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Propelling System for Super 40mm ALACV AirBurst Munition

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S40mm ALACV

- This Presentation Will Focus on Two Issues With the S40mm AirBurst Projectile & Cartridge
  - Development of the Test Projectile & Driving Band / Obturator System
  - Propellant Development for the ALACV AirBurst Application

Super 40mm ALACV Program

Design Restraints

- Cartridge case lengths given at 165mm for AB and 218mm for APFSDS
- Cartridge configuration based on 30mm x 173
  - Overall Length and case diameter
- Must fit into MK44 gun envelope
- Projectile Weight: 670gms
- Velocity objective: 1050 m/s
- Pressure: P + 3SD £ 496MPa

30/40mm Case Comparison

30/40mm

Case Family

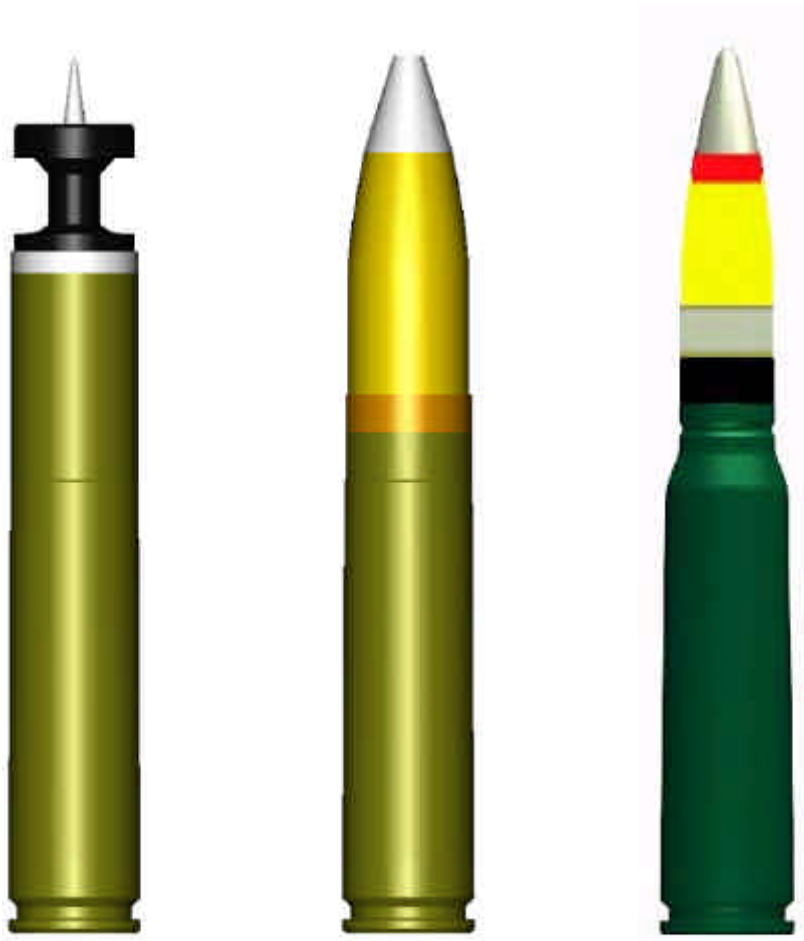
CTG	OAL
S40KE	218mm
S40AB	165mm
30mm	173mm

