

U.S. Army Research, Development and Engineering Command



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Anti-Armor Warhead Venting N. Al-Shehab, D. Pfau, E. L. Baker, A. Daniels

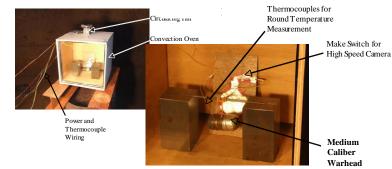
2010 IMEM Symposium 11-14 October 2010



Background



- Typically Anti Armor Warheads (AAW) respond violently to cook-off events
 - AAW have the highest energy/metal accelerating explosives.
- Technology involves release of the shape charge (SC) liner to prevent explosive pressurization in the warhead during cook-off events.
- 40mm medium caliber warhead baseline and concept prove-out testing conducted under a PEO Ammunition funded effort
- Medium caliber testing clearly shows that fuze release is a practical method of reducing the warhead reaction violence during a cook-off event





Type II

Baseline







Type V

Background: 40mm Liner Release



40mm Liner Release Concept testing

Polycarbonate Thread Ogive Delrin Pinned Ogive Reduced Thread Ogive



SET UP



POST TEST RESULTS











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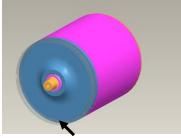
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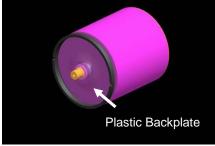
MRM Venting Concepts



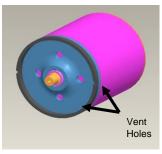


Plastic Retaining Ring

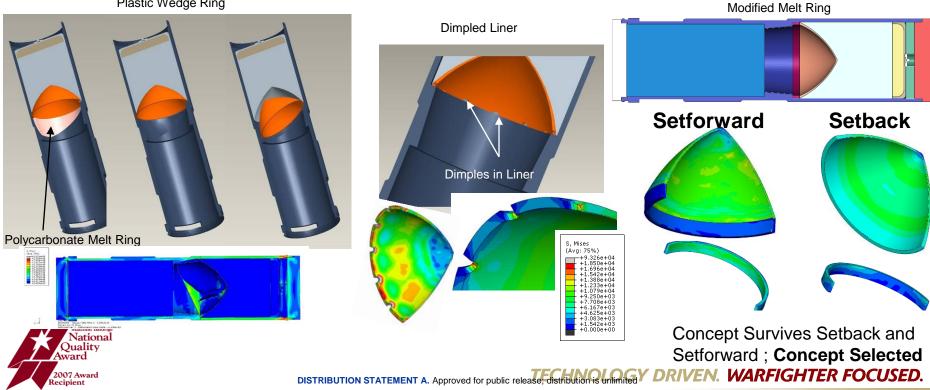
Aft Venting Concepts



Forward Venting Concepts



Vented Backplate



Plastic Wedge Ring

MRM Thermal Modeling



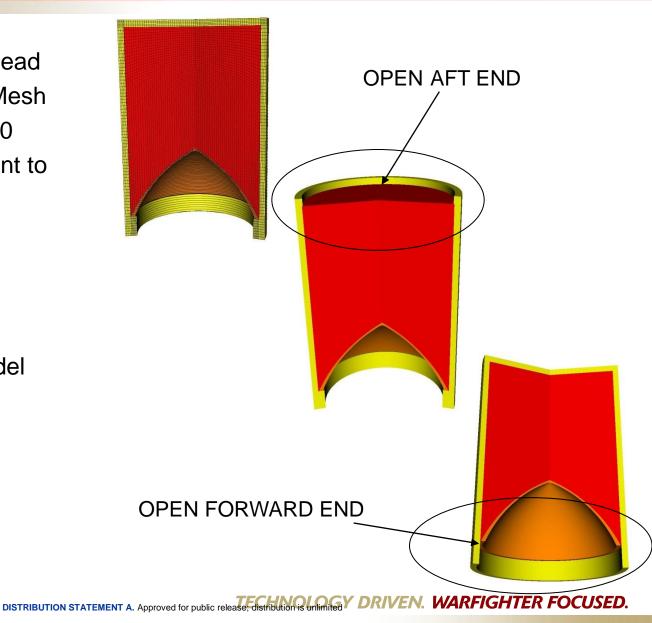
- Defeatured MRM warhead •
- TrueGrid Lagrangian Mesh •
- **Prout-Thompkins LX-10** ٠

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- Similar HMX content to PBXN-9
- < 3k elements, 2-D
- **Baseline model**

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- Open aft-end model
- Open forward-end model



