

Performance characterization of a short-range multi-projectile 'last line of defense' C-sUAS system

*ID2Move - The C-UAV Day:
From defense purposes to civil vital applications*

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1. Definition

1. Setting the scene
2. CUAS technology

2. Solution

1. Weapon System
2. Exterior Ballistics
3. Terminal Ballistics

3. Conclusion and Future Work





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1. Weapon System

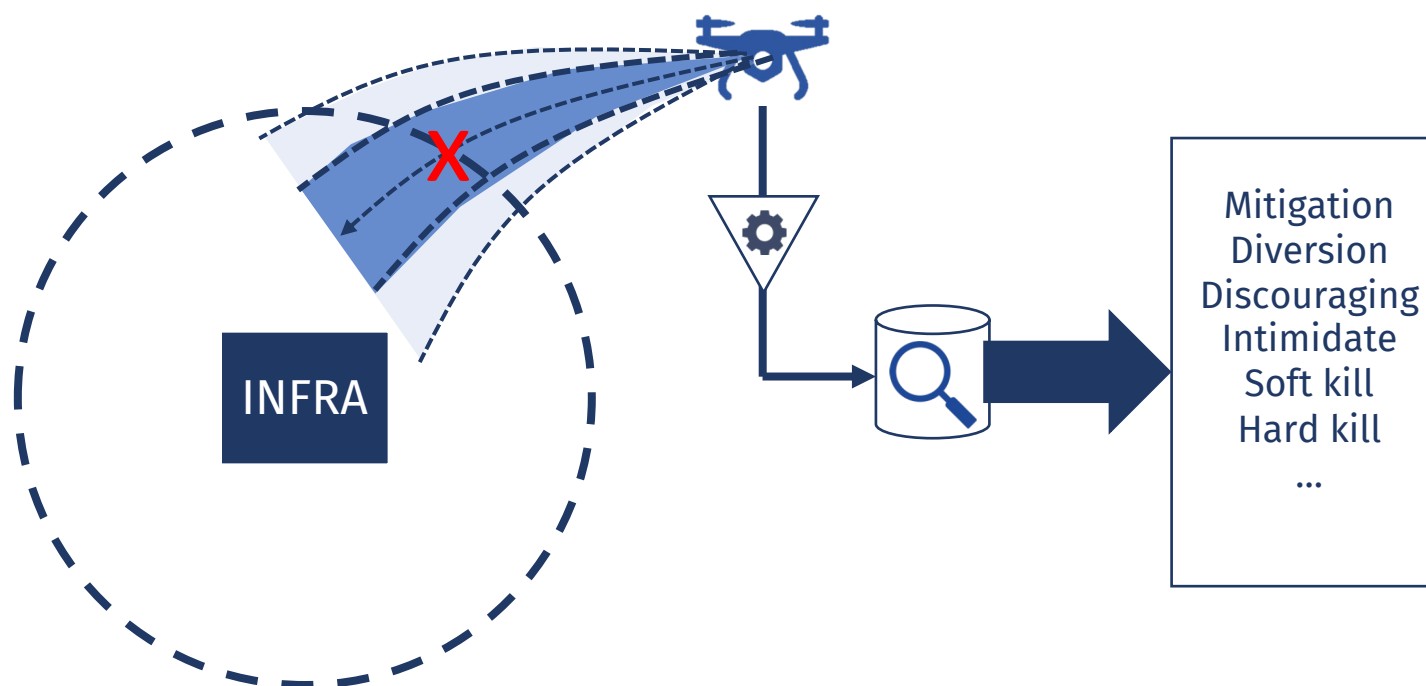
2. Exterior Ballistics

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Definition - Setting the scene

