

# **THE NEXT GENERATION**

The case for a new NATO rifle  
and machine gun cartridge

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# THE LESSONS OF AFGHANISTAN

## Characteristics:

- Precise targeting required with limited effects
- Collateral damage must be minimised
- Focus on infantry and their weapons

## Key ammunition question:

Are the 5.56 mm and 7.62 mm cartridges optimal for the next generation of small arms?

# THE RANGE PROBLEM

RANGE IN METRES	100	200	300	400	500	600	700	800	900	1K
ASSUMED	75%	90%	100%							
AFGHAN-ISTAN	25%	50%	75%							

# Biting the Bullet



By

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and

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Why the time has come to acknowledge the significant limitations of 5.56 mm ammunition in British and NATO service and reconsider the case for replacing it with a larger, intermediate calibre – a solution regarded as ahead of its time when originally proposed by Britain more than 50 years ago.

# BRITISH 5.56mm GUNS AND EFFECTIVE RANGES



## L86A2 LSW

25in / 65cm barrel

300-400 metres

## L85A2 rifle

20in / 52cm barrel

c.300 metres



## L110A1 LMG

14in / 35cm barrel

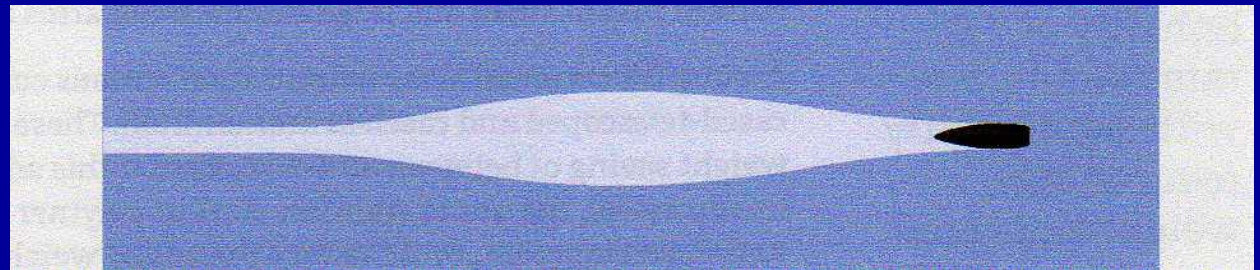
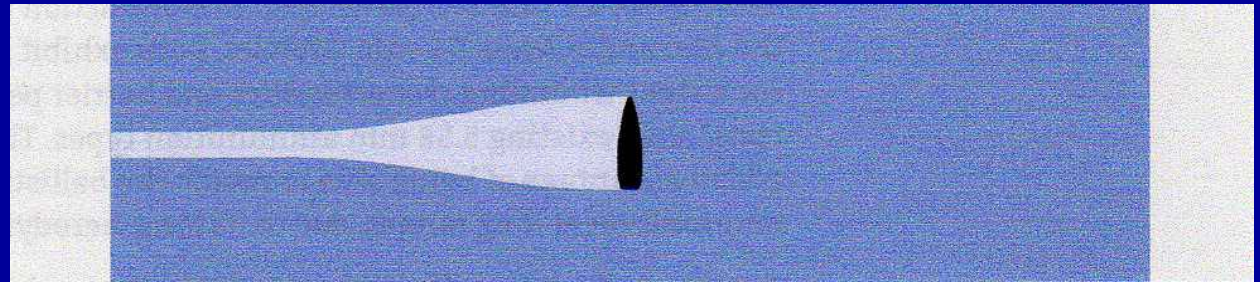
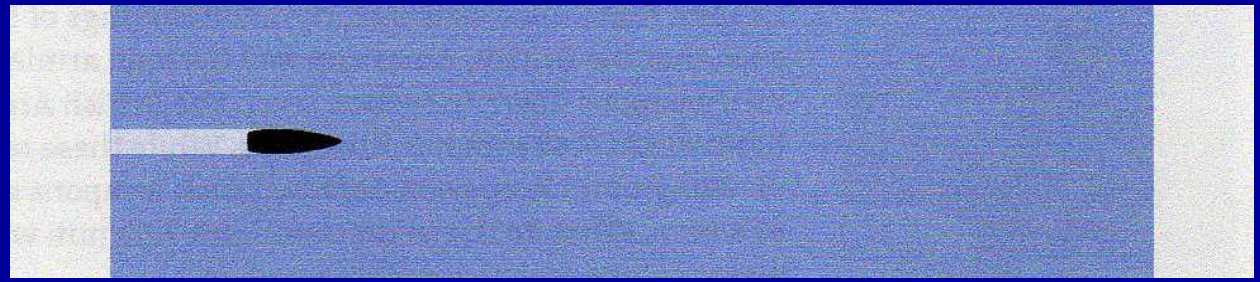
c.200 metres

