

# Experimental Studies of Scalable Effects Warhead Technologies

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**MBDA**  
MISSILE SYSTEMS



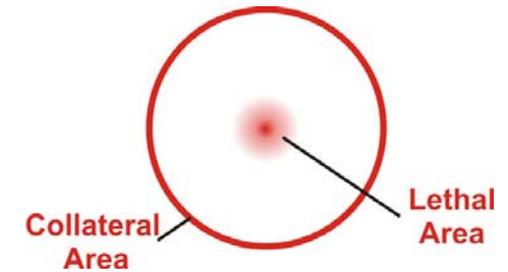
# Agenda

- **Motivation**
- **Flexible Response Warhead Technologies**
- **Scalable Effects Warhead**
- **TDWs Deflagration Cylinder Test**
- **Variety of Test Charges: Stable Low-output Mode**



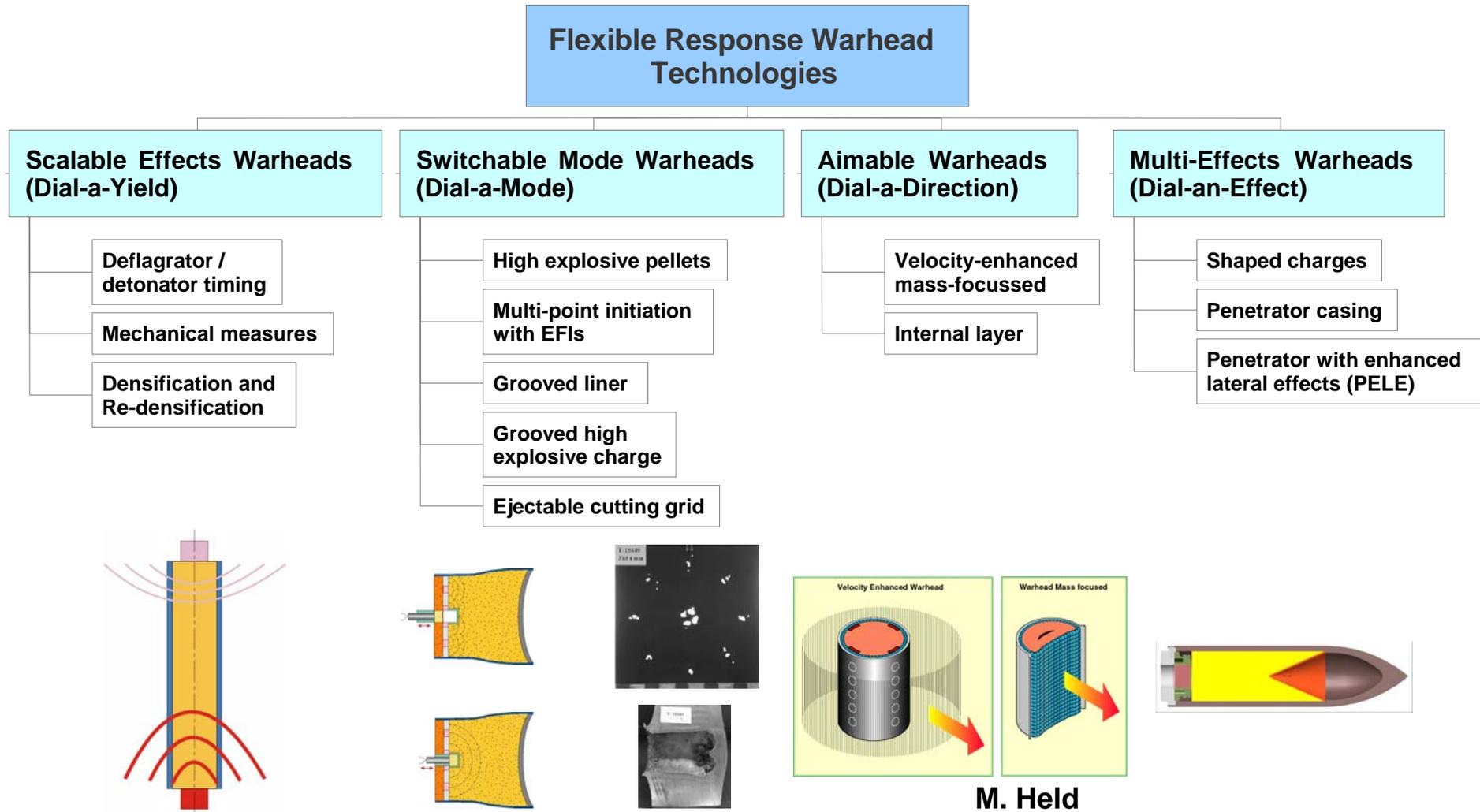
# Motivation

- **Current Munitions: Collateral Damages in Urban Terrain**





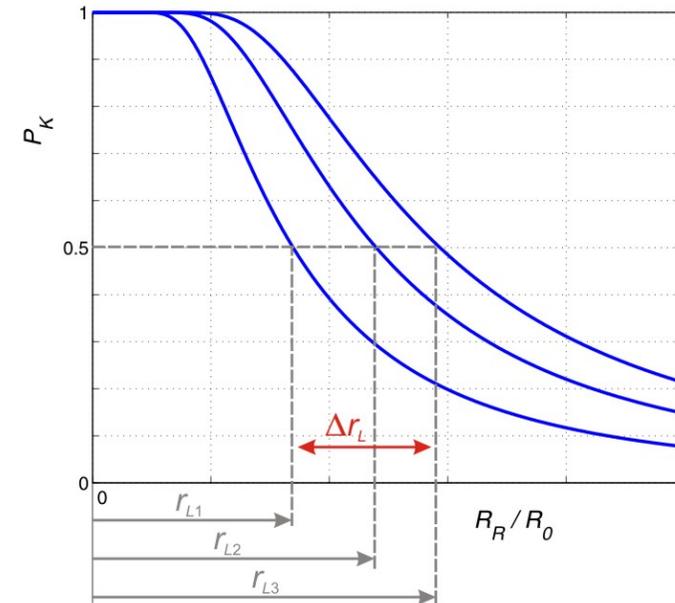
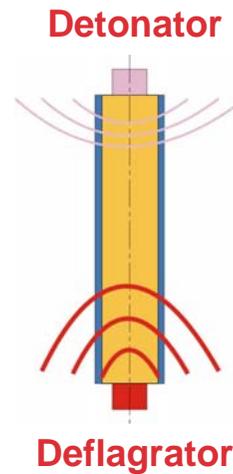
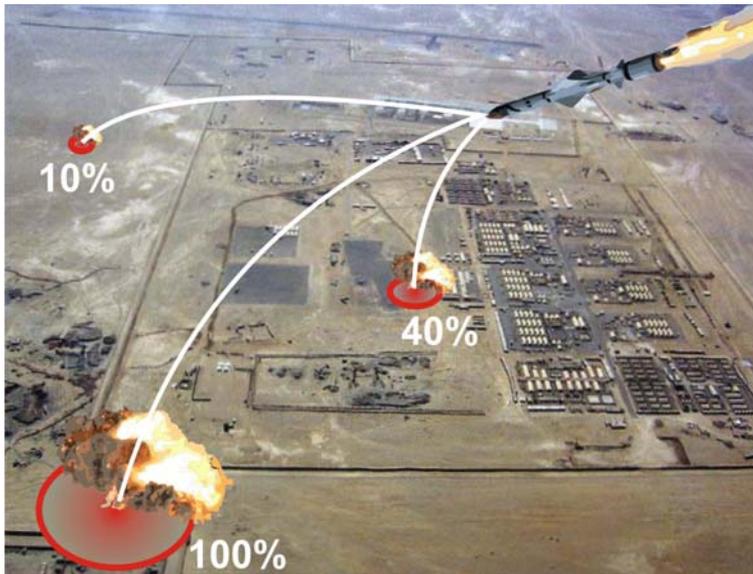
# Flexible Response Warhead Technologies





