S40x180mm Ammunition for the MK44 Weapon

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GENERAL DYNAMICS
Ordnance and Tactical Systems

S40x180mm MK44 Ammunition

- Brief S40mm ammunition history
  - US Army Contract Efforts
  - Internal Research and Development (IRAD) Efforts
- S40mm Ammunition Family
  - Armor Piercing Fin Stabilized Discarding Sabot with Tracer (APFSDS-T)
  - Multi Purpose Air Burst with Tracer (MPAB-T)
- Summary

GD-OTS and ATK working together to further S40mm technology

S40x180mm - Introduction

The S40mm MK44 capable weapon and ammunition solution is ready for U.S. Army study and test.

- The 30mm MK44 weapon is a battle proven system with a complete family of qualified ammunition ranging from target practice, armor piercing and high explosive cartridges.
- The proven MK44 weapon contains growth provisions for S40mm cartridges
  - Increasing lethality over 30mm where…bigger is better.
  - Minimal up-gun cost impacts due to a combination of MK44 weapon part commonality and interchangeability.

30mm to S40mm Projectile Growth
Placing more Lethality on Target

30mm and S40mm with the MK15 Link

S40mm - Introduction

- Maintains lethality overmatch against the most common/capable threat.
- Leverages existing scalable 30mm cartridge technologies and qualified explosive items.
- Can use existing and established US supplier base to meet growth objective needs.
- Allows use of common 30mm MK44 and S40mm MK44 weapon parts

30mm,S40mm, and larger caliber commonalities = Lower Cost

Brief S40mm Ammunition History

- US Army Contract Efforts
- Internal Research and Development (IRAD) Efforts

S40mm – US Army Contract Efforts

2001-2005 – US Army Contract for the Advanced Light Armaments Combat Vehicle (ALACV):

- Propellant development for:
  - Multi Purpose Air Burst with Trace (HEAB-T)
  - Target Practice with Trace (TP-T)
- Cartridge development:
  - S40mm x 218 APFSDS-T
  - S40mm x 165 HEAB-T
- Live fire demonstrations at High Rate Bursts (HRB) out of the MK44 mounted in a Bradley Fighting Vehicle.
- Successful APFSDS-T ballistic penetration performed.
- Successful HEAB-T ballistic function demonstrated.

S40mm–Internal Research and Development (IRAD)

2001-Present –IRAD:

- Common S40mm x 180mm case design, development, tooling and manufacture complete for S40mm ammunition family.
- S40mm APFSDS-T Cartridge Design:
  - Successful aluminum sabot ballistic testing with common case.
  - Composite material sabot solution in progress.
  - Propellant solutions from GD-OTS St. Marks and GD-OTS Canada very near objective.
- S40mm MPAB-T Cartridge Design
  - Induction or contact set fuze with:
    - PD/PD delay
    - Self destruct
    - Selectable short/long fuze arming ranges
- S40mm TP-T Cartridge Design
  - Simple two piece metal projectile design for low cost production.

S40mm Ammunition Family

S40mm Ammunition Family

- APFSDS-T for armor targets. Features include:
  - Cobalt free penetrator
  - Composite sabot assembly
- MPAB-T for urban and troop targets. Features include:
  - PD/PD delay
  - Short or long selectable arming ranges
  - Airburst function
  - Self destruct function
  - Induction or contact communication fuze

MPAB-T TP-T APFSDS-T

Projectile technology is scalable to larger calibers for increased requirements.

S40mm Armor Piercing Fin Stabilized Discarding Sabot with Tracer (APFSDS-T)

