



# Is there a problem with the lethality of the 5.56 NATO caliber?



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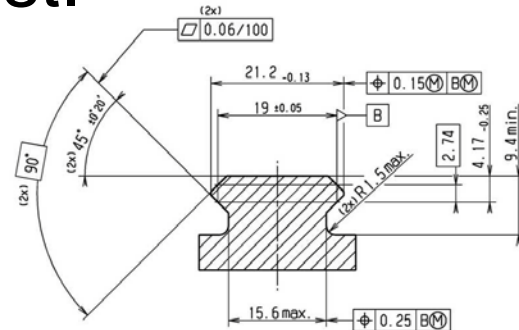
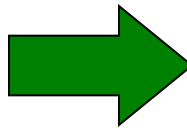


*NATO Army Armaments Group*

**No!**

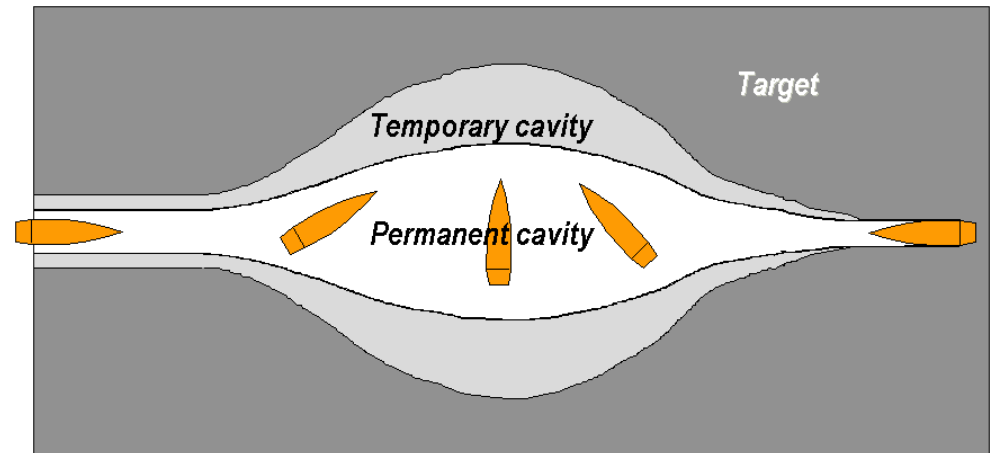
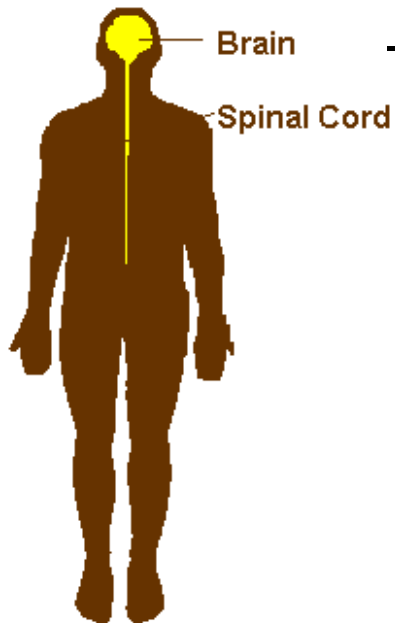
# Our Terms of Reference

- We are responsible for all issues related to dismounted soldier's weapon systems.
- We have two main missions:
  - Exchange of information and lessons learned.
  - Promote technical standardization.
- STANAG 4694 “NATO Accessory Rail” was approved by the NAAG in May -09, and has been sent out on a ratification request.



# Two ways to incapacitate

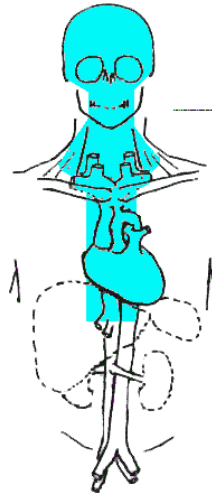
1. Hit to the central nervous system.
  - Immediate incapacitation regardless of caliber or type of projectile!
2. Loss of blood pressure by massive bleeding.
  - Incapacitation can take time!





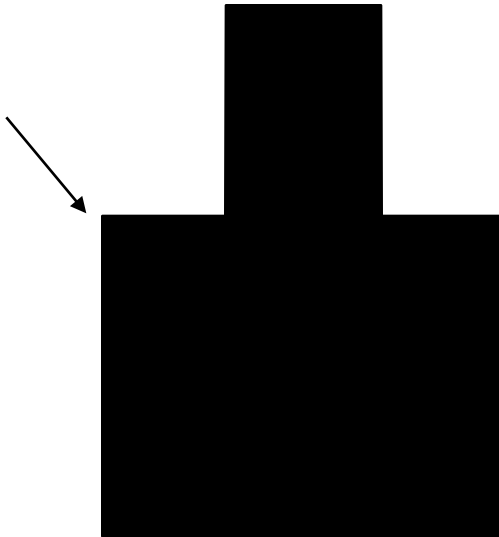
# Small Arms Lethality

- GBR hosted a two day "NATO Workshop on Small Arms Lethality" in February -09 at the Defence Academy of the United Kingdom in Shrivenham.
- The conclusion was that ***shot placement*** is the most important parameter.
- This is achieved through good and realistic training.



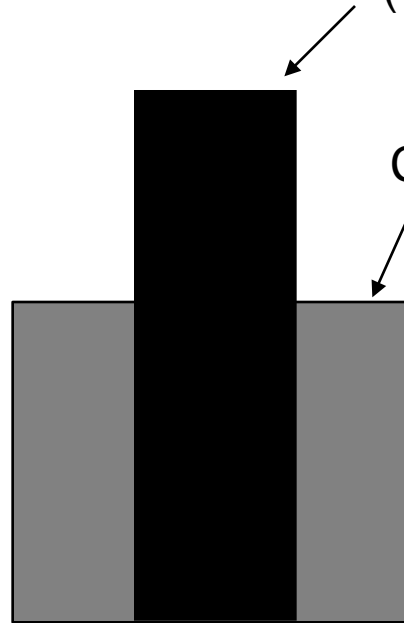
# New Swedish pop-up target

Sheet metal



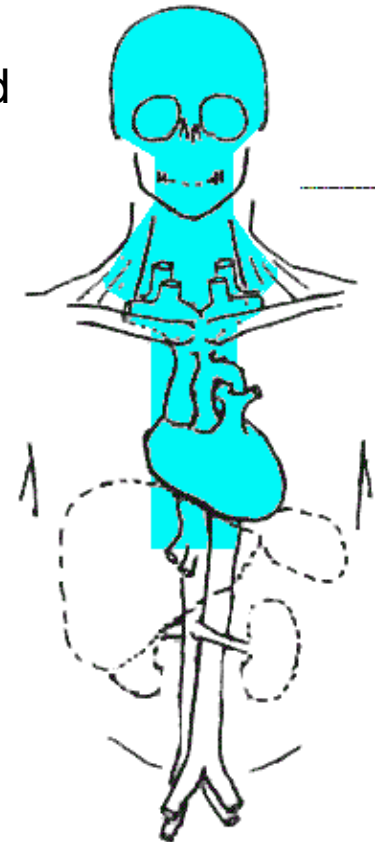
Original target

Sheet metal  
(w=120mm)