**Detect****Track****Identify****Neutralize**



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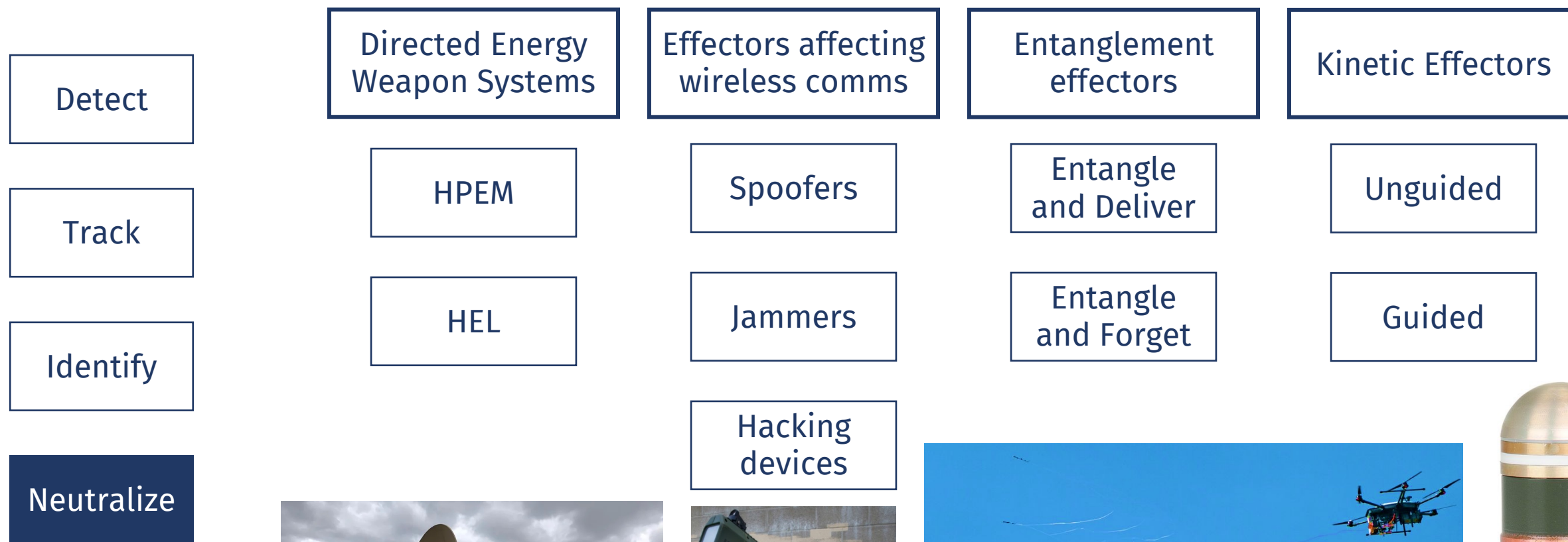
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Definition- CUAS technology





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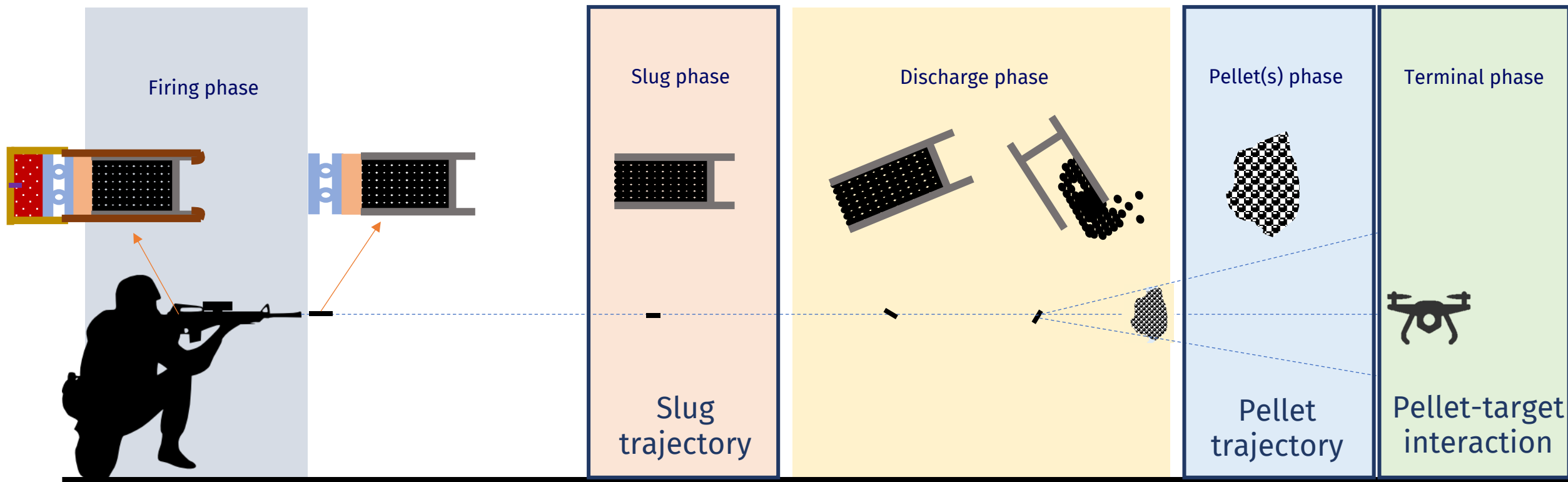
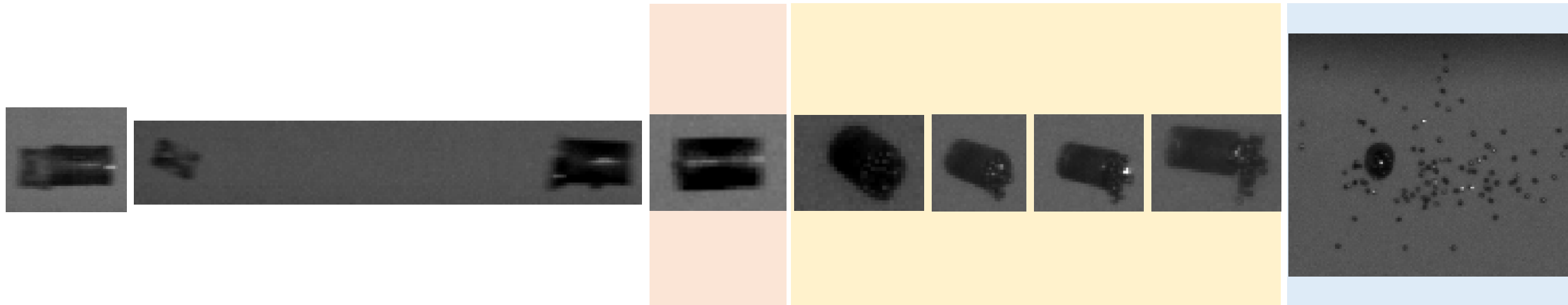
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Solution – Weapon System