S40 KE **S40 AB** **30 x 173**

30/40mm Cartridge Comparisons

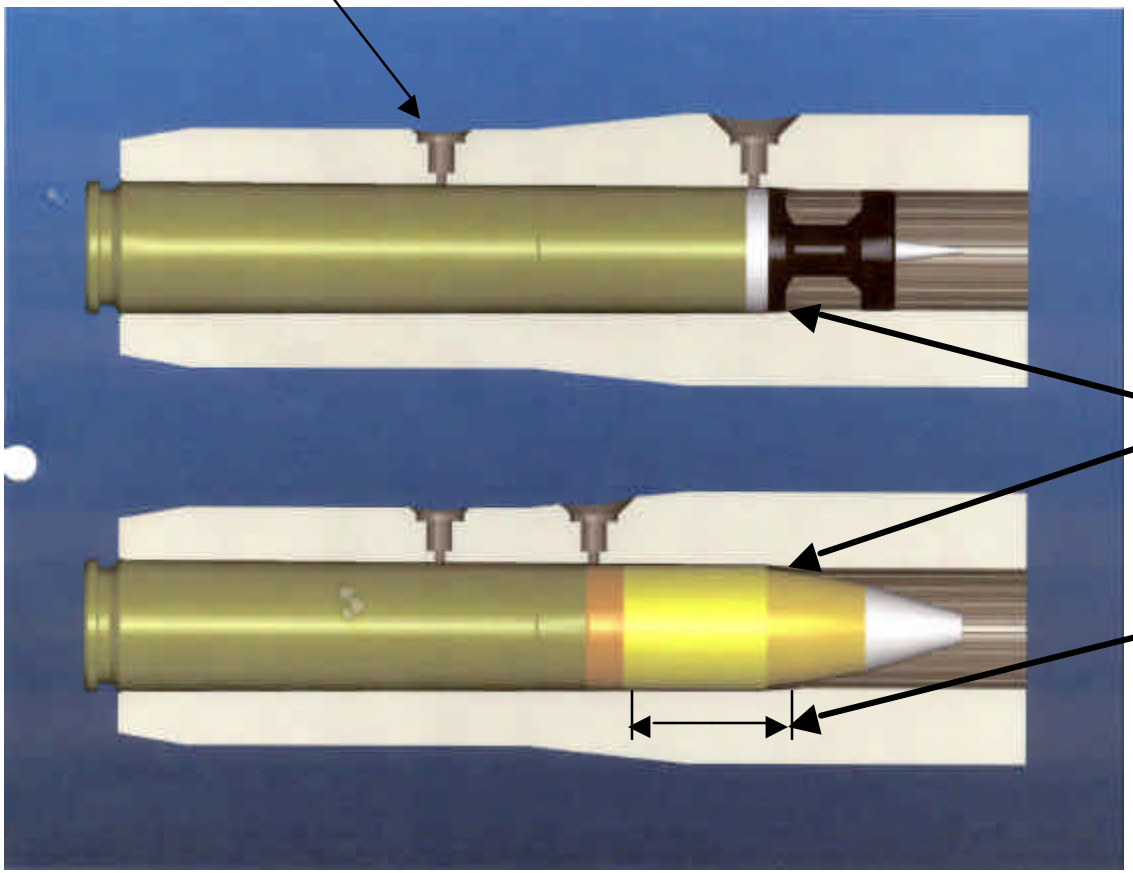
OAL

289.97mm max



S40 KE **S40 AB** **30 x 173**

S40mm Barrel Interface Drawing



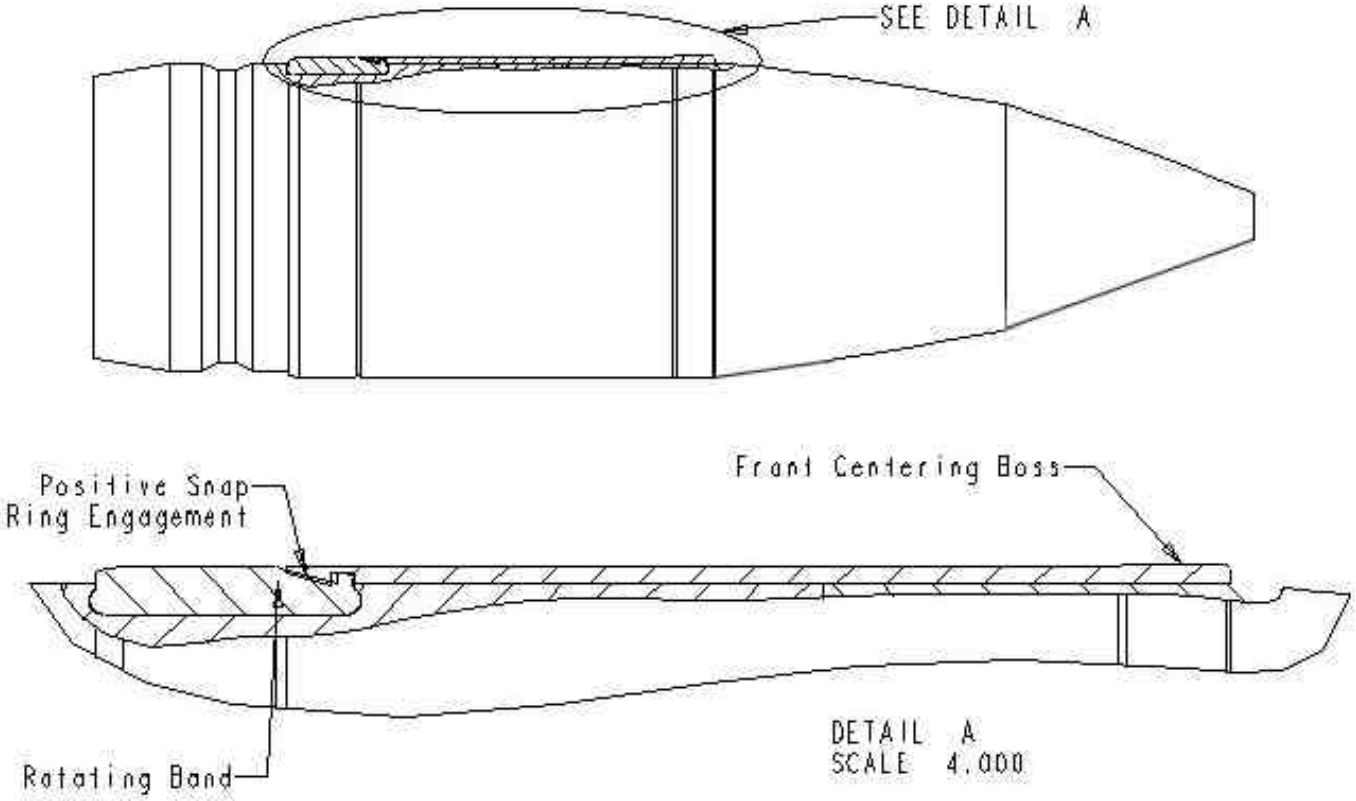
S40mm AB

The major design issue is:

- **How to seal the chamber area and prevent gas blow-by before the projectile driving band enters the forcing cone and rifling?**

S40mm AB Design Concept #1

LW40 AIR BURST PROJECTILE RIFLING SKIN CONCEPT



S40mm AB Design #1

- 5 plastic materials were downselected for evaluation of:
  - Ease of machining
  - Thermal expansion
  - Retention at extreme temperatures when assembled to the projectile
- The 2 best candidates selected for ballistic testing were Delrin AF and Nylatron.