Modified target

Cardboard



# Two main problems with current and future soldier systems

## Weight



## Power supply



1.5V	1.5V	3V
AAA	AA	123A

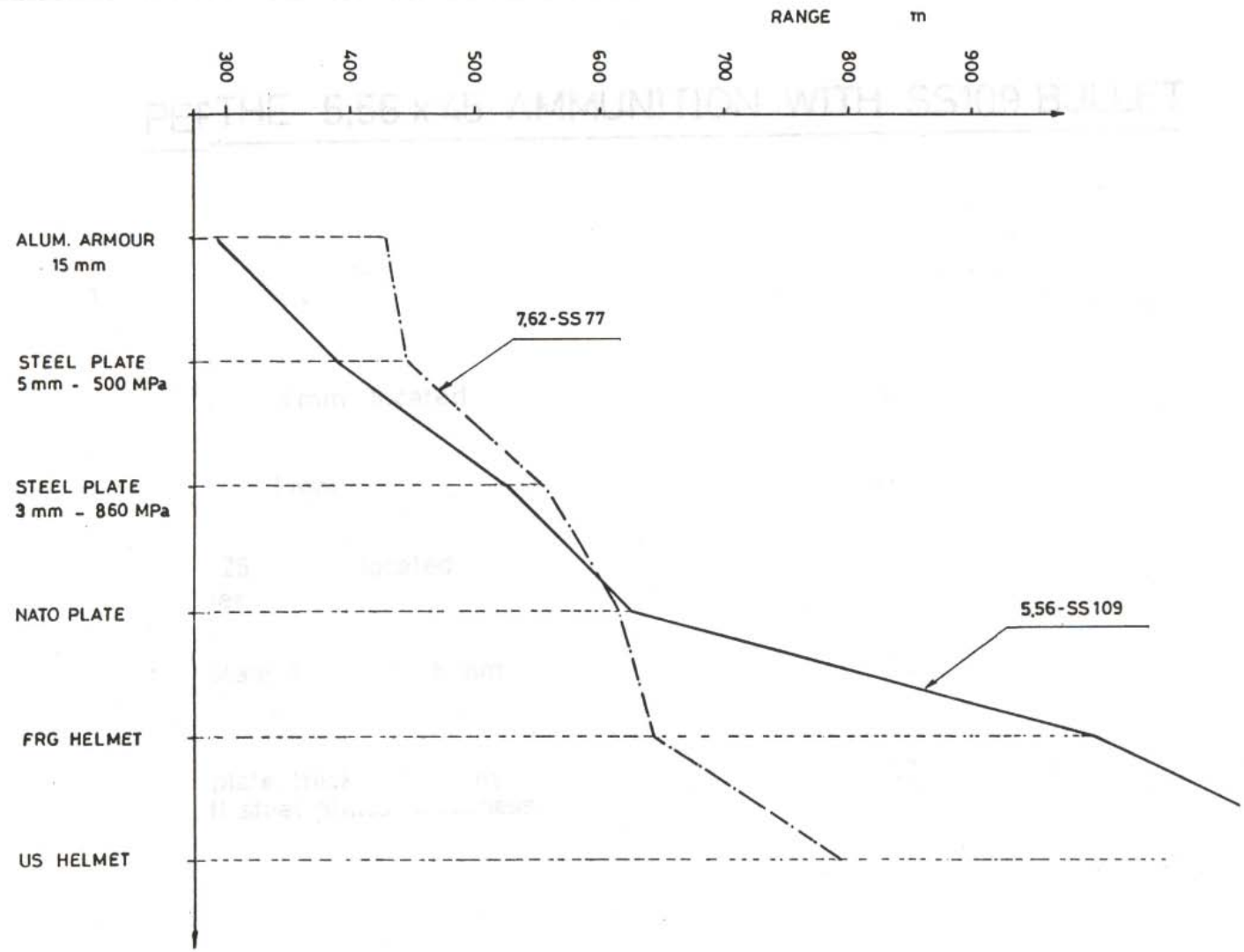
# NATO Rifle Calibers



	<b>7.62 x 51 NATO</b>	<b>5.56 x 45 NATO</b>
STANAG	2310	4172
Cartridge length (mm)	71.0	57.0
Cartridge weight (g)	24.0	12.7
Bullet weight (g)	9.5	4.0
Bullet diameter (mm)	7.82	5.70
Muzzle velocity (m/s)	830	930
Muzzle energy (J)	3270	1730
Core material	Lead	Steel/Lead
Rifling twist	1/12" (305 mm)	1/7" (178 mm)
Penetration of 3 mm steel plate at (m)	800	1300
Penetration in RHA at 100m and 0° NATO of APHC projectile	18mm	12mm

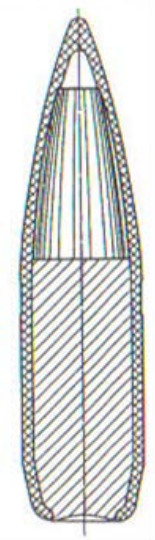


# Compared performance of NATO rounds



# Development of 5.56mm SS109 round

- FNH developed a weapon family in the mid 70's consisting of the FNC rifle and the Minimi LMG.
- To increase the range for the LMG a round that could penetrate the NATO plate (3.5mm mild steel) out to 600m was developed.
- It had a dual core (steel tip and lead rear).
- It was named SS109.
- It required a 1/9" rifling twist.
- There were no requirements to penetrate body armor.