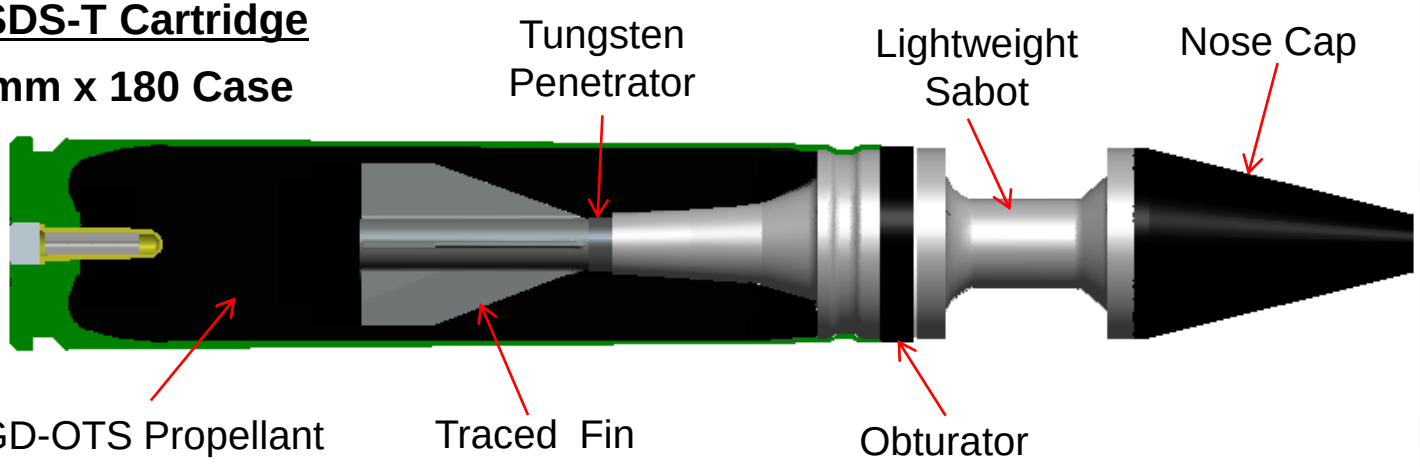
S40mm APFSDS-T – Design Characteristics

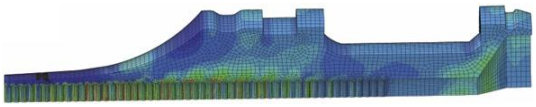
Projectile Features:

- S40mm provides ~50% higher flight weight (penetrator, fin, and windscreen) than the 30mm APFSDS-T.