# Scalable Effects Warhead

- **Dial-a-Yield Technology: Lethal and Collateral Radii are Scalable**



## Scalable Effects Warheads

**Target-dependent, cockpit-selectable warhead response**



# Scalable Effects Warhead

- Dial-a-Yield Technology: Variable Fragment Effects**

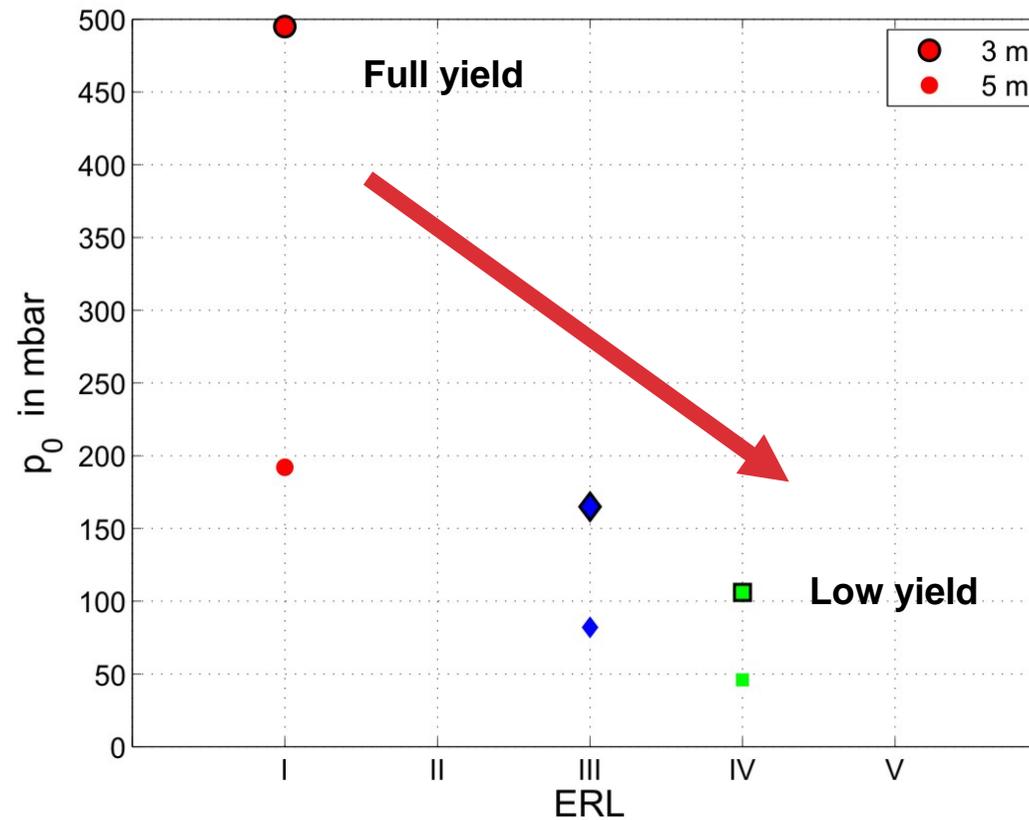
Low output mode	Scaled output		Full output mode
<10%	40%	80%	100%
Deflagration – ERL IV	ERL III	ERL II	Detonation – ERL I





## Scalable Effects Warhead

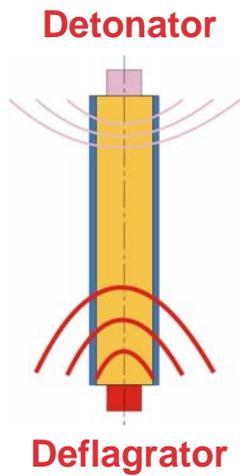
- **Dial-a-Yield Technology: Blast Effects are also Scalable**