# History of 5.56 NATO

- In 1970 NATO decided to try to standardize a common rifle and a second rifle caliber.
- During 1977-1980 NATO therefore performed tests with rifles and ammunition.
- The calibers tested were:
  - 5.56mm rounds with increased penetration from BEL and USA.
  - GBR 4.85mm round.
  - DEU 4.7mm caseless round.
- No weapon could be agreed upon.
- The BEL SS109 round was found to be the best, and was standardized as NATO's second rifle caliber in 1980.



# Benefits of 5.56 over 7.62

- Equal lethality.
- Half the mass (12g – 24g).
- Half the volume.
- Reduced recoil and signature (noise and flash).
- Better penetration in thin metal plates.
- Flatter trajectory and shorter ToF out to 700m
- Lighter weapons.
- Higher hit probability.



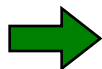
# Swedish experience



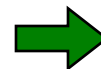
- In SWE we realized already back in the early 80's that you must "train as you fight".
- A dynamic shooting training was therefore introduced in 1985.
- There are three levels of "Marksmanship badges" that are worn by soldiers and officers.
- When SWE introduced the 5.56 ak 5 rifle in 1986, the score had to be increased because otherwise everybody qualified as a Marksman.
- The same thing happened when we introduced the ak 5C with its red-dot sight.



7.62 ak 4 (G3)



5.56 ak 5 (FNC)



5.56 ak 5C + sight



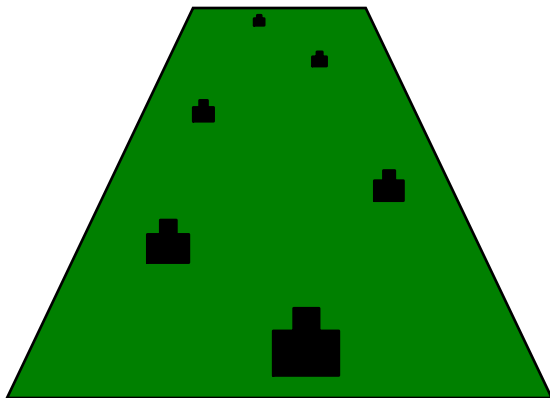


# NATO Workshop on Marksmanship Training

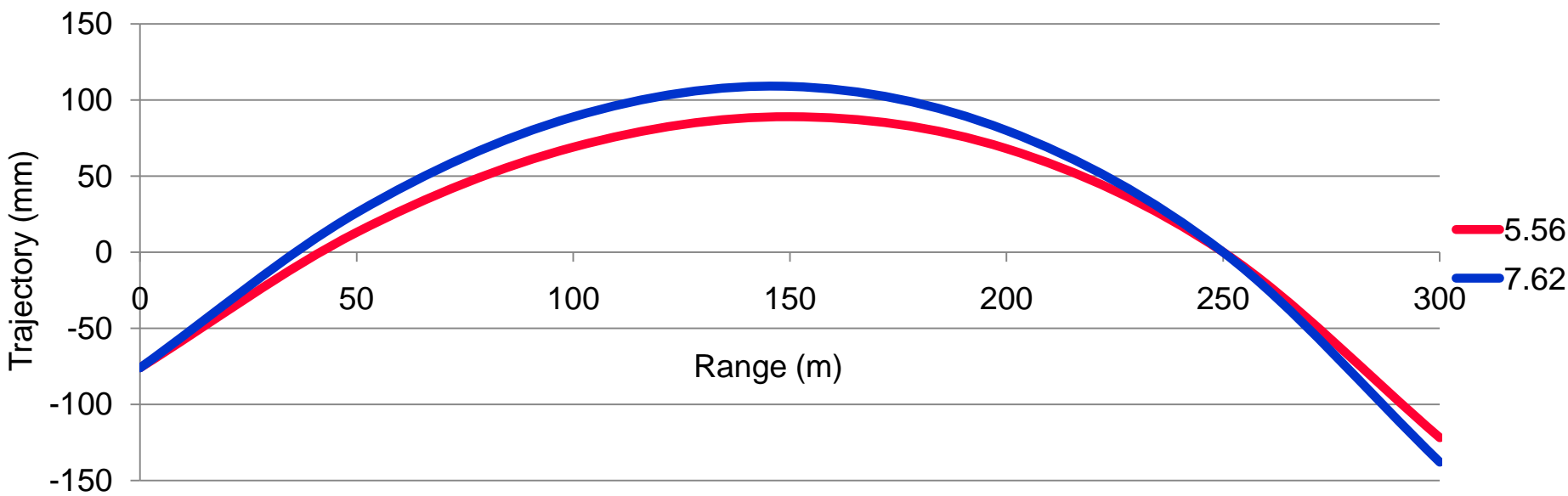
- Spain hosted a marksmanship training workshop in March -10.
- The results showed that only a few nations teach shooting beyond 200-300m to ordinary infantry soldiers.
- Nations are using from 150 rounds during 28h engaging targets out to 200m up to 1000 rounds during two weeks engaging targets out to 400m.
- SWE and CAN requirement: Prone or kneeling position, 3-5 rounds at 100m max dispersion 150mm.

# Long range shooting

- It is very difficult to hit at longer range due to:
  - Shooters dispersion
  - Moving targets
  - Unknown range
  - Wind drift
- Swedish units in ISAF rely on 12.7mm (.50 cal) machine guns for long range...



