



RDECOM



Composite Sabot Technology For 105-mm Gun System



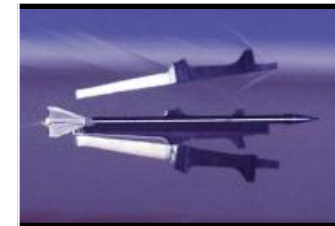
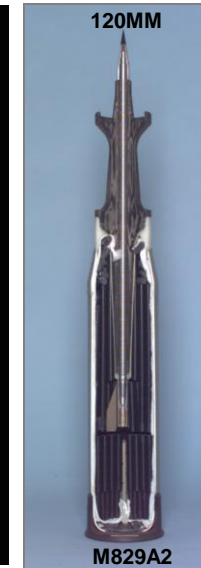
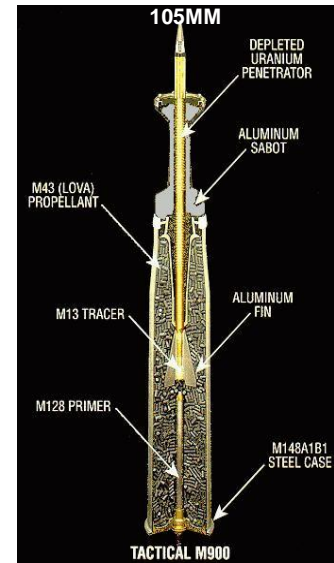
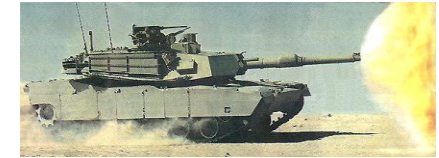
TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Velan Mudaliar

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- Long Rod Kinetic Energy(KE) Penetrator
 - Armor-Piercing defeat mechanism against enemy tanks.
- Sabot and Obturator Sub-Assembly
 - Provides sealing and structural support for KE Penetrator as projectile is accelerated inside gun tube upon ignition of cartridge's internal propellant bed
 - Obturator band separates and three segments of sabot are discarded upon exiting the muzzle of the gun tube
- Defeating Target
 - Long Rod KE Penetrator flies downrange towards the target and provides enough kinetic energy to pierce armor of enemy Tank.



Contributors

ARDEC –Velan Mudaliar, Saif Musalli, Shri Singh, Nicholas Payne, Daniel Prillaman

ARL – Michael Minnicino, William Drysdale

General Dynamics Ordnance Tactical Systems (GD-OTS)

Alliant Tech Systems (ATK)