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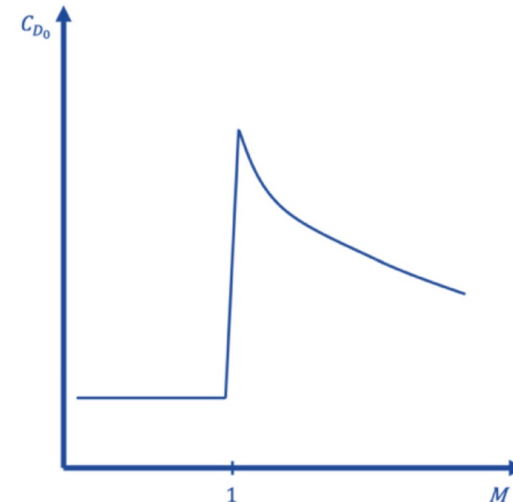
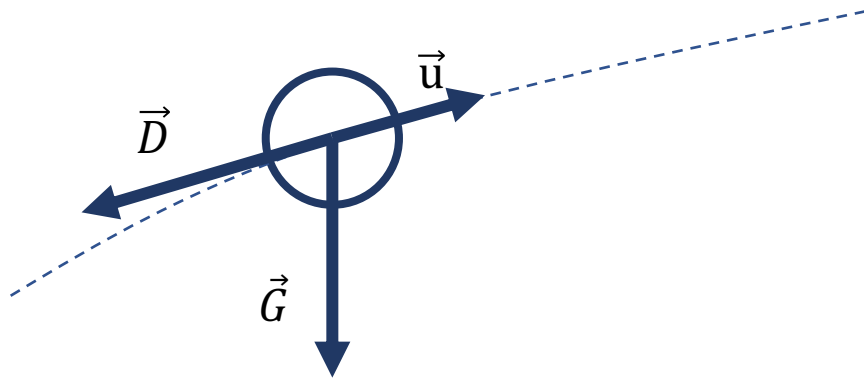


Solution – Exterior Ballistics

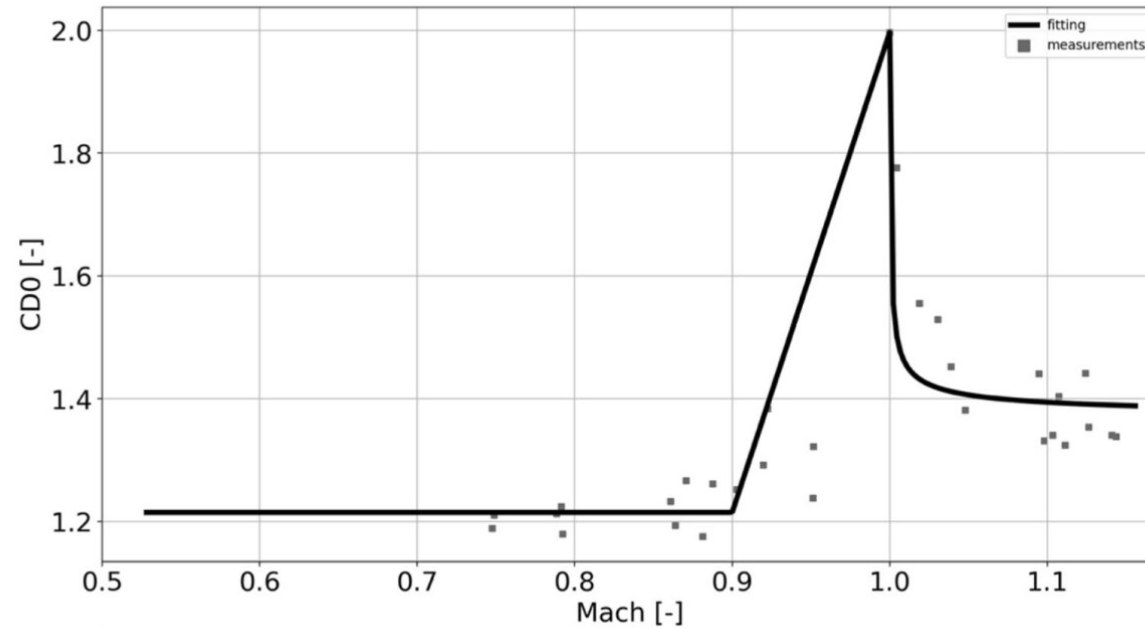


- $\frac{d(m \vec{u})}{dt} = \sum_i \vec{F}_i$
- $m \frac{d\vec{u}}{dt} = \vec{G} + \vec{D} \quad \vec{G} = m \cdot \vec{g} \quad \vec{D} = \mathbf{C_D} A \frac{\rho u^2}{2} \vec{1}_u$