# Comparison between 5.56 and 7.62 with equal barrel lengths (20"=508mm)

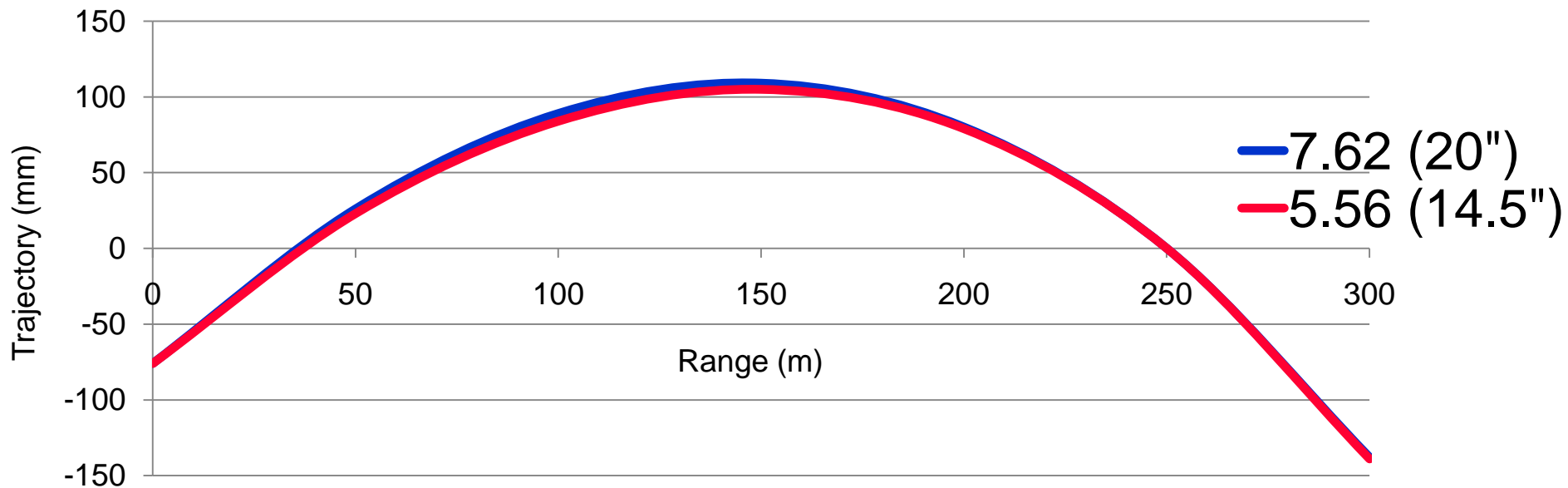


20" barrel	0	50	100	150	200	250	300
5.56	-76	13	69	89	68	0	-122
7.62	-76	26	89	109	80	0	-138

Rifles with optical sights. NATO standard air temperature (+15°C).