Performance Enhancement Opportunity

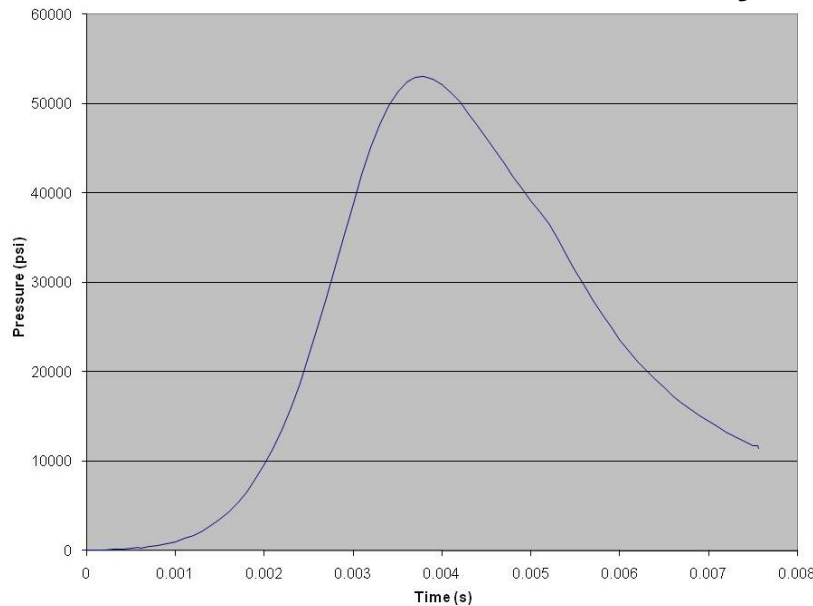


- Current 105-mm anti-armor ammunition uses aluminum sabot
- Lightweight composite sabot reduces the sabot mass, which increases velocity
 - Increased velocity delivers more kinetic energy to target or defeats enemy tanks at an extended range
 - Composite technology currently used in the 120MM smooth bore gun system.
- 105-mm gun system is rifled
 - The spin environment provides unique challenge to composite sabot technology
 - Survivability against spin environment favors strength enhancement in the hoop direction
 - Current manufacturing process for 120-mm composite sabot does not offer a good solution to provide strength in the hoop direction.
- ARDEC and ARL concepts should enable lightweight composite sabot structure to survive launch from 105-mm gun system
- Goal: Reduce sabot weight by at least 25%

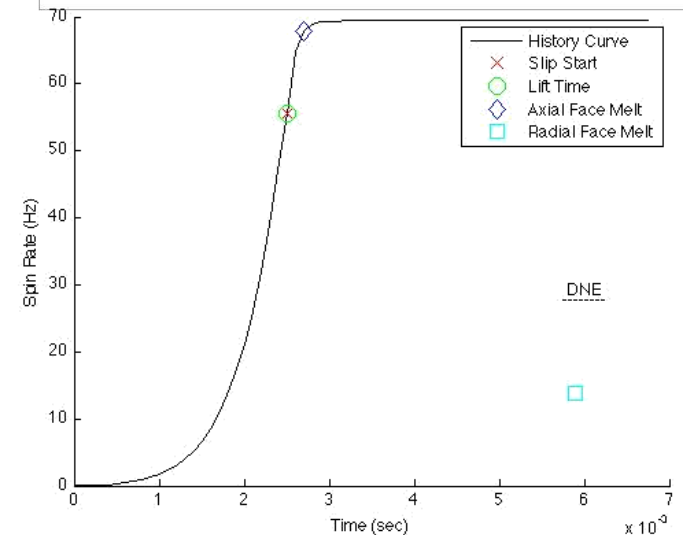
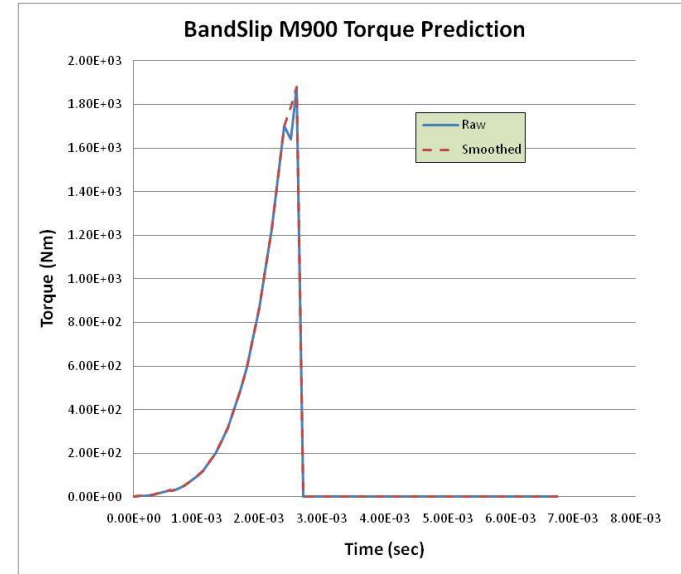
Bandslip Torque-Time History Estimation

- Bandslip Input: projectile & gun geometry, projectile inertial properties, base pressure-time history
- Bandslip Output: projectile dynamic time histories