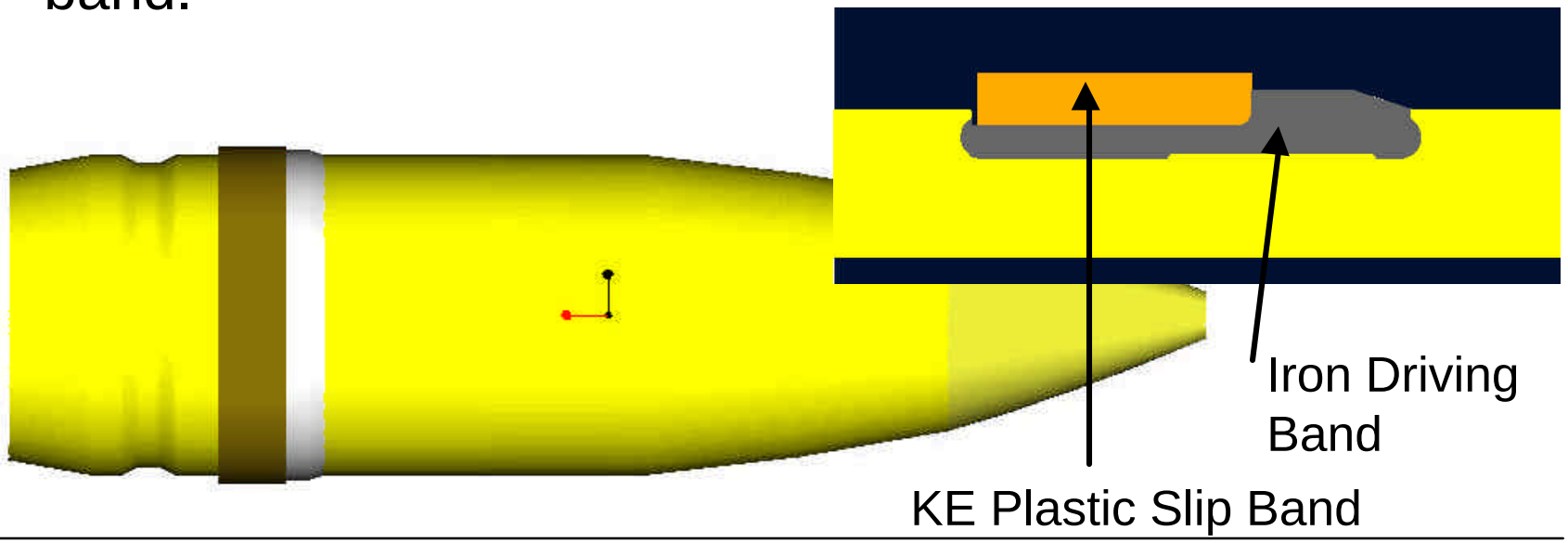
S40mm AB Design #1 Ballistic Tests

ABM Test @ SMP Sepember 2001

- AirBurst Slugs @ ~670 gms with Integral Rotating Band and SMP Hybrid Propellant @ +21°C.
  - 16 total rounds tested with & without sleeves
- Summary
  - Significant blow-by with/without sleeves
  - Back to the drawing board