# Experimental Setup

- TDWs Deflagration Cylinder Test



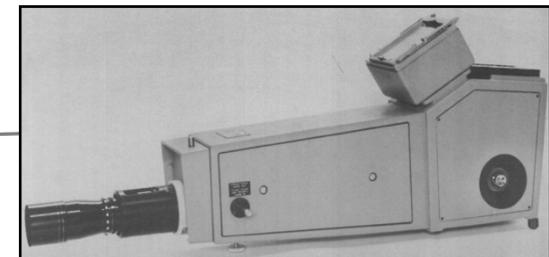
Protection by  
concrete barriers  
and metal plates



Argon bomb  
Steel tube with  
HE charge

Viewing direction  
of rotating mirror camera

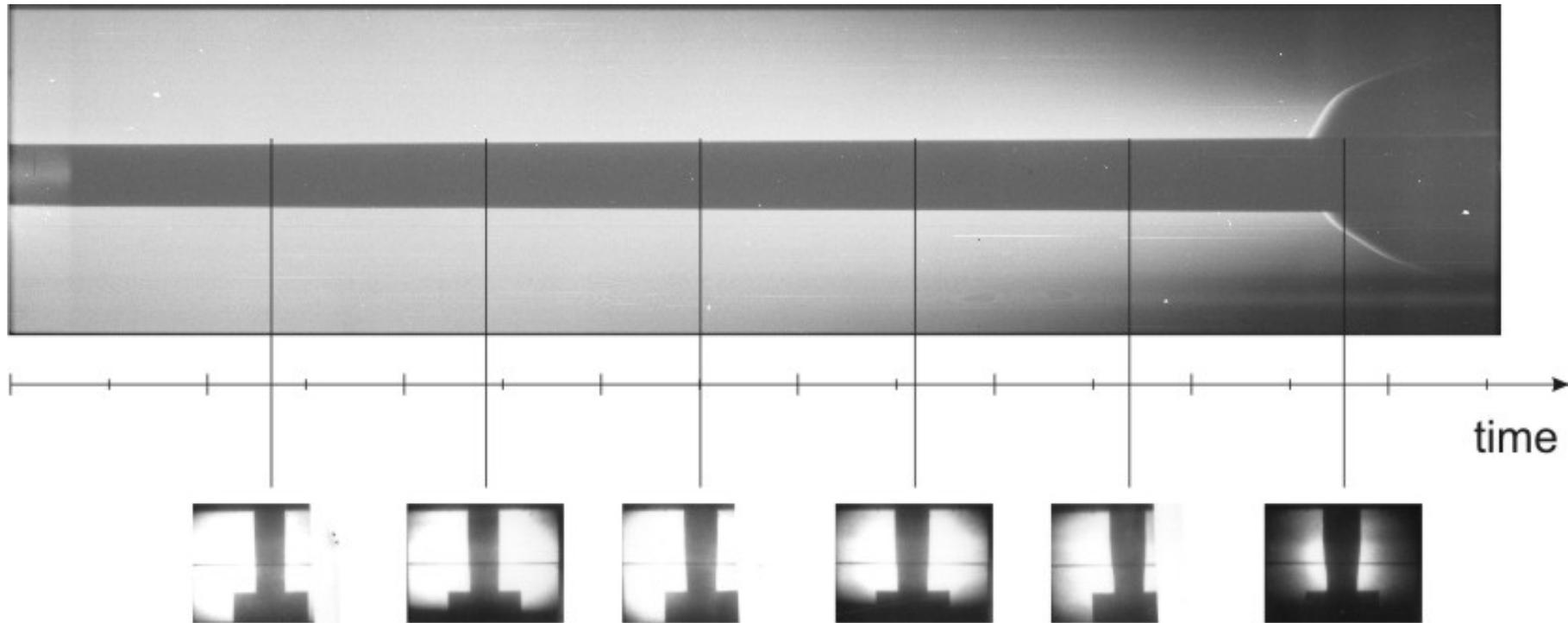
Cordin 200





## Combined Streak / Framing Records

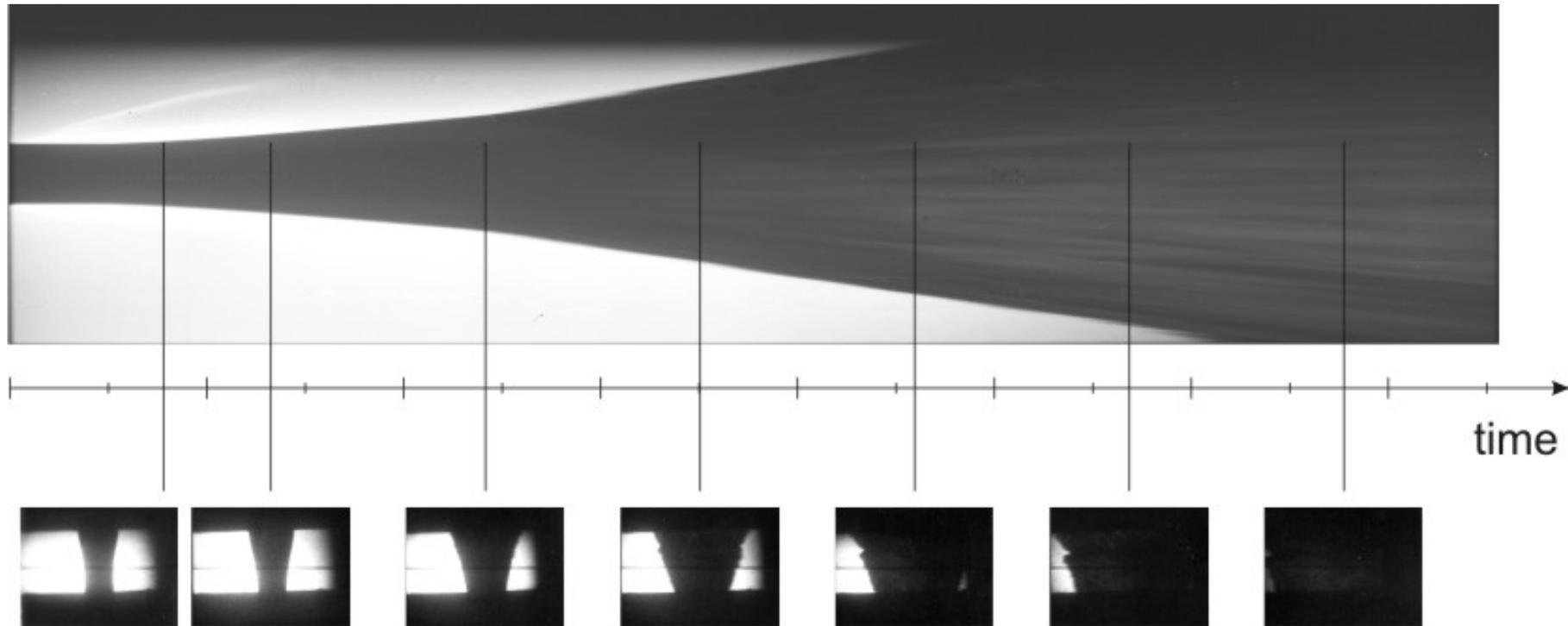
- Deflagration Reaction





## Combined Streak / Framing Records