Base-Pressure-Time History

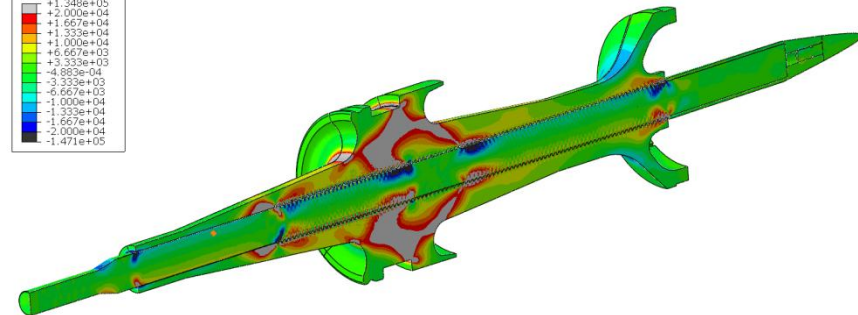
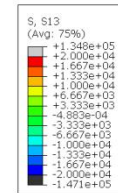
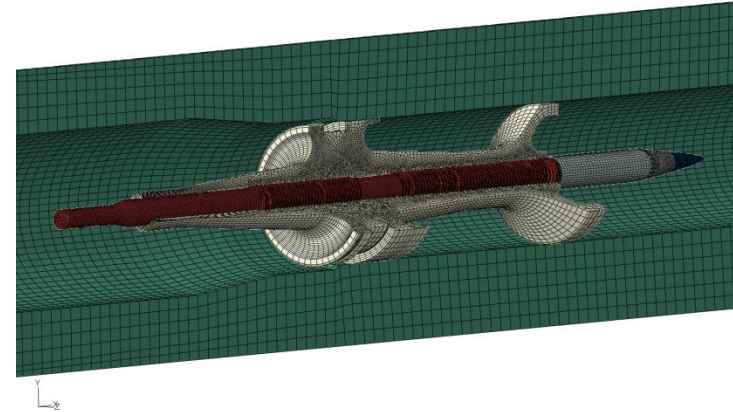


Torque-Time History



Spin Rate-Time History

- Modeling & Simulation of spin environment in 105-mm rifled gun tube system is very complex.
 - Considers spin induction from the rifling of the gun system and the obturator with the slip band.
 - Empirical values were used for inputs
 - Initial torque when the obturator is engaged in the forcing cone of the gun tube
 - Spin data
- M&S Results:
 - Composite sabot structure lacks sufficient strength in the hoop direction to survive 105-mm gun launch.





Four Approaches Examined



1. Reduce Torque
2. Increase Interlaminar Shear Strength
3. Rotate Architecture
4. Hybrid Concepts (Current Focus)

Concept description

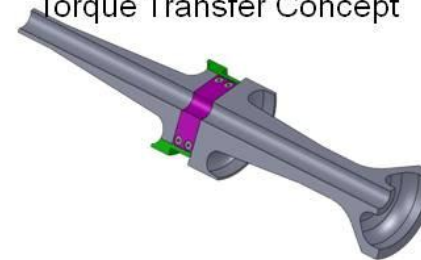
- Bulk Head Concept
 - Provides a metallic surface for interfacing with the obturator/slip band
 - Protects composite sabot from exposure to propellant gases inside gun tube.
- Torque Transfer Concept
 - Same capabilities as Bulk Head Concept but with an additional function: transfer of torque to the penetrator.
- Wedge Concept
 - Transfers the torque along the length of the sabot.

Concept sketches

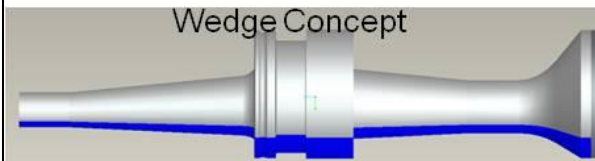
Bulk Head Concept



Torque Transfer Concept



Wedge Concept





Current Status



- Contracts awarded to GD-OTS and ATK to develop full-scale prototypes of hybrid concepts discussed
- Live-fire testing of prototypes will take place at Yuma Proving Ground in October 2011
- Concepts will be refined based on test results and prototypes will be fabricated for final iteration of testing in early FY12



Velan Mudaliar

U.S. Army RDECOM-ARDEC

Munitions Engineering Technology Center (METC)

LOS-BLOS Munitions Division

Ph: 973-724-6177

velan.mudaliar@us.army.mil