## PROBLEMS WITH 5.56mm AMMUNITION

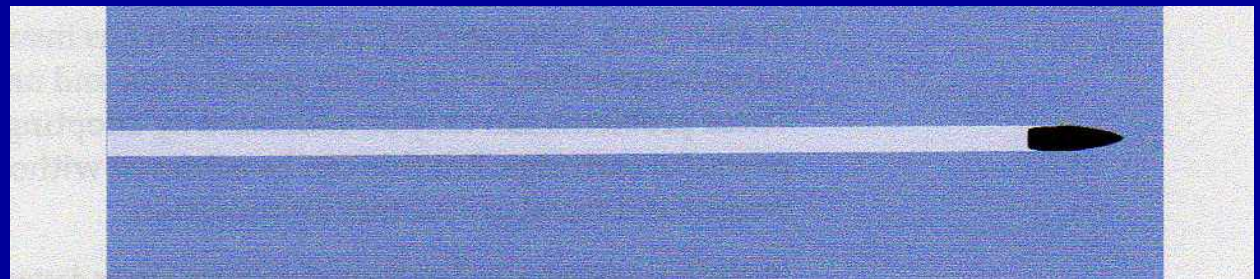
- More than 50% of engagements beyond effective rifle range (70% with short-barrelled guns)
- Inadequate suppressive effect (fire ignored)
- Unreliable terminal effectiveness (erratic yaw)
- Lack of barrier penetration (easily stopped or deflected)



To maximise terminal effectiveness, the bullet needs to yaw rapidly on impact (as shown in the first three diagrams).



If bullet fails to yaw, it makes only a small wound channel



# **Time for a Change**

U.S. Military Small Arms Ammunition  
Failures and Solutions

*NDIA Dallas, TX  
21 May 2008*

Gary K. Roberts, LCDR, USNR



# **Increasing Small Arms Lethality in Afghanistan: Taking Back the Infantry Half-Kilometer**

**A Monograph  
By  
Major Thomas P. Ehrhart  
United States Army**



**School of Advanced Military Studies  
United States Army Command and General Staff College  
Fort Leavenworth, Kansas**

**AY 2009**

# INCREASED USE OF 7.62mm WEAPONS

L7A2 GPMG (right)

L129A1 (below)



# DO WE NEED A NEW CARTRIDGE?

5.56 x 45



7.62 x 51

	Cartridge weight grains/gm	Bullet weight grains/gm	Muzzle velocity* fps/mps	Muzzle energy* ft lbs/joules
5.56mm M855	185/12	62/4.0	3,050/930	1,285/1,730
7.62mm M80	370/24	147/9.5	2,700/823	2,392/3,217

\* From 20 inch (508mm) barrels

## DO WE NEED A NEW CARTRIDGE?

5.56mm for urban fighting, 7.62mm for open terrain?

### PROBLEMS:

1. Combat ranges may change rapidly
2. Mixed calibres in a squad reduces firepower
3. Doesn't help 5.56mm effectiveness & barrier penetration
4. Doesn't reduce weight & recoil of 7.62mm ammunition



# WHAT DO WE NEED SMALL ARMS TO ACHIEVE?

## REQUIREMENTS:

1. Reliable incapacitation
2. Good barrier penetration characteristics
3. Effective range to match full-power 7.62mm weapons
4. Lightest weight and lowest recoil consistent with 1-3

Ammunition selection is the key to achieving these

## AMMUNITION OPTIONS

1. Retain the 5.56 and 7.62, but introduce an improved 5.56 loading
2. Return to using the 7.62, with an improved loading
3. Replace the 5.56 with a more effective short to medium range cartridge, retaining the 7.62 in DMRs and LMGs
4. Replace both existing rounds with a new intermediate cartridge with good long-range performance