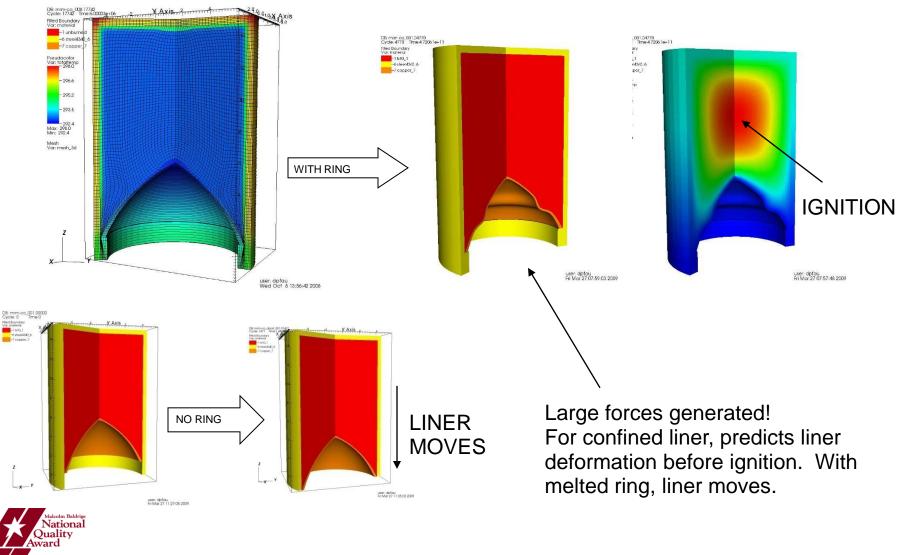




2007 Award Recipient

MRM Thermal Modeling







Baseline and Concept Prove-Out: SCO

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2007 Award Recipient

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IT WORKS!



Baseline and Concept Prove-Out: FCO



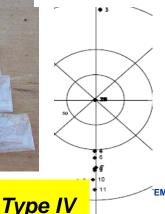
Baseline FCO Test



Body and Pic Assembly @ 183'



Waveshaper @ 163'

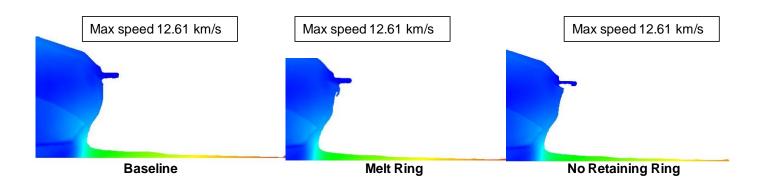


Concept Prove-Out

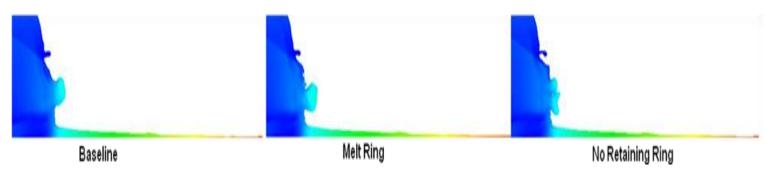


Unreacted HE

MRM Venting Concept Performance Modeling



Jet velocity of various configurations of the MRM warhead at 34µs.



Velocity profiles of at 49µs, just prior to target impact.

Inserting melt ring also has minimal impact on jet velocity and jet profile.



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MRM SCO Baseline Test With front and aft simulants – Violent Response



System Level Confinement increases the reaction violence during SCO event





MRM Snap Ring SCO Test With front and aft simulants – Type IV

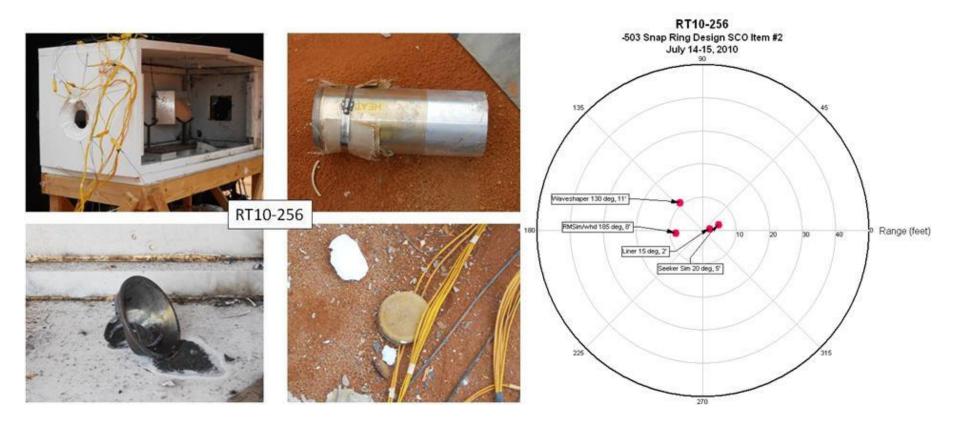




Liner venting allows for depressurization during SCO event



Second MRM Snap Ring SCO Test With front and aft simulants – Type IV



Liner venting allows for depressurization during SCO event





MRM FCO Baseline Test With front and aft simulants – Violent Response



Rocket Motor found 100ft away. All debris to the aft end of the munition





MRM Snap Ring FCO Test With front and aft simulants – Type IV





National Depressurization occurs at warhead –seeker Simulant interface





System Level Confinement increases reaction violence of the munition

- Liner Release Venting technology is a practical means of relieving pressures within the warhead to mitigate SCO and FCO threats
- Relatively low cost of implementing Liner Release design, high pay-off for mitigation of cook-off threats
- Designed using Modeling & Simulation (M&S) to meet launch requirements
- Performance M&S showed minimal impact on jet velocity and penetration. Performance testing shows that a symmetric vent design (melt ring) has minimal impact on the jet penetration.





The End



Questions