S40mm AB Design #2

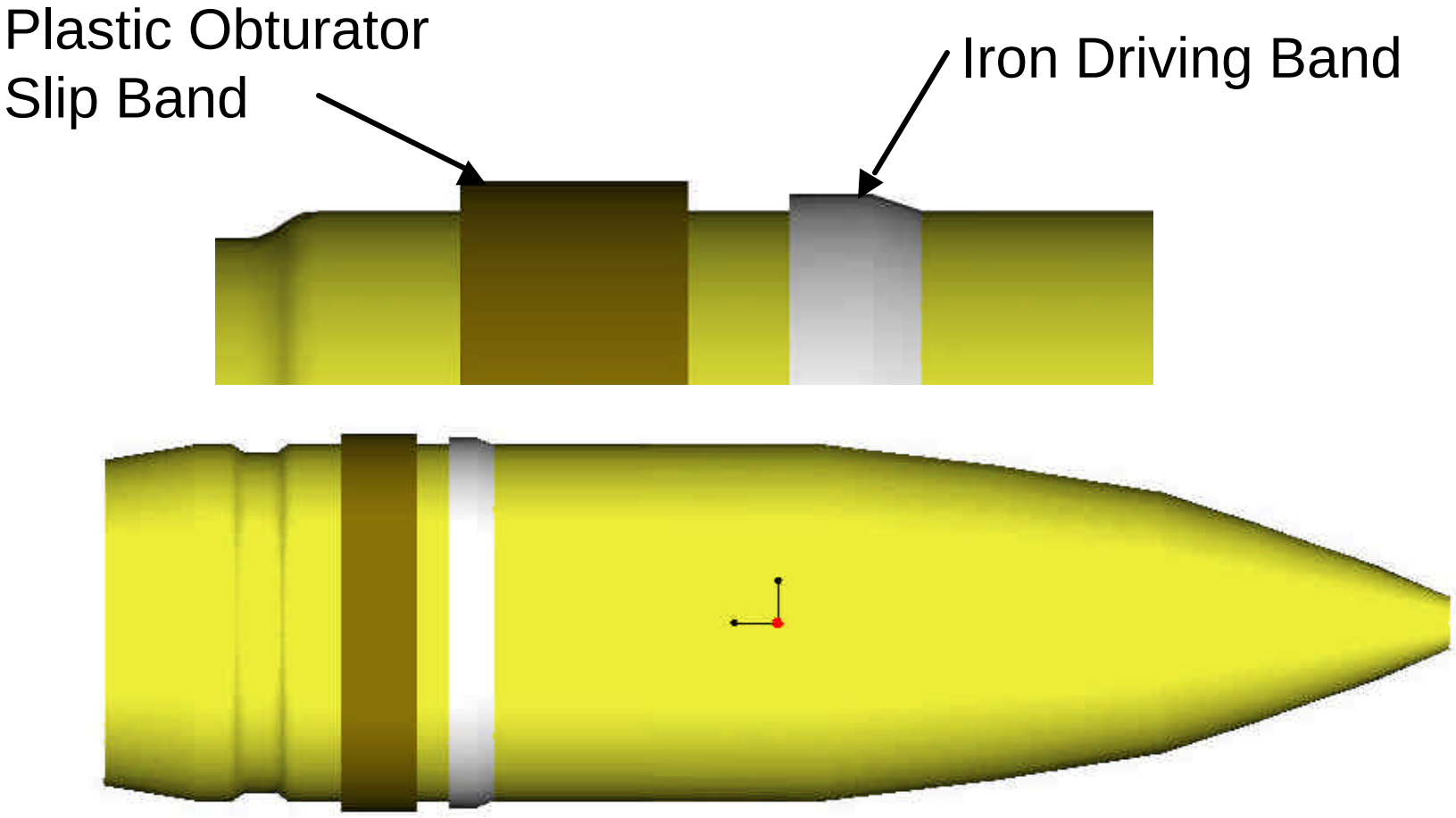
- Combine KE technology with AB round and install a plastic slip band behind the driving band.
- The purpose of the slip band is to seal in the 2” free travel
- The slip band fits over the “L” shaped soft iron driving band.



S40mm AB Design #2 Summary

- Initial testing at SMP in December 2001 showed no anomalies with pressures >480MPa
- Follow on Testing at NTS Camden in May 2002 resulted in:
  - 1 of 10 rounds in-flight instability on a dispersion test.
  - Follow on down bore digital video clearly showed small blow-by on several rounds.
  - Analysis showed that the soft iron band was failing under the plastic obturator

S40mm AB Design #3



S40mm AB Design #3

- Designed split band with .150” between the front driving band and the plastic obturator.
- Testing of 10 rounds with down-bore digital camera showed no obturator leakage.
- All subsequent tests (>120 rounds) have been fired successfully with no in-flight anomalies.
- Tests have been conducted at +140°C to -25°C.
- Pressures have been pushed to 480 MPa

S40mm AB Test Firing

Video from the UDLP test at Camp Roberts in 2002

S40mm AB Projectile Design Summary

- Combining KE slip band obturator technology to the AB round has been successful.
- The plastic obturator seals successfully in the 2” free flight region of the barrel before entering the forcing cone.