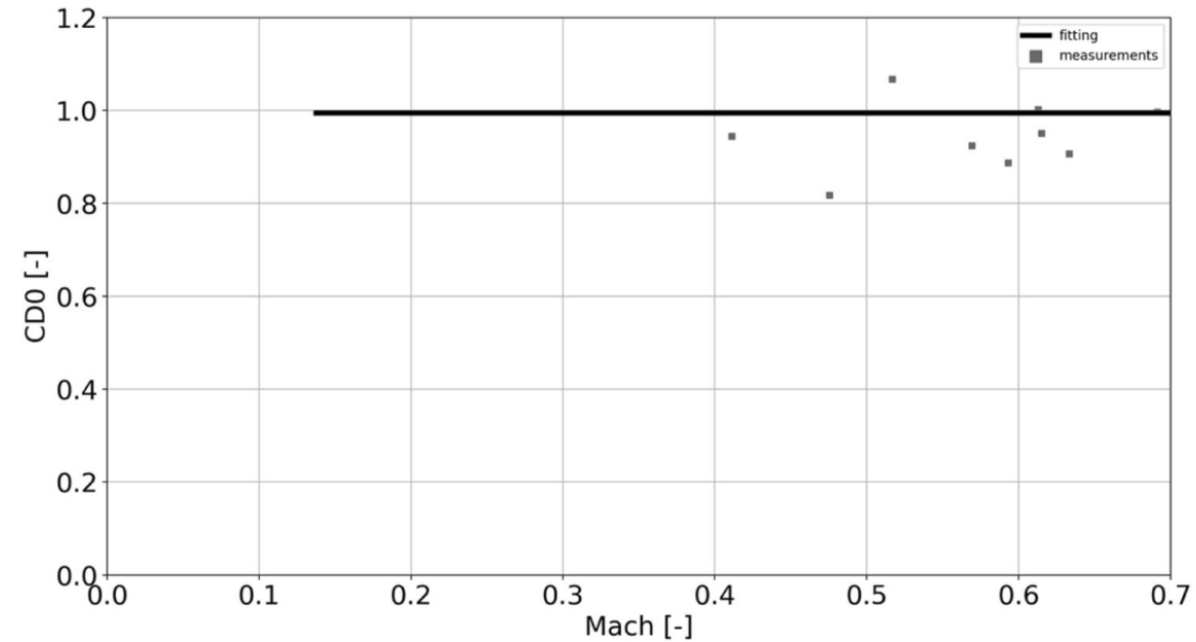
- With m the fixed mass of the projectile, $\vec{u}$ the velocity vector of the projectile w.r.t. ground, $\vec{G}$ the gravitational force, $\vec{D}$ the drag force.