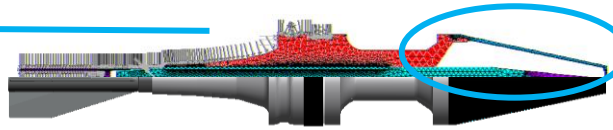
APFSDS-T Cartridge

S40mm x 180 Case

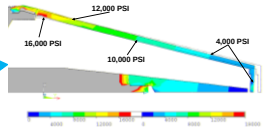




Composite Sabot FEA

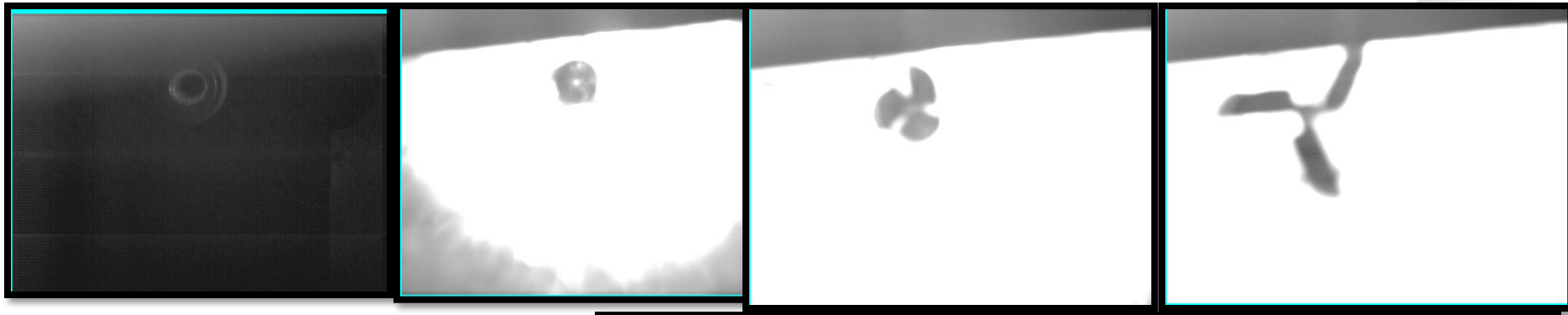


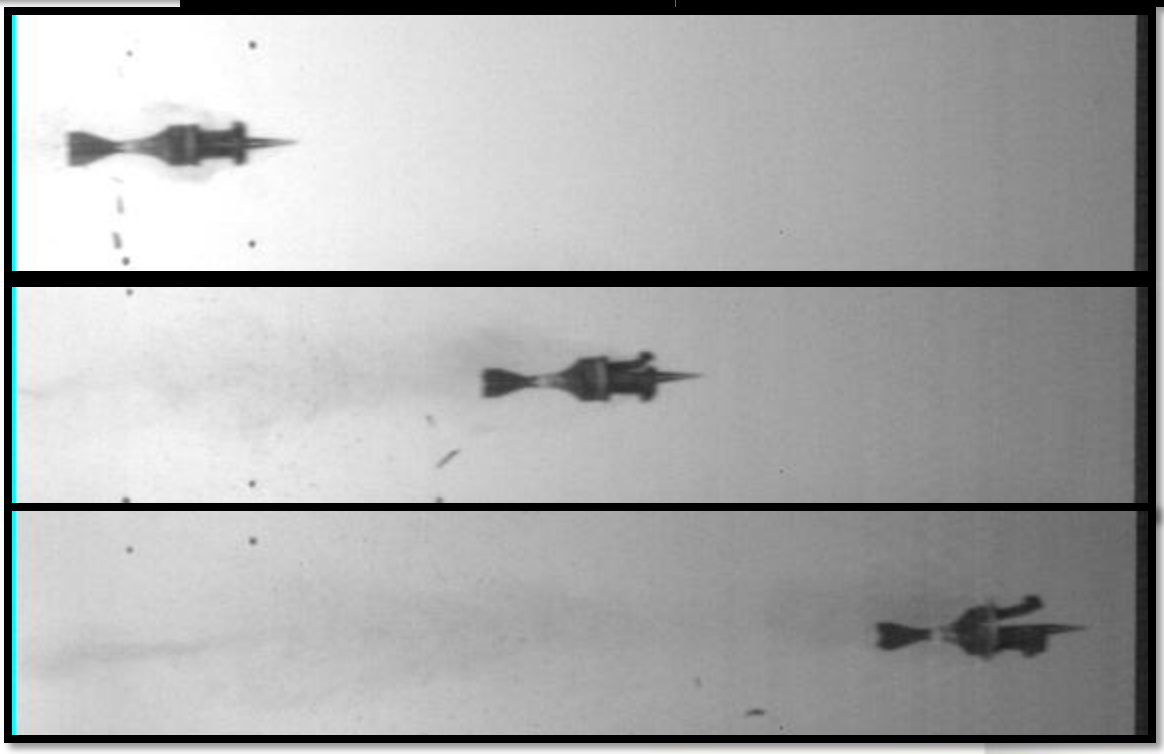
Projectile Launch Loads



Nose Cap/Penetrator Tip FEA

S40mm Composite Sabot Ballistic Test: Down Muzzle and Sideline Projectile Views





Successful composite sabot ballistic testing using St. Marks Powder Hybrid® Propellant

S40mm APFSDS Composite Sabot

Objective:

Transition from aluminum to composite sabot decreasing sabot mass by 43% for a lighter weight projectile translating to higher velocity, kinetic energy, and penetration capability

Status:

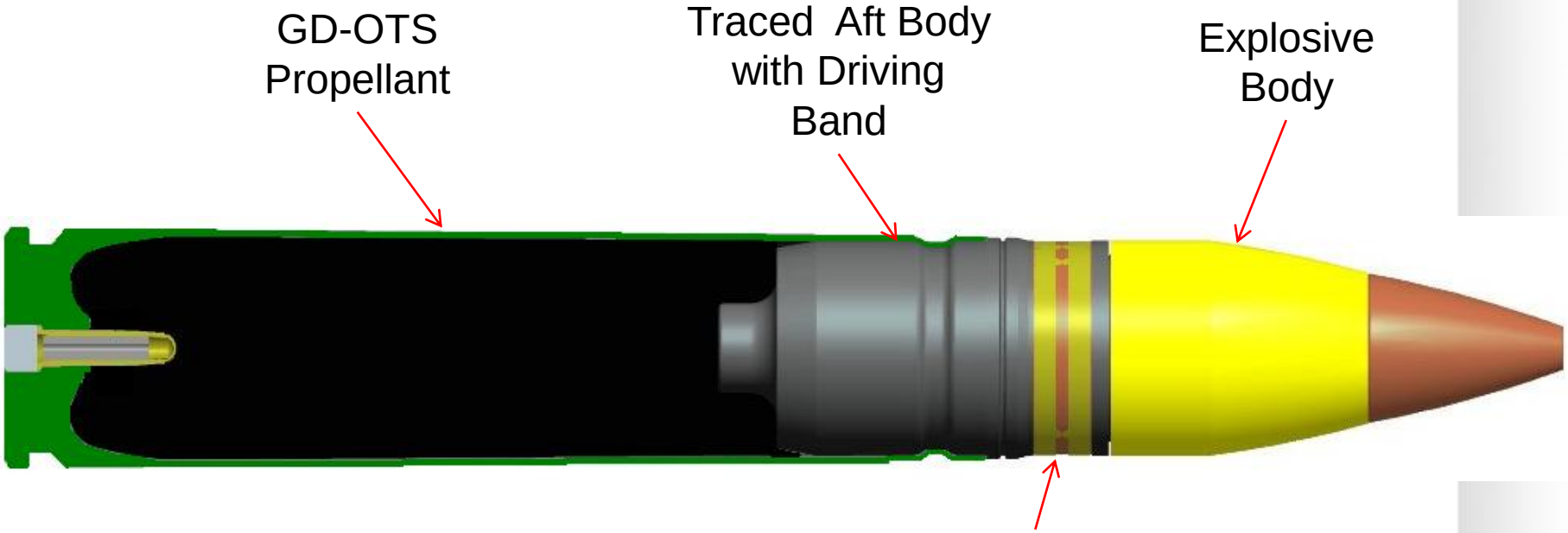
- Design work complete
- Composite sabot mold fabricated and producing test parts
- Initial testing complete