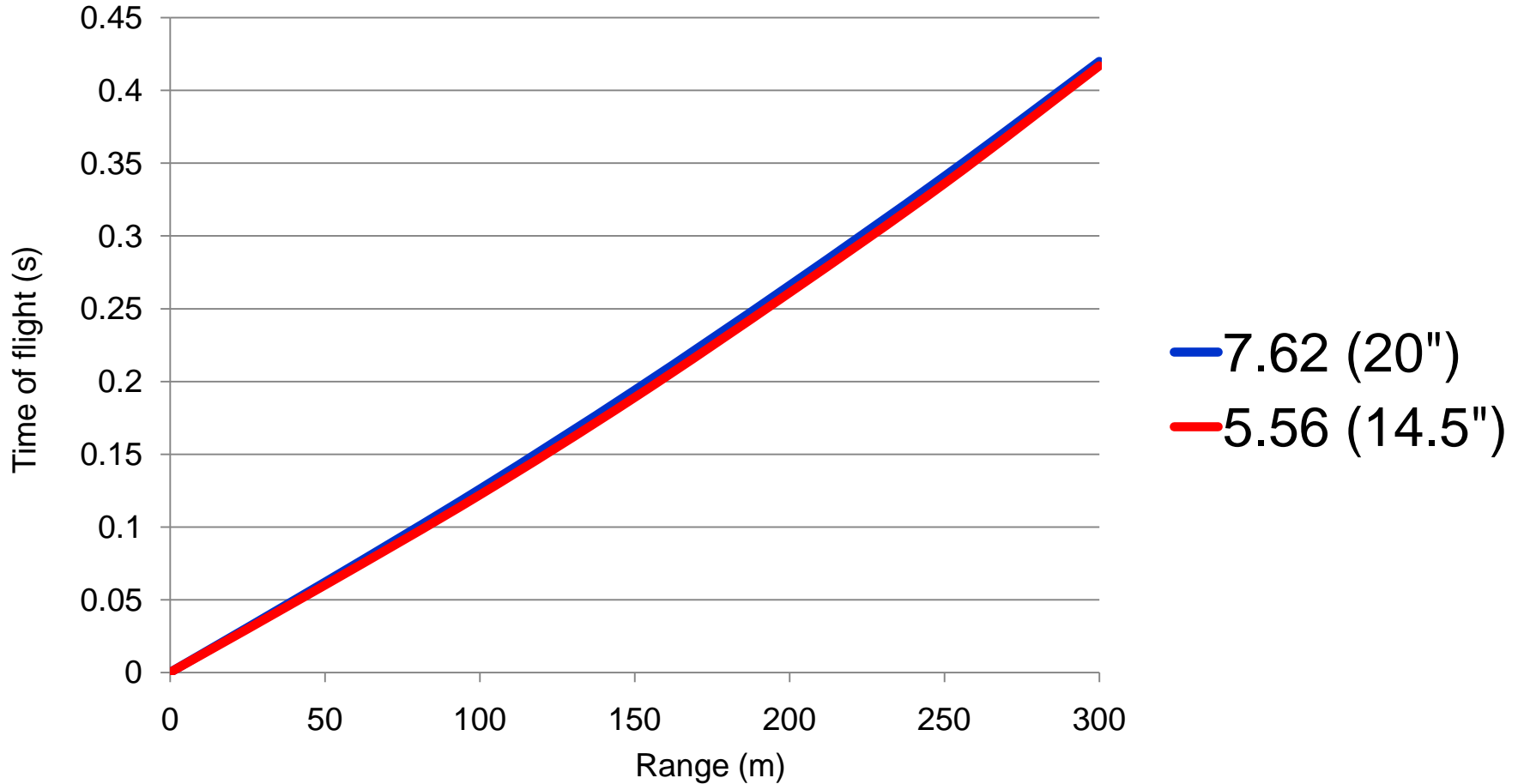


# Comparison between 5.56 with short barrel and 7.62 with long barrel



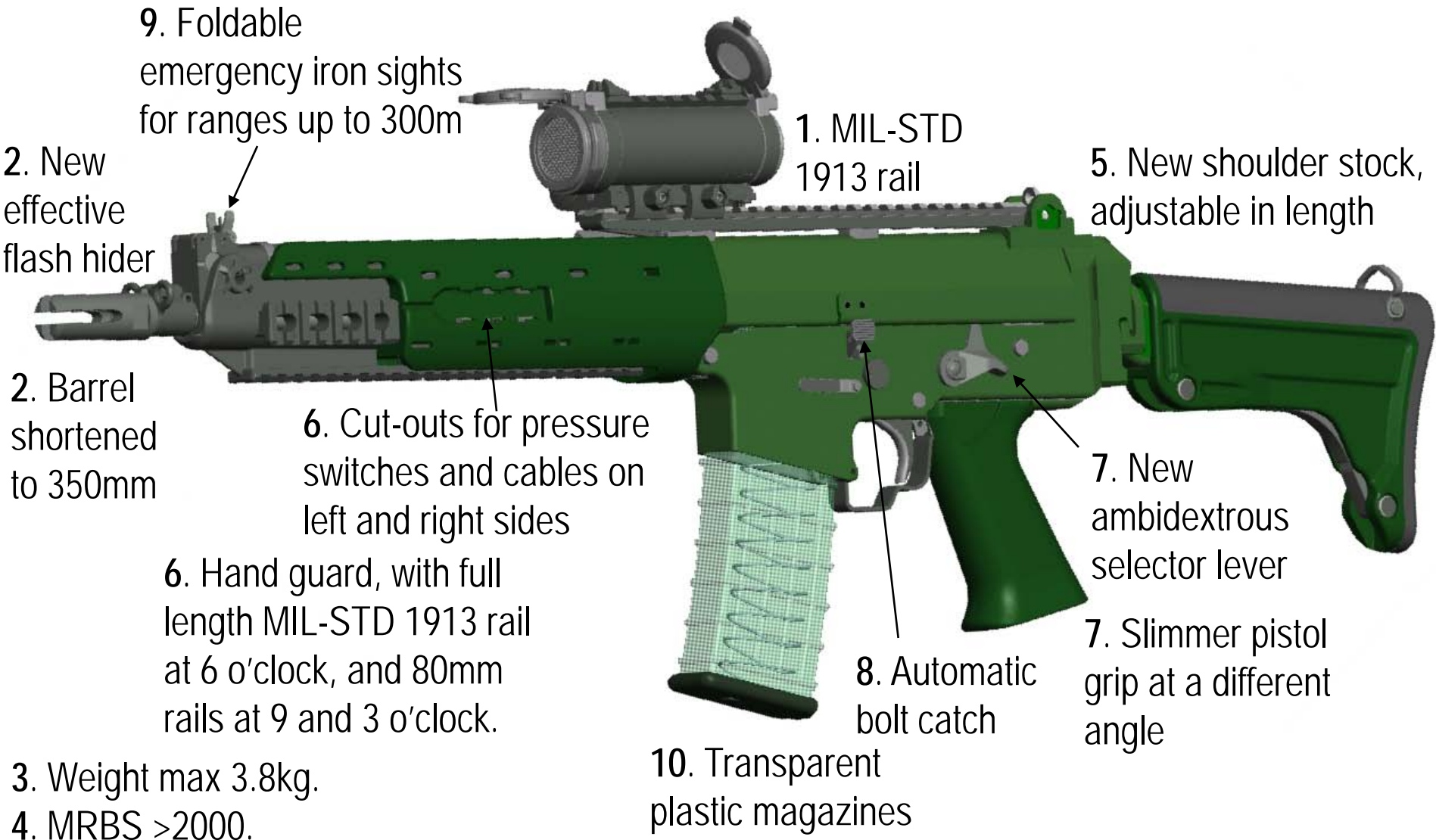
Rifles with optical sights. NATO standard air temperature (+15°C).  
20"=508mm. 14.5"=368mm.

# Time of Flight

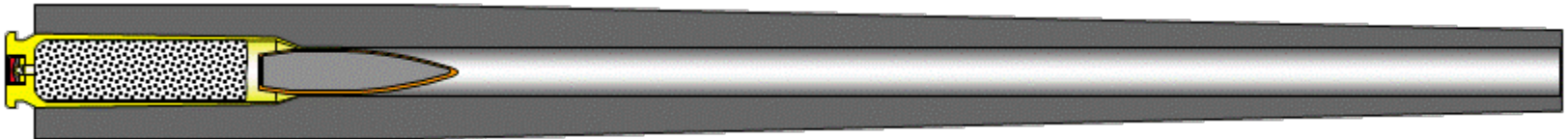
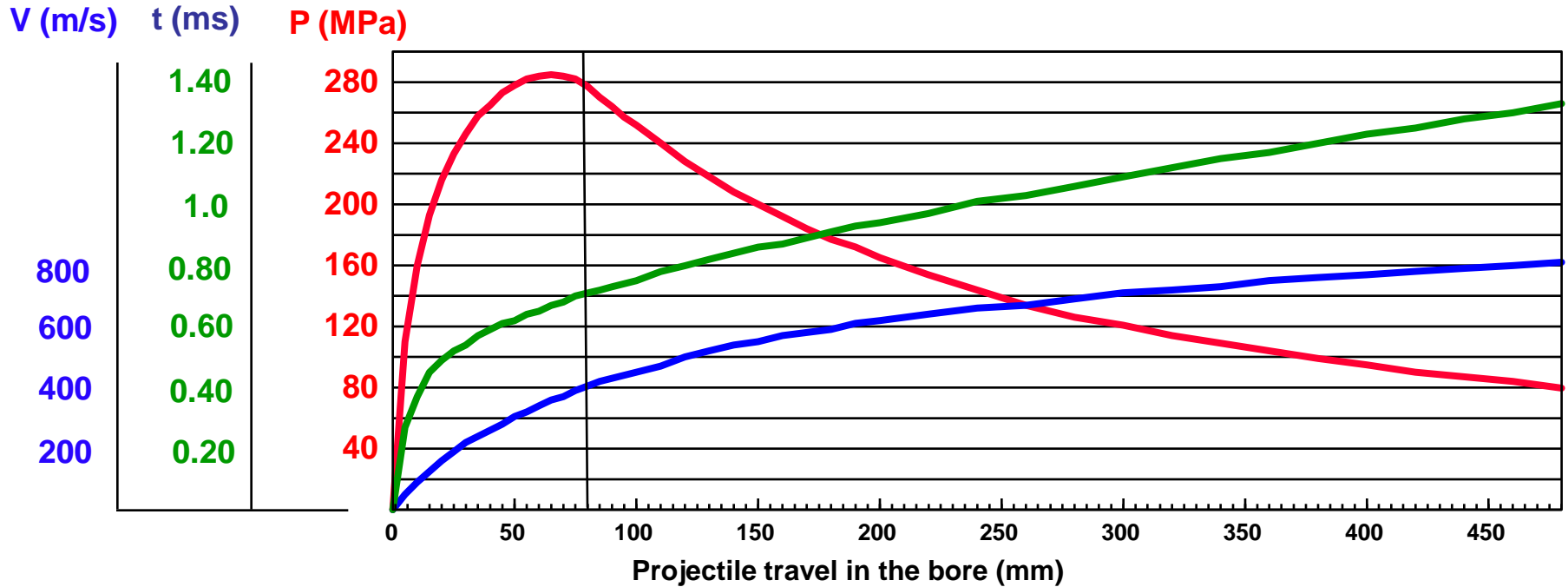


Rifles with optical sights. NATO standard air temperature (+15°C).  
20"=508mm. 14.5"=368mm.

