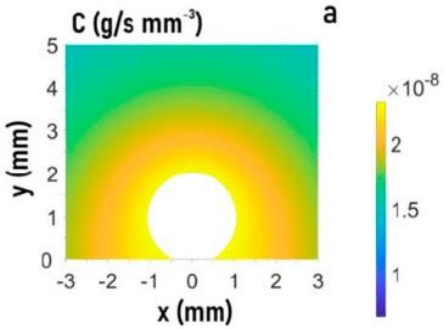
Why bother?

- Time constraints
- Security
- Result Fidelity
- Data management
- It's application specific

- Basic composition and material make up
- Literature search
- Application of knowledge
- SME judgement – including trial and error!

Layer 1	Layer 2	Layer 3	Layer n
Estimated grade			
Thickness mm			
Density kg/m^3			
……			

Relevant Data → Data formatting → Exploit for different application



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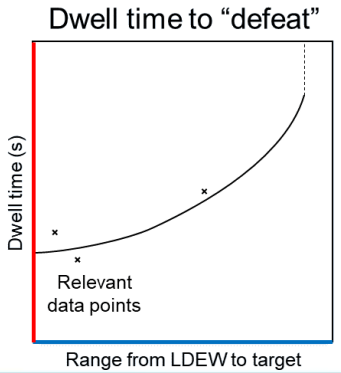
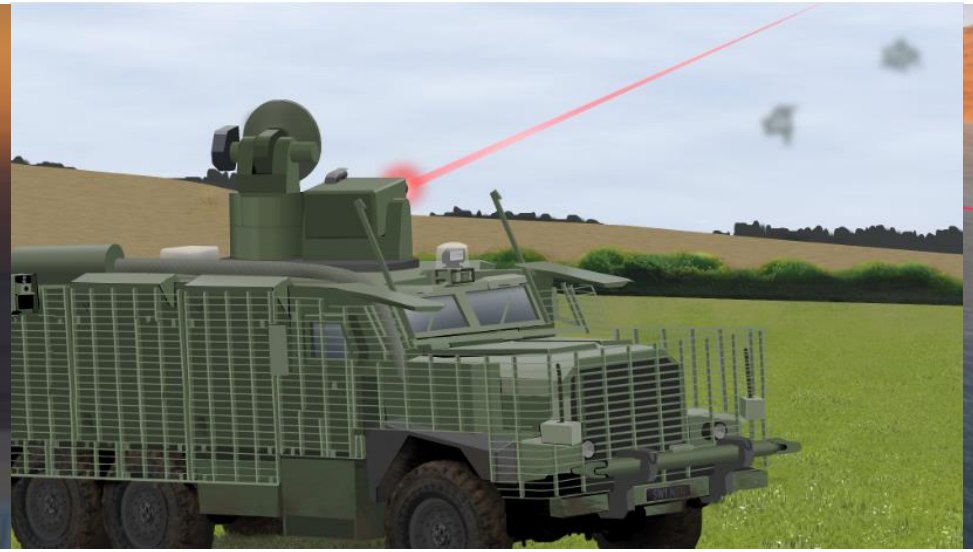
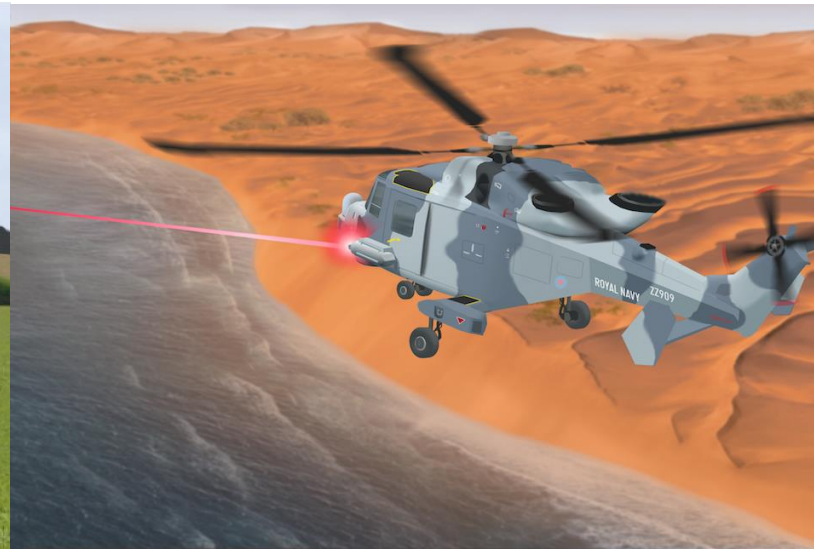


Examples of UK interest in High Energy Lasers





Thank you, any questions?

https://www.memedroid.com/memes/detail/3503744/Bad-shot?refGallery=tags&page=1&tag=lol

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Thank You, any questions?

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