Solution – Exterior Ballistics



Slug
trajectory

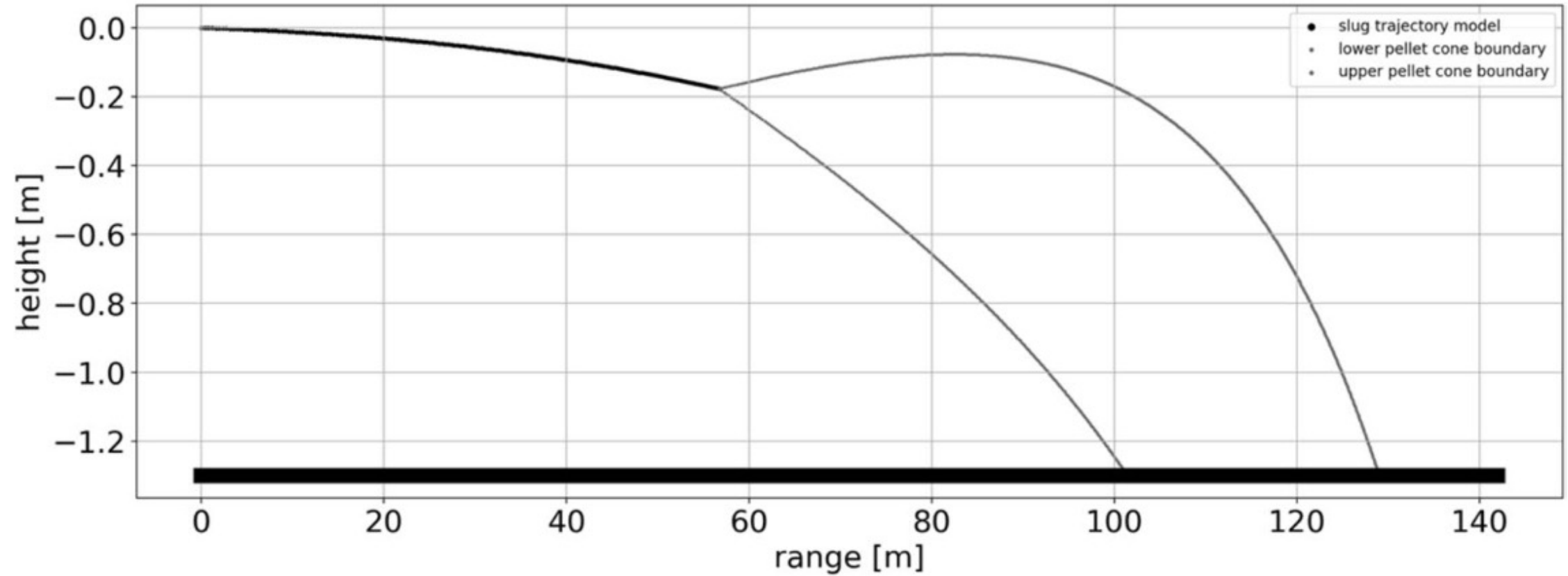


Pellet
trajectory

Solution – Exterior Ballistics



$$m \frac{d\vec{u}}{dt} = \vec{G} + \vec{D}$$





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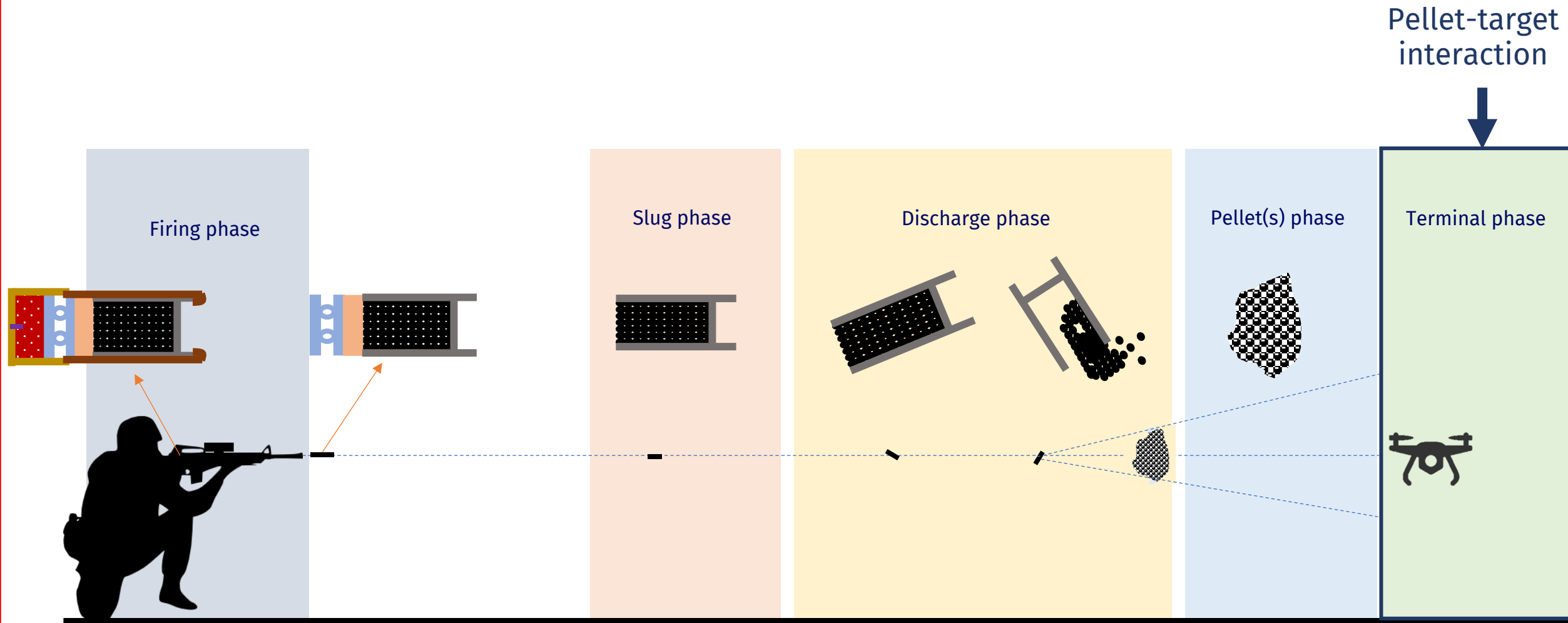
1. Weapon System
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3. **Terminal Ballistics**