# User priorities on SWE ak 5C



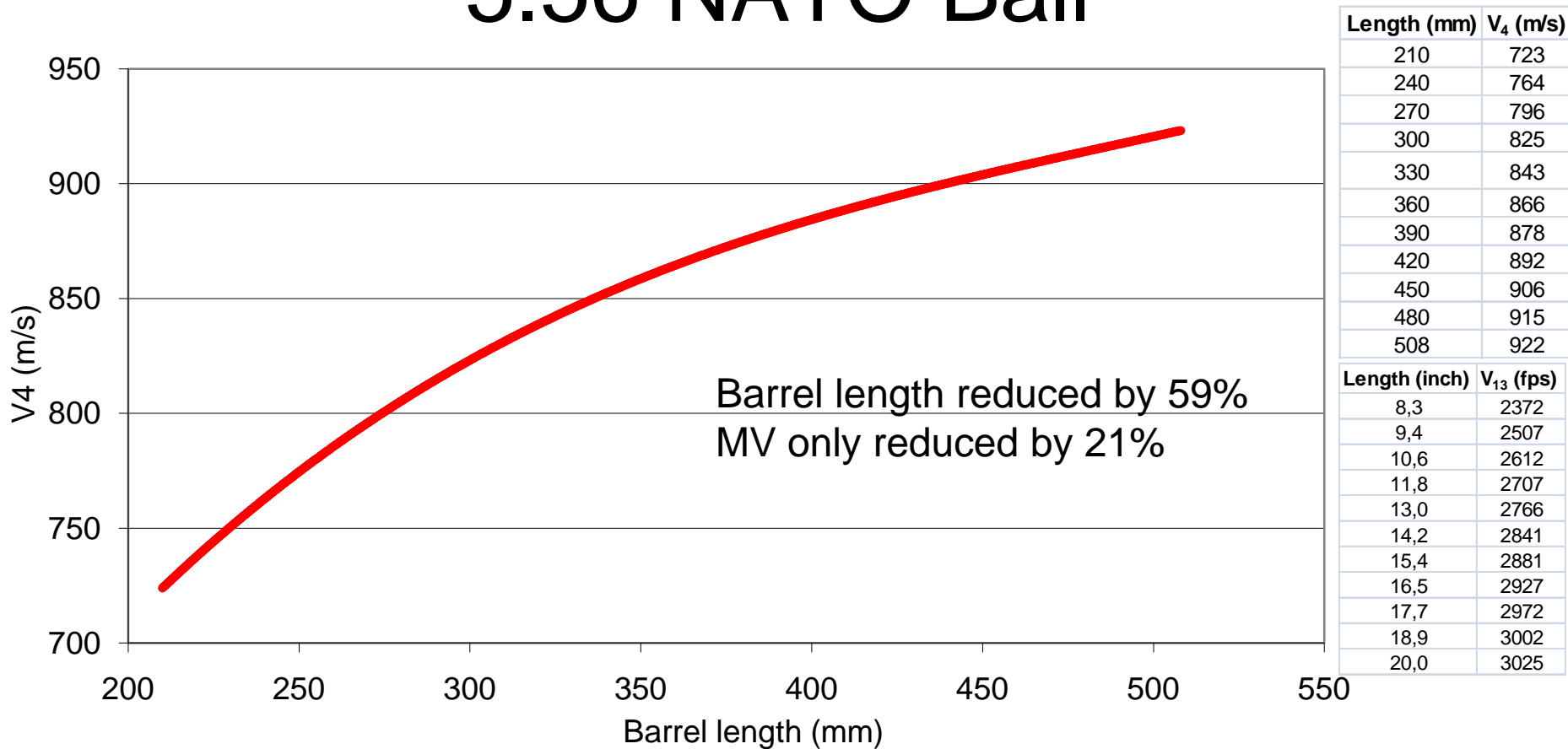
# 7.62mm inner ballistics



50% of  $V_0$  within 80mm!