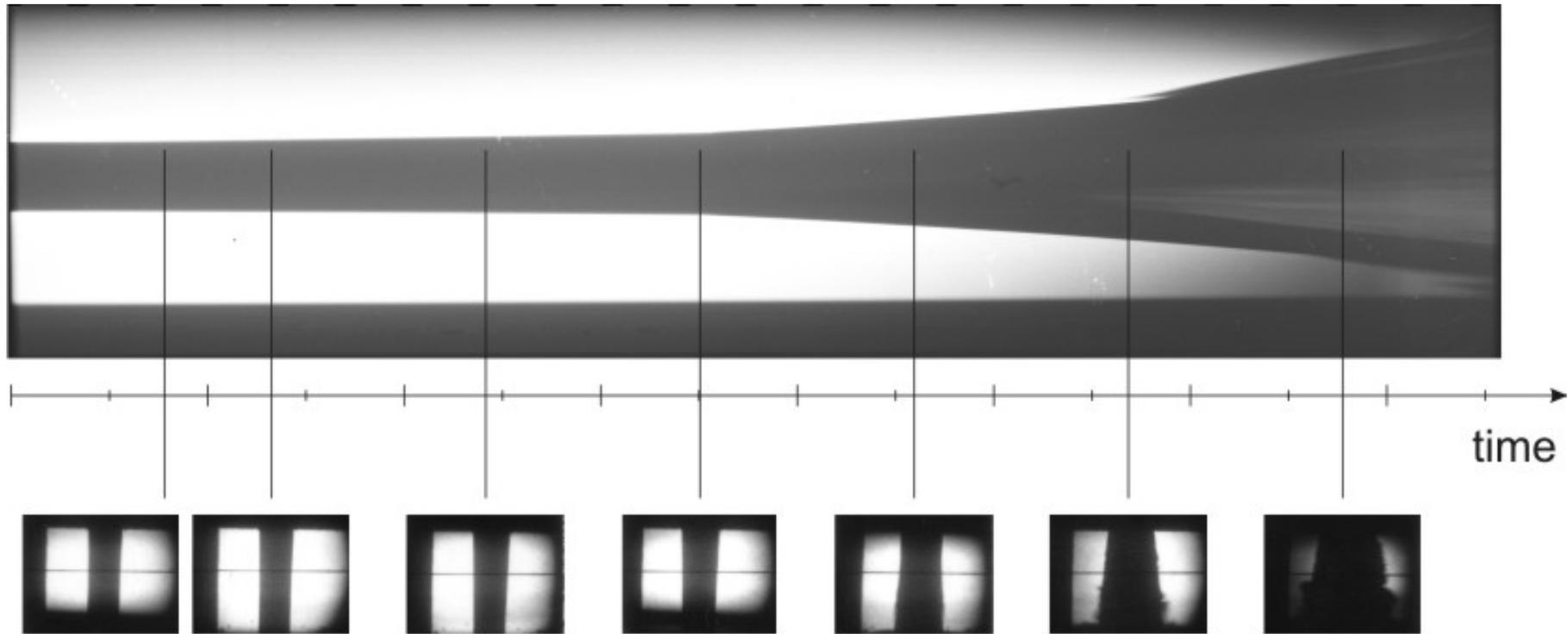
- Detonation Reaction





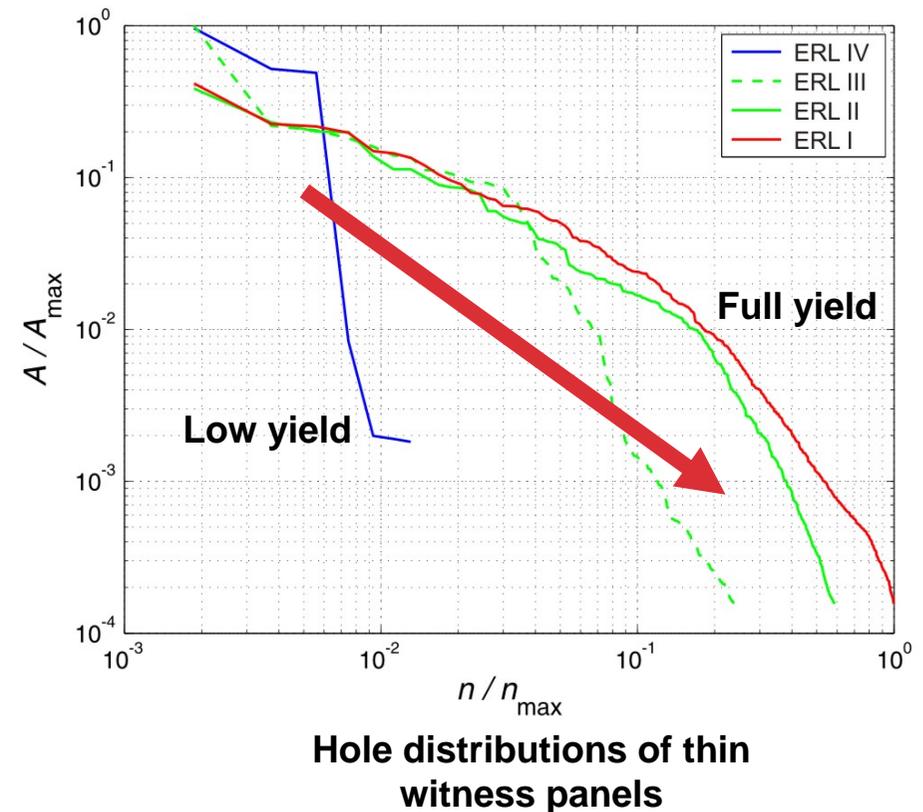
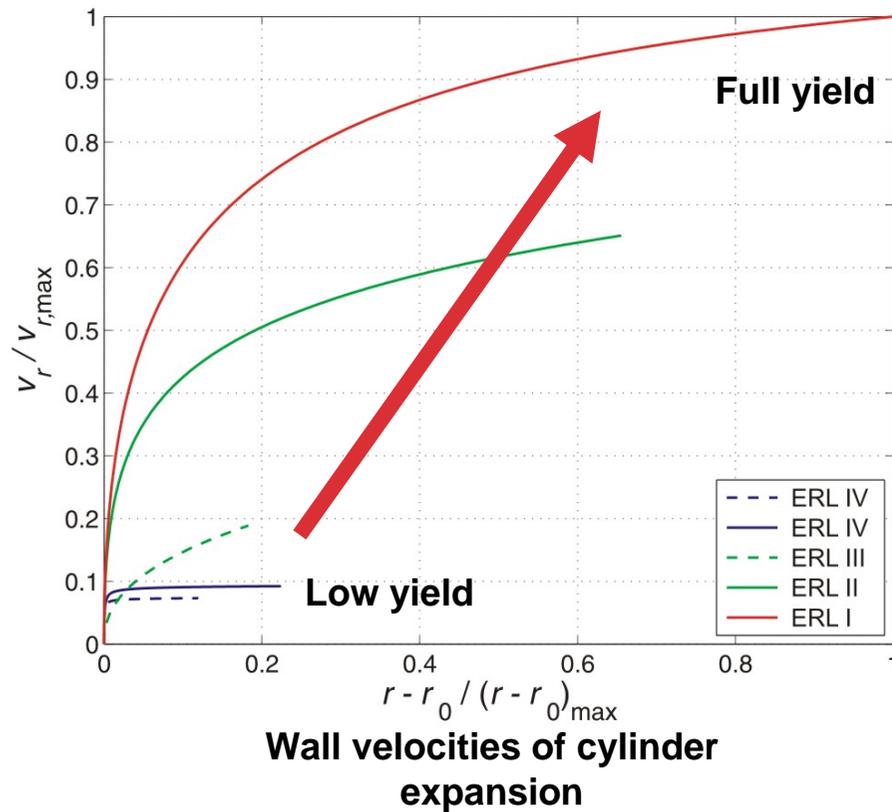
# Combined Streak / Framing Records

- **Overlaid Reaction**





# Proven Scalability of Fragment Effects of Small-scale Charges



**Fragment effects are scalable through fragment numbers, sizes, and velocities**



**Thank you very much!**

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