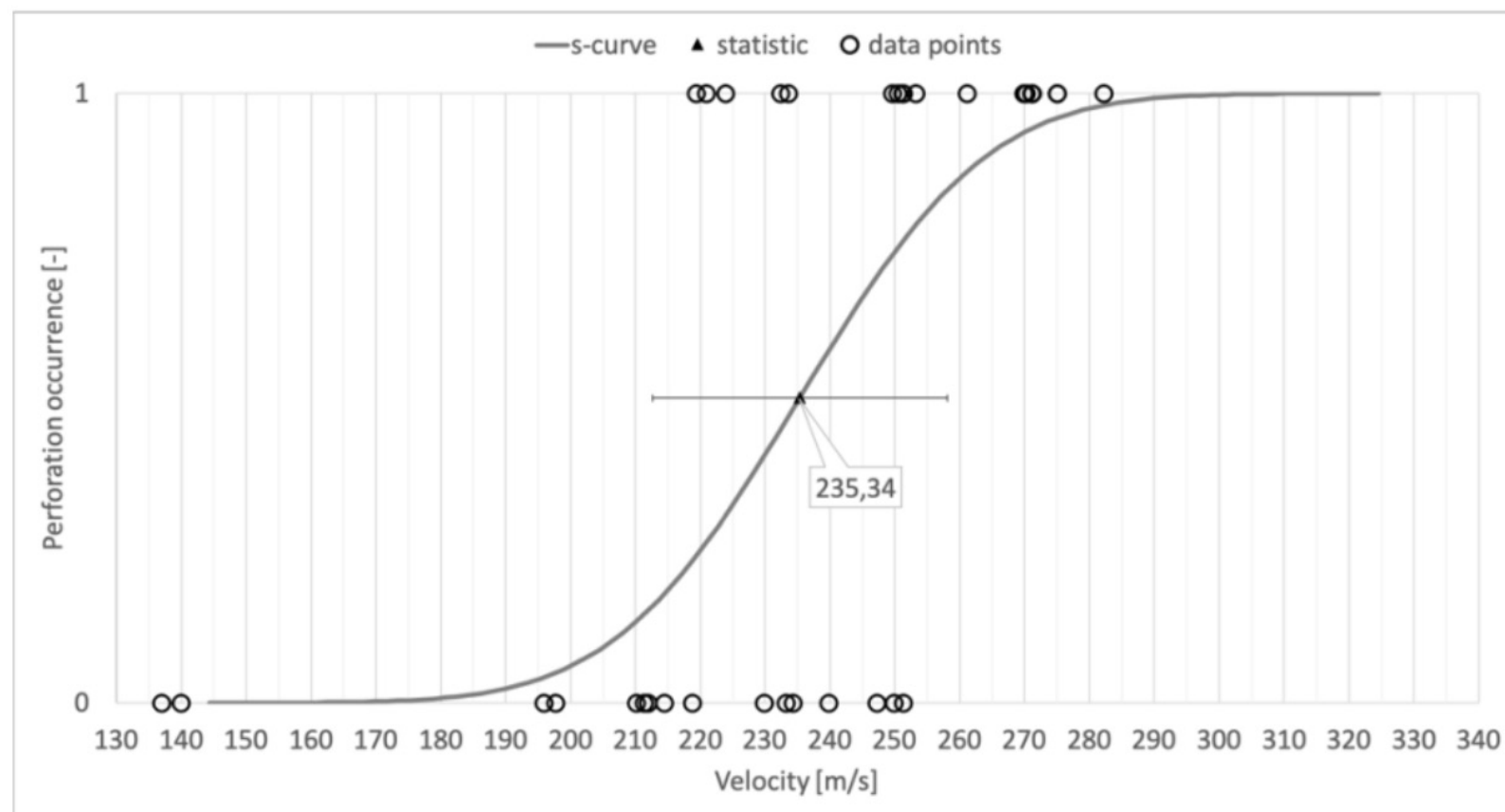
3. Conclusion and Future Work



Solution – Terminal Ballistics

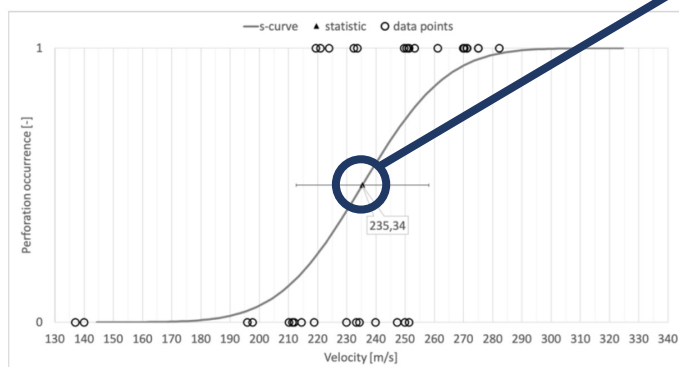