## AMMUNITION OPTIONS ASSESSED

1. 5.56mm too small; improvements use open-point bullets
2. 7.62mm inefficient; too much weight and recoil
3. 6.8mm Rem replaces 5.56mm, but can't replace 7.62mm

## RECOIL OF 5.56mm, 6.8mm, 7.62mm

Recoil of  
**HK416/ 6.8**  
(middle) much  
closer to 5.56mm  
**HK416** than to  
7.62mm **HK417**





## AMMUNITION OPTIONS ASSESSED

1. 5.56mm too small; needs open-point bullets
2. 7.62mm inefficient; too much weight and recoil
3. 6.8mm Rem replaces 5.56mm, but can't replace 7.62mm
4. The right calibre, bullet and ballistics can deliver a new general-purpose intermediate cartridge with a long-range performance good enough to replace 7.62 as well as 5.56

# AMMUNITION OPTIONS HISTORY

.30'06 (1906+)

150gr / 9.7gm @ 2,700 fps / 823 mps

.276 Pedersen (c.1930)

125gr / 8.1gm @ 2,520 fps / 768 mps

7 x 43 British (c.1950)

140gr / 9.0gm @ 2,415 fps / 736 mps

6.25 x 43 British (c.1970)

100gr / 6.5gm @ 2,680 fps / 817 mps

6 x 45 SAW (c.1970)