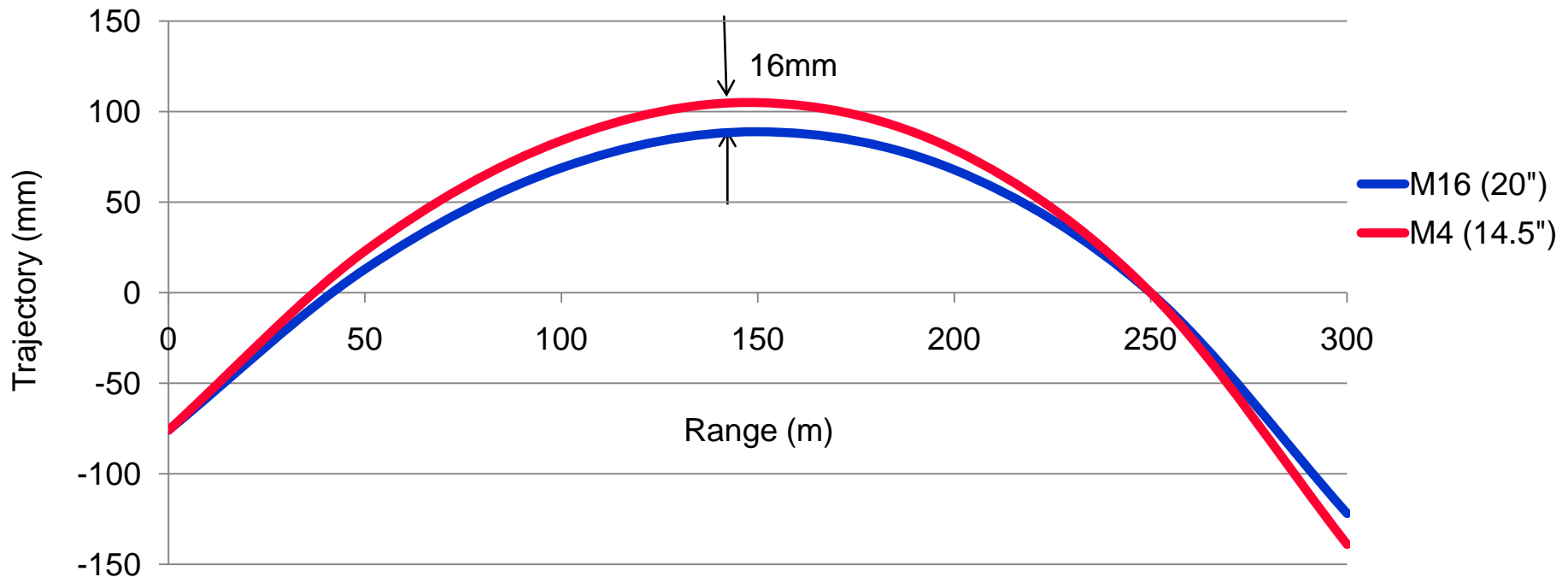
# Barrel length / Muzzle velocity

## 5.56 NATO Ball



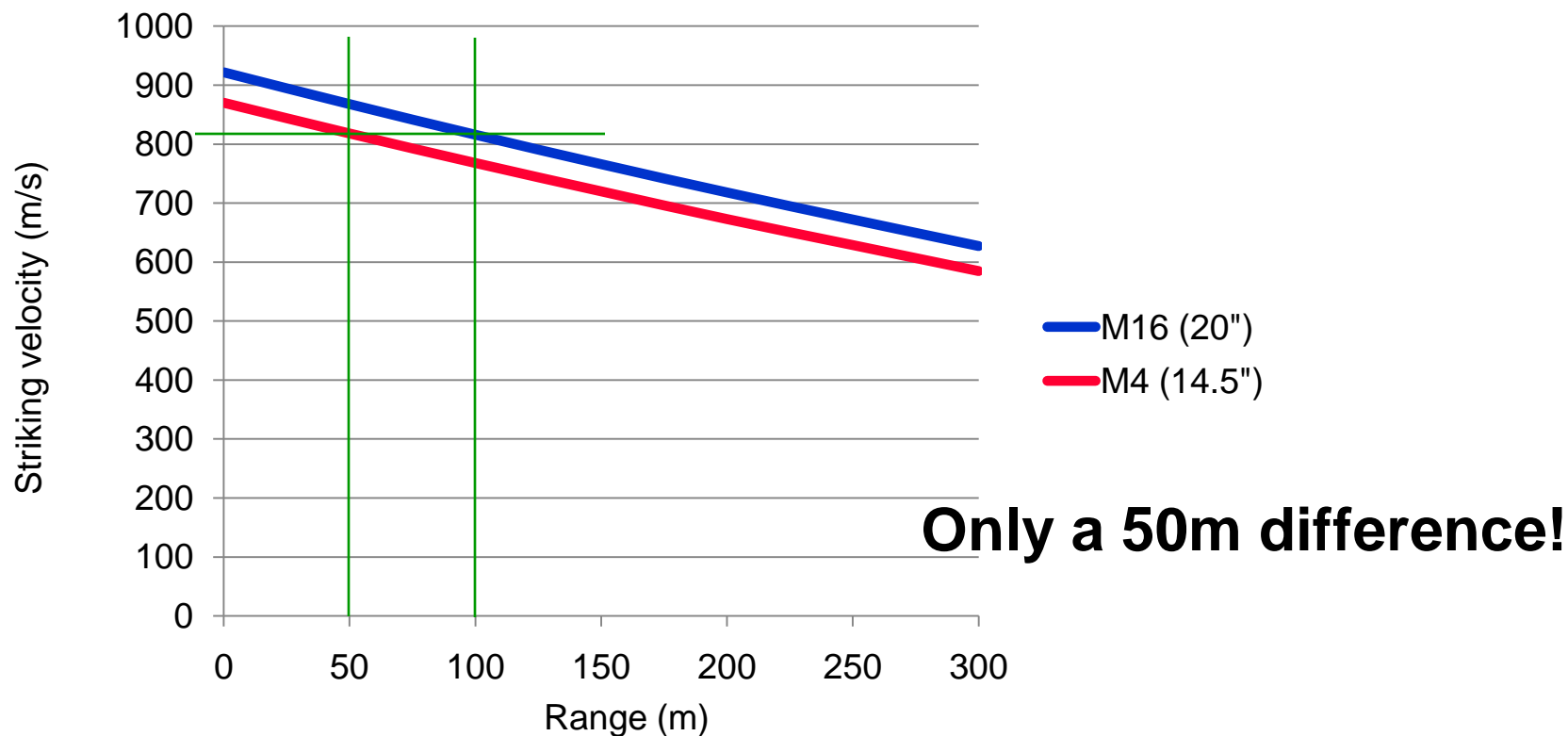
Colt M16A2. NATO reference ammo. NATO standard ammo temperature (+21°C).

# The effect of a long barrel is often greatly exaggerated



Rifles with optical sights. NATO standard air temperature (+15°C).  
20"=508mm. 14.5"=368mm.