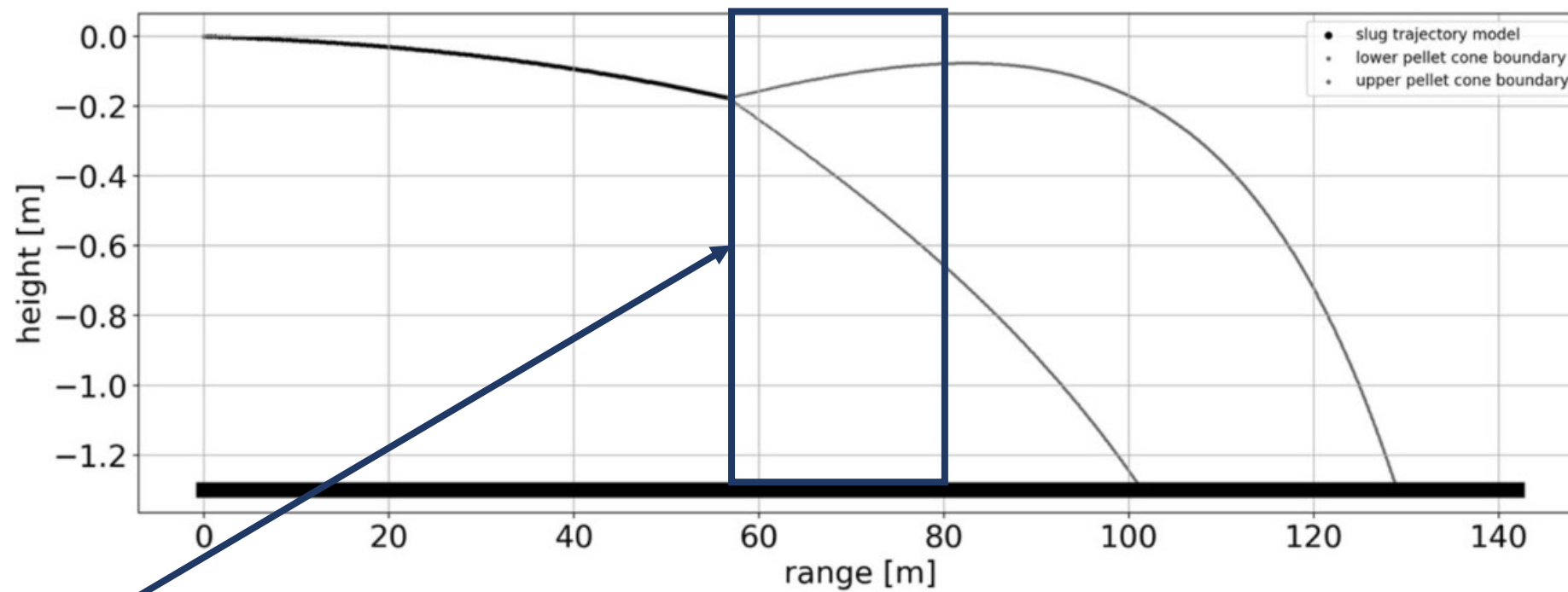


Solution – Terminal Ballistics



Ballistic limit ' v_{50} ' velocity of the pellet for which 50% of the impacts penetrate the target