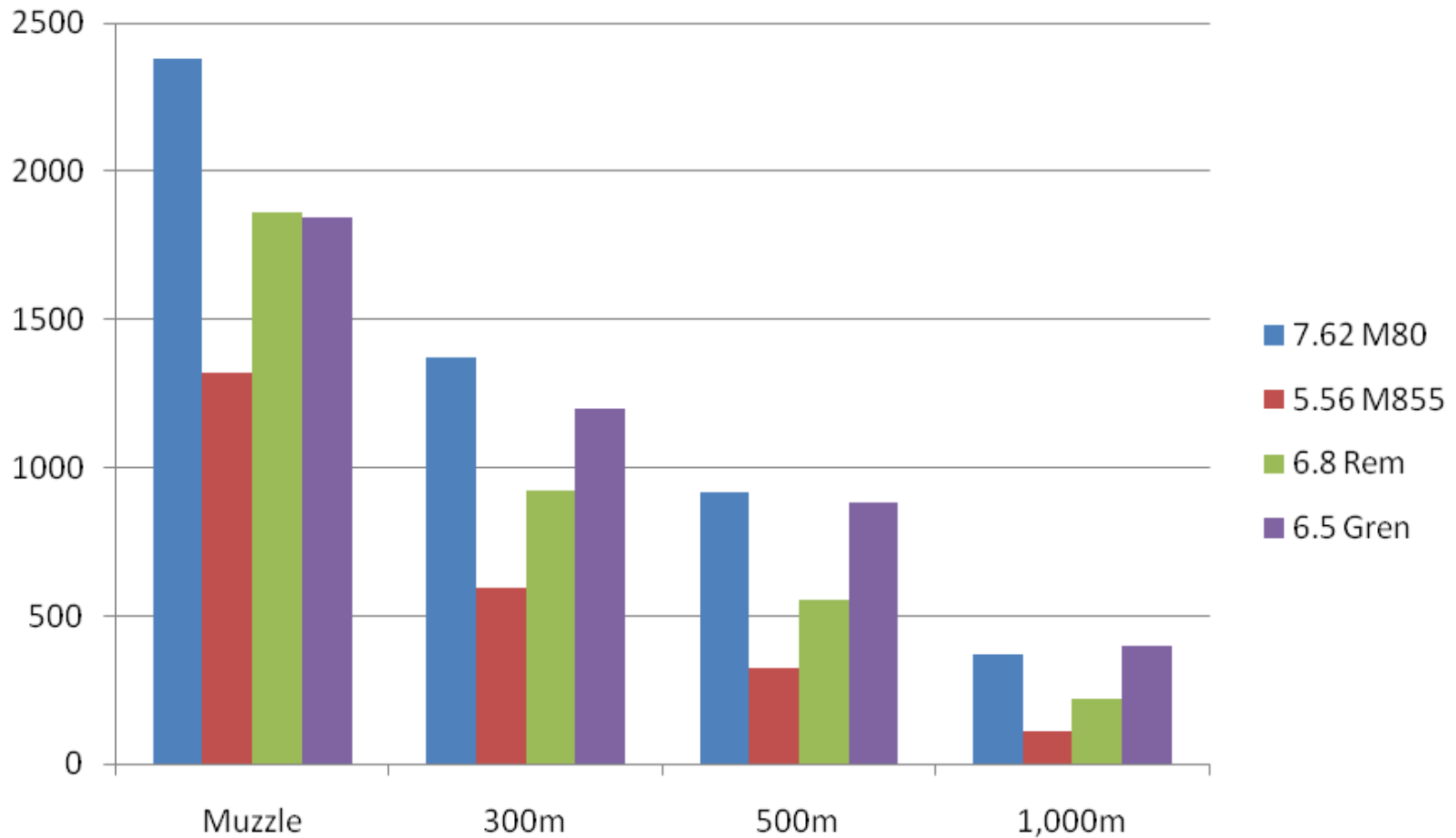
105gr / 6.8gm @ 2,520 fps / 768 mps

6.5mm Grendel (2000s)

123gr / 8.0gm @ 2,600 fps / 790 mps



# BULLET ENERGY LOSS (ft/ lbs) WITH RANGE



# CURRENT RIFLE ROUNDS & BULLETS



Left to right:

7.62x51 M80

5.56x45 SS109

6.8x43 Rem SPC 115 gr

6.5x38 Grendel 123 gr





# AMMUNITION CHARACTERISTICS

1. Calibre between 6.5mm and 7mm
2. Low-drag bullet fired at medium velocity
3. Muzzle energy, weight & recoil midway between 5.56mm & 7.62mm
4. Performance at 1,000 metres to be comparable with 7.62mm M80
5. Anti-personnel effectiveness vital: rapid and reliable yaw on impact
6. Good barrier penetration characteristics
7. Must have FMJ option for universal use
8. Leave armour penetration to a specialised design

## SOME POSSIBLE OPTIONS FOR A GENERAL PURPOSE CARTRIDGE

20 inch (508mm) barrels	Bullet weight grains/gm	Muzzle velocity fps/mps	Muzzle energy ft lbs/joules
7.62x51	147 / 9.5	2,700 / 823	2,392 / 3,217
5.56x45	62 / 4.0	3,050 / 930	1,285 / 1,730
6.5mm GPC	115-123 7.45-8.0	2,690-2,600 820-790	1,855 / 2,500
6.8mm GPC	127-135 8.2-8.75	2,560-2,480 780-755	1,855 / 2,500
7mm GPC	133-142 8.6-9.2	2,500-2,420 760-740	1,855 / 2,500

Similar to the 6.5mm Grendel at the bottom of the range, the 7x43 British at the top

# CURRENT AND POSSIBLE FUTURE ROUNDS



The 6.5 x 45, 6.8 x 45 and 7 x 45 are photo mock-ups to give a visual impression of some of the possible options.

They are all based on a slightly extended 6.8 x 43 case.

7.62x51 5.56x45 6.5x45? 6.8x45? 7x45?

# ADVANCED AMMUNITION CONCEPTS

- Primary concern with bullet performance
- Issues raised equally applicable to conventional ammunition and advanced types
- If LSAT or other advanced types adopted, we should take the opportunity to investigate the optimum calibre rather than copy what we already use



## OBJECTIONS TO A NEW CARTRIDGE

1. The ammunition's OK – improve the training
2. There is no such thing as a golden bullet
3. Small arms irrelevant at long range
4. It would cost too much
5. Afghanistan is not typical
6. The USA must get involved

## RESPONSES TO OBJECTIONS

1. Training is vital but can't compensate for everything
2. The smaller the cartridge, the more likely it is to fail
3. Heavy fire support may not be available or usable
4. New round phased in as weapons replaced
5. Afghanistan may be typical of the future: but ammo better than 5.56mm and lighter than 7.62mm always useful
6. The USA must get involved!

# PROPOSAL

Small-scale research & development project to:

1. Determine the optimum calibre and ballistics
2. Produce conventional options for thorough testing
3. Provide input to LSAT and other advanced technologies
4. Provide a conventional back-up in case it's required

Very low costs and risk, but high potential benefits

*Let's get it right next time!*

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