Composite Sabot Technology
For 105-mm Gun System

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Background

- **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.

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General Dynamics Ordnance Tactical Systems (GD-OTS)
Alliant Tech Systems (ATK)
• 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

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

<table>
<thead>
<tr>
<th>Concept</th>
<th>Details</th>
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<tr>
<td><strong>Bulk Head Concept</strong></td>
<td>- Provides a metallic surface for interfacing with the obturater/slip band</td>
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<td>- Protects composite sabot from exposure to propellant gases inside gun tube.</td>
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<td><strong>Torque Transfer Concept</strong></td>
<td>- Same capabilities as Bulk Head Concept but with an additional function: transfer of torque to the penetrator.</td>
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<td><strong>Wedge Concept</strong></td>
<td>- Transfers the torque along the length of the sabot.</td>
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### Concept sketches

- **Bulk Head Concept**
- **Torque Transfer Concept**
- **Wedge Concept**
• 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
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