Solution – Terminal Ballistics



$V_{50} \rightarrow X_{50}$



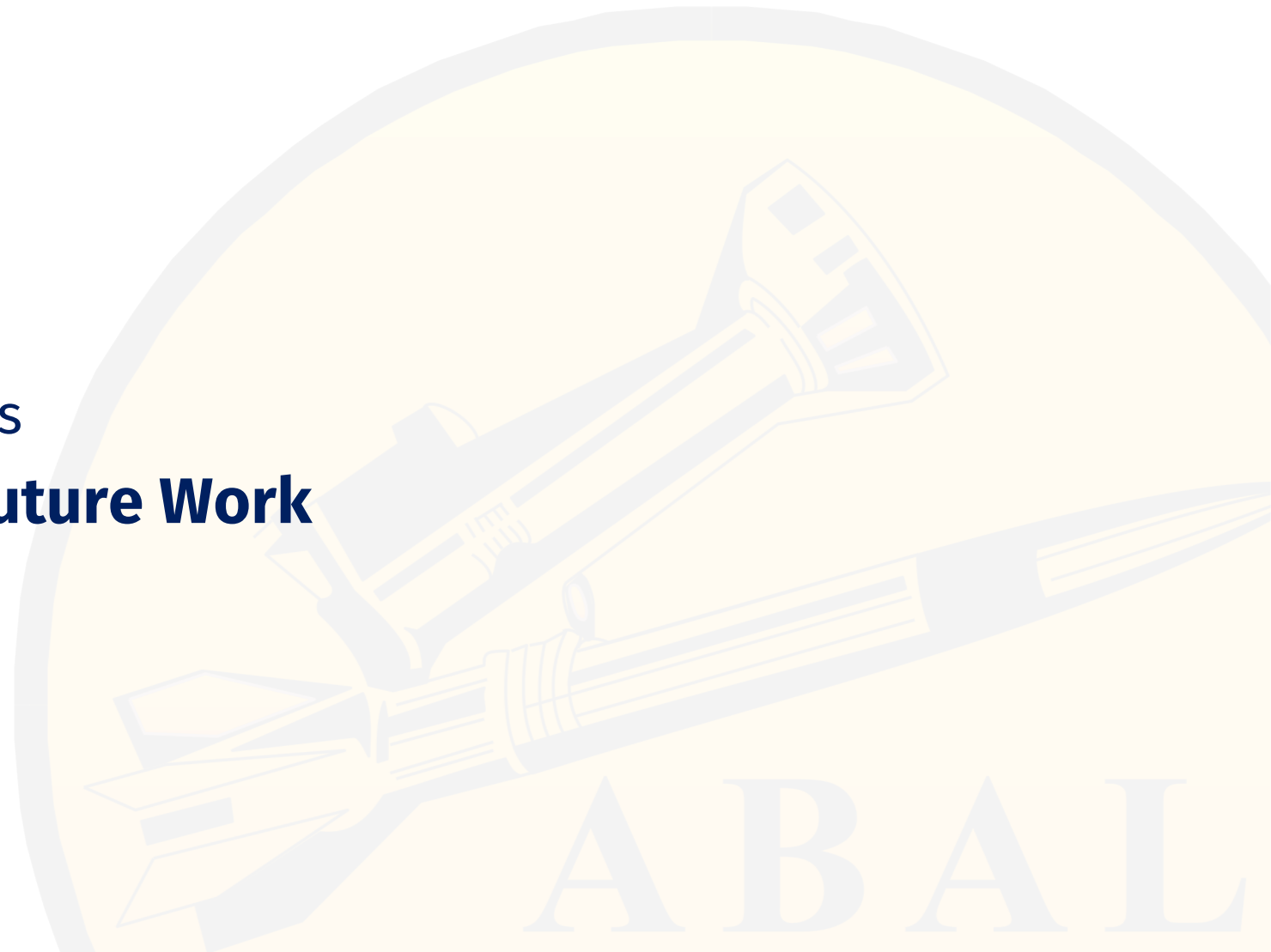
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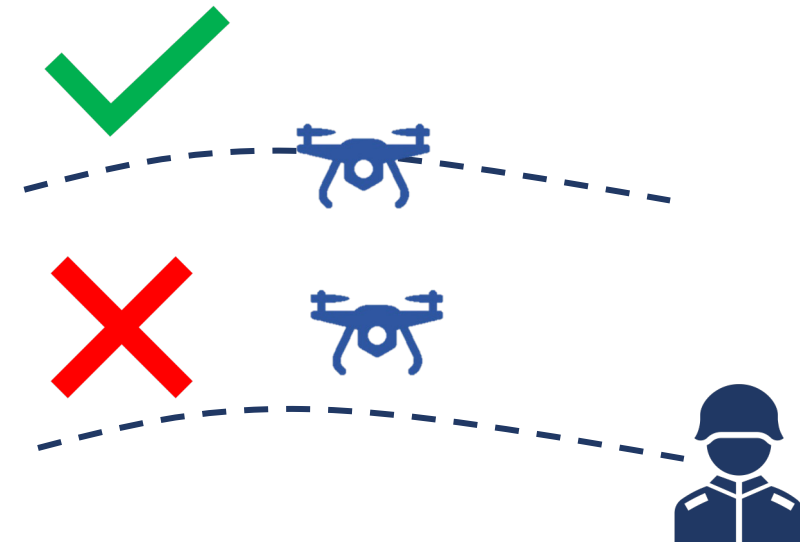
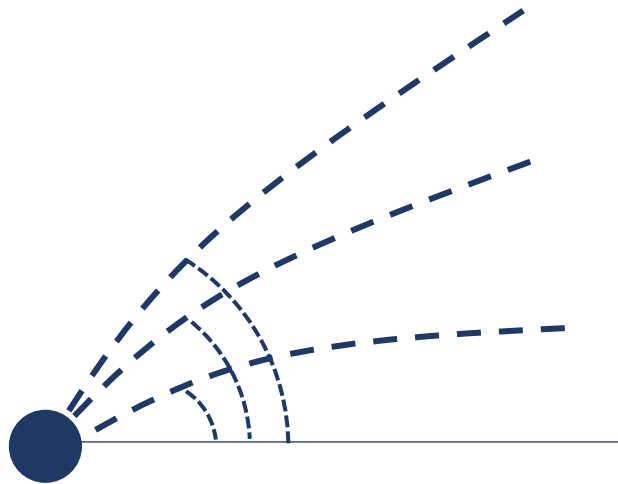
3. Conclusion and Future Work



Conclusion and Future Work



- Conclusion
 - Model of projectile at horizontal firing, fitted to reality
 - Experimental setup for exterior and terminal ballistics
- Future work
 - Modelling projectile at other elevations
 - Characterizing collateral damage



Thank you

Questions?

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