Next Steps:

- Additional ballistic testing at temperatures
- MK44 weapon testing

S40mm Multi Purpose Air Burst with Tracer (MPAB-T)

S40mm MPAB-T Cartridge



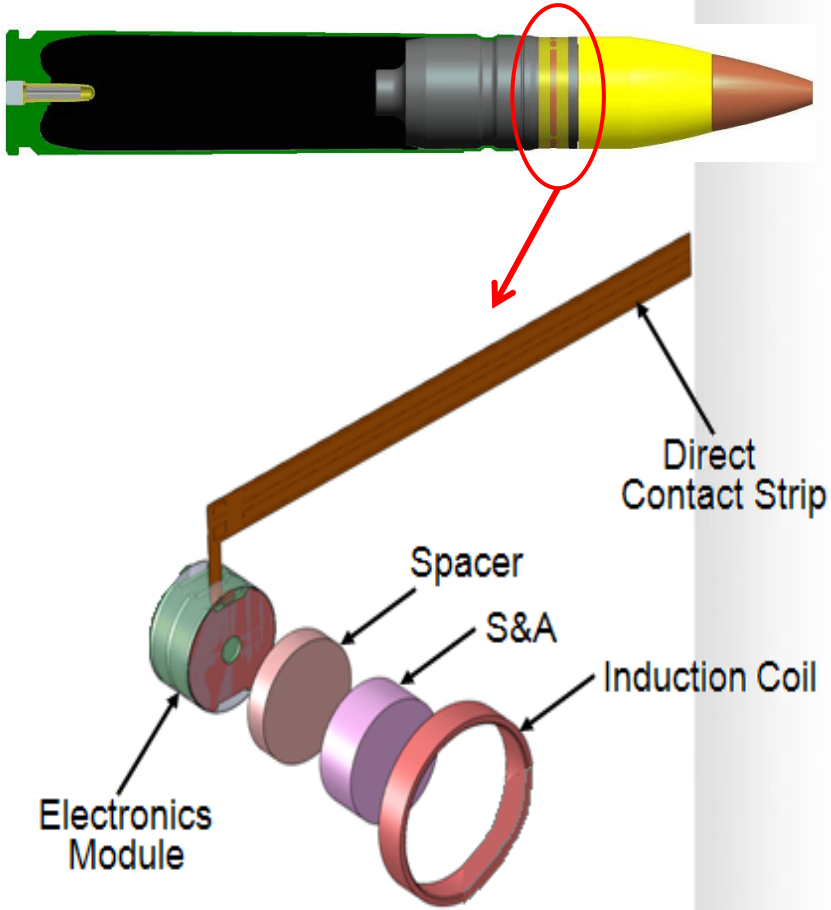
MPAB-T Cartridge

S40mm x 180 Case

Induction communication option follows STANAG 4547 protocol

S40mm Air Burst – Fuze Characteristics

- Inductive or contact set, time-based, programmable electronic fuze.
- Airburst function
- PD/PD Delay feature to:
  - Increase capability of the ammunition and eliminate the need for HEI PD ammunition.
  - Defeat light materiel targets
  - Provide PD function in the unlikely event that PD is preferred or an air burst communication signal fails.
- Selectable arming: allows user to select an arming range of short or long.
- Self destruct function



Induction/Contact Airburst Fuze

Summary

- The S40mm cartridges offer greater lethality than 30mm without reducing the number of stowed rounds:
  - APFSDS-T design provides more kinetic energy on target vs. 30mm
  - MPAB-T design is up to 3 times more lethal than 30mm
- APFSDS-T sabot and GD-OTS propellant development will yield goal muzzle velocity by end of 2011.
- The S40mm APFSDS-T and MPAB-T munitions have been successfully demonstrated out of the MK44 cannon
- S40mm technology is scalable to larger calibers as required

MK44 Weapon

S40mm Family

MPAB TP KE