"Precision and Lethality in Medium and Large Caliber"

Super 40mm Ammunition – Performance/Lethality
S40mm MK44 Ammunition

• Why S40mm ammunition?
• Lethality of S40mm over 30mm
• Brief S40mm ammunition history
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  – Internal Research and Development (IRAD) Efforts
• S40mm Ammunition Family
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  – Multi Purpose Air Burst with Tracer (MPAB-T)
  – Target Practice with Tracer (TP-T)
• Summary
Why S40mm ammunition?
Why S40mm Ammunition?
The up gunned S40mm MK44 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
Why S40mm Ammunition?

It is a solution that meets the Army’s future fighting capability growth objective:

- To maintain lethality overmatch against the most common/capable threat
- Leverage existing 30mm cartridge technologies and qualified explosive items
- Existing and established US supplier base currently implementing growth objective needs
- Common 30mm MK44 and S40mm MK44 weapon parts
- Common MK15 cartridge link for 30mm and S40mm
- Nearly common cartridge packaging system for 30mm and S40mm

30mm and S40mm commonalities = Lower weapon system costs
Lethality of 540mm over 30mm
S40mm APFSDS-T offers up to 20% more lethality over the 30mm APFSDS-T while allowing the same number of stowed rounds.
S40mm Air Burst offers up to 3 times the lethality of the 30mm Air Burst while allowing the same number of stowed rounds.
Brief S40mm ammunition history

- US Army Contract Efforts
- Internal Research and Development (IRAD) Efforts
S40mm – US Army Contract Efforts


• Propellant development for:
  – Armor Piercing Fin Stabilized Discarding Sabot with Trace (APFSDS-T)
  – Multi Purpose Air Burst with Trace (MPAB-T)
  – Target Practice with Trace (TP-T)

• Cartridge development:
  – S40mm x 218 APFSDS-T
  – S40mm x 165 MPAB-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 MPAB-T ballistic function demonstrated
S40mm–Internal Research and Development (IRAD) Efforts

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 process
  – Propellant solutions from GD-OTS St. Marks and GD-OTS Canada within 10% of goal at ambient temperature

• 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
- **TP-T** for training. Features include:
  - Simple two piece projectile construction for low cost production
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
- Muzzle velocity consistent with the 30mm APFSDS-T at 1430 mps
- This yields an ~ 20-25% increase in penetration capability over the 30mm and >145% more kinetic energy on target at 2,000 m

APFSDS-T Cartridge

S40mm x 180 Case
S40mm APFSDS-T – Penetrator

S40mm penetrator comparison placing more lethality on target over current 25mm and 30mm solutions.
S40mm Challenges and Solutions

Challenge: Muzzle velocity goal of 1430m/s

Solution:
- GD-OTS propellant solutions:
  - SHP831 Hybrid Propellant produced by St. Marks Powder
  - Mixed propellant from:
    - St. Marks Powder, SHP831 Hybrid
    - GD-OTS Canada, Extruded SPDN
  - Transition from aluminum to composite sabot decreasing projectile mass

Status:
- Current velocity breakthrough with General Dynamics St. Marks SHP831 Hybrid propellant at ambient temperature
- Within ~10% of the ambient velocity goal with aluminum sabot
- Loose fill propellant pour
- Additional testing planned with composite sabot later in 2010 to reach velocity goal

Approved for Public Release
S40mm APFSDS-T - Demonstrated Performance

Spin, yaw, dispersion, penetration, trajectory, and autogun testing have been successfully performed.

Back Side of 2” Armor Plate (3km equivalent)

4” Back-up Plate
S40mm Multi Purpose Air Burst with Tracer (MPAB-T)
S40mm MPAB-T Cartridge

GP-DTS Propellant

Traced Aft Body with Driving Band

Explosive Body

Electronic Induction or Contact Set Fuze (contact version shown)

MPAB-T Cartridge
S40mm x 180 Case
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 an air burst communication signal fails
- Selectable arming: allows user to select an arming range of short or long
- Self destruct function
S40mm Air Burst - Demonstrated Performance

One 3-rd burst hit 12 of 12 mannequins and perforated vests/helmets 7 times (2 mannequins) @ 600m
S40mm Target Practice with Tracer (TP-T)
S40mm TP-T

Projectile Features:

- Simple two piece metal projectile design for low cost production
- Ballistic match to the MPAB-T
- Qualified tracer configuration: PGU-30 trace igniter and M793 trace sustainer
The S40mm cartridges offer greater lethality than 30mm without reducing the number of stowed rounds:

- Developed link and linkless MK44 feed systems have provisions for S40mm ammunition.
- APFSDS-T design provides ~20-25% more penetration than 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 2010.

The S40mm APFSDS-T and MPAB-T munitions have been successfully demonstrated out of the MK44 cannon.

Storage Volume
30mm = 40mm