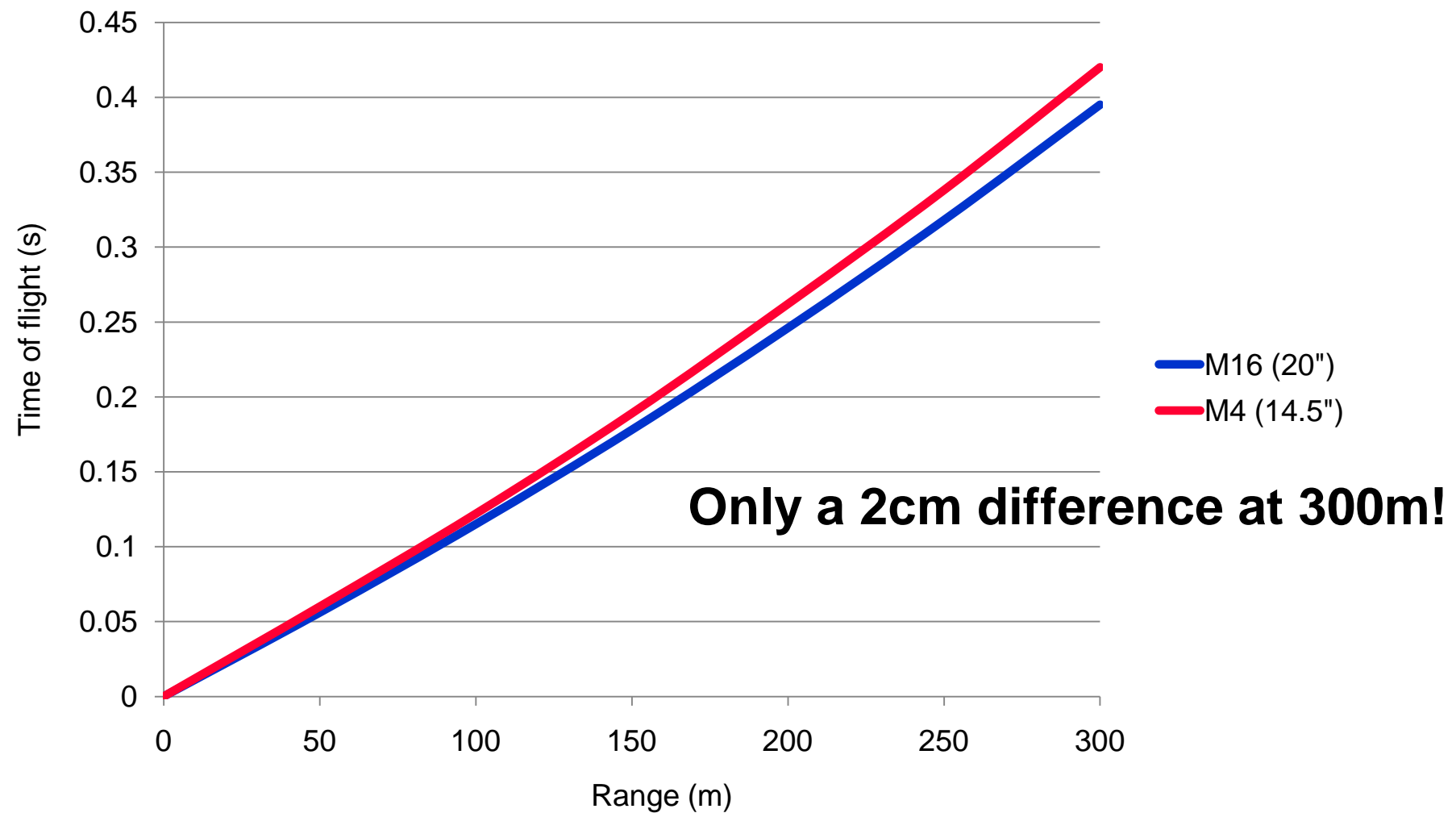
# Striking velocity of 5.56 NATO Ball



	<b>0</b>	<b>50</b>	<b>100</b>	<b>150</b>	<b>200</b>	<b>250</b>	<b>300</b>
<b>M16 (20")</b>	922	870	820	772	725	680	637
<b>M4 (14.5")</b>	870	820	772	725	680	637	595



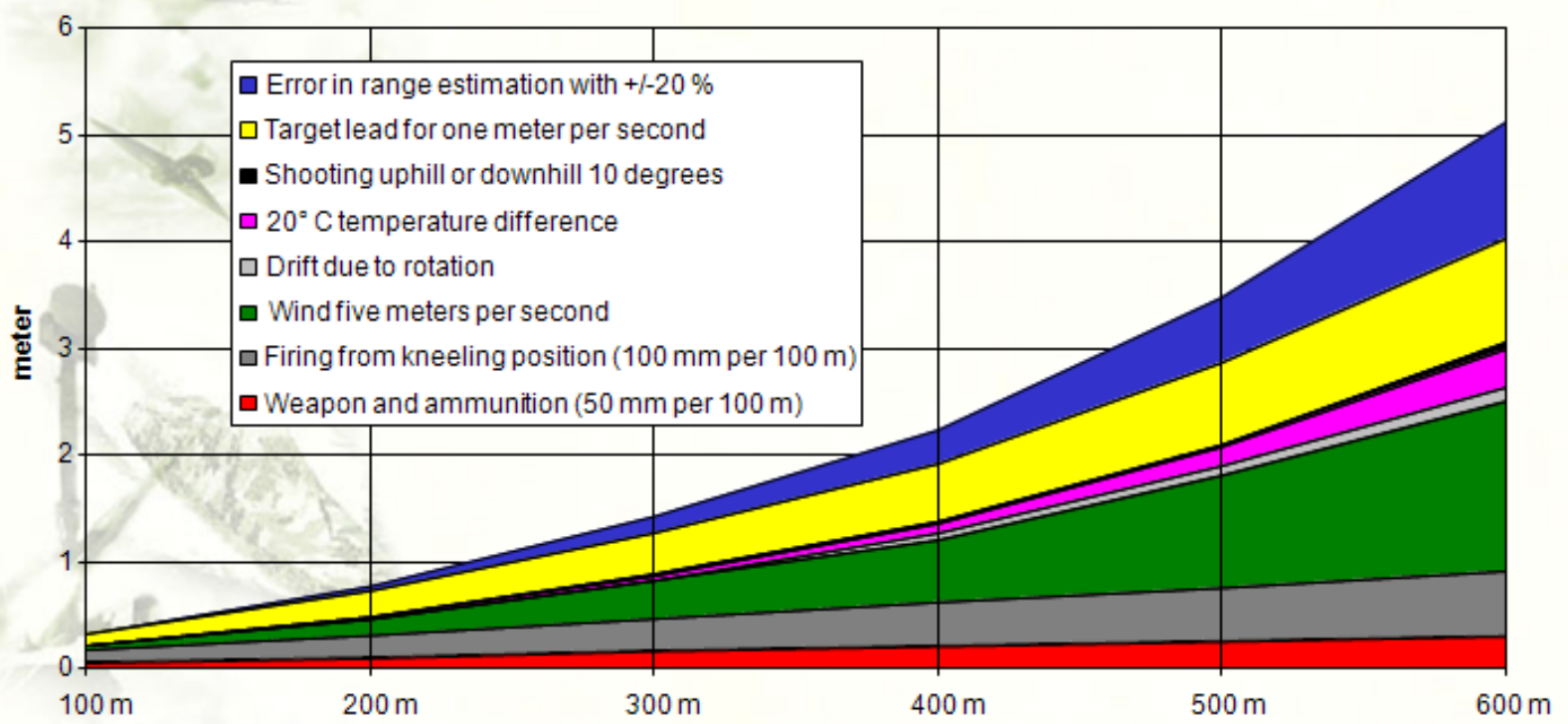
# Time of flight for 5.56 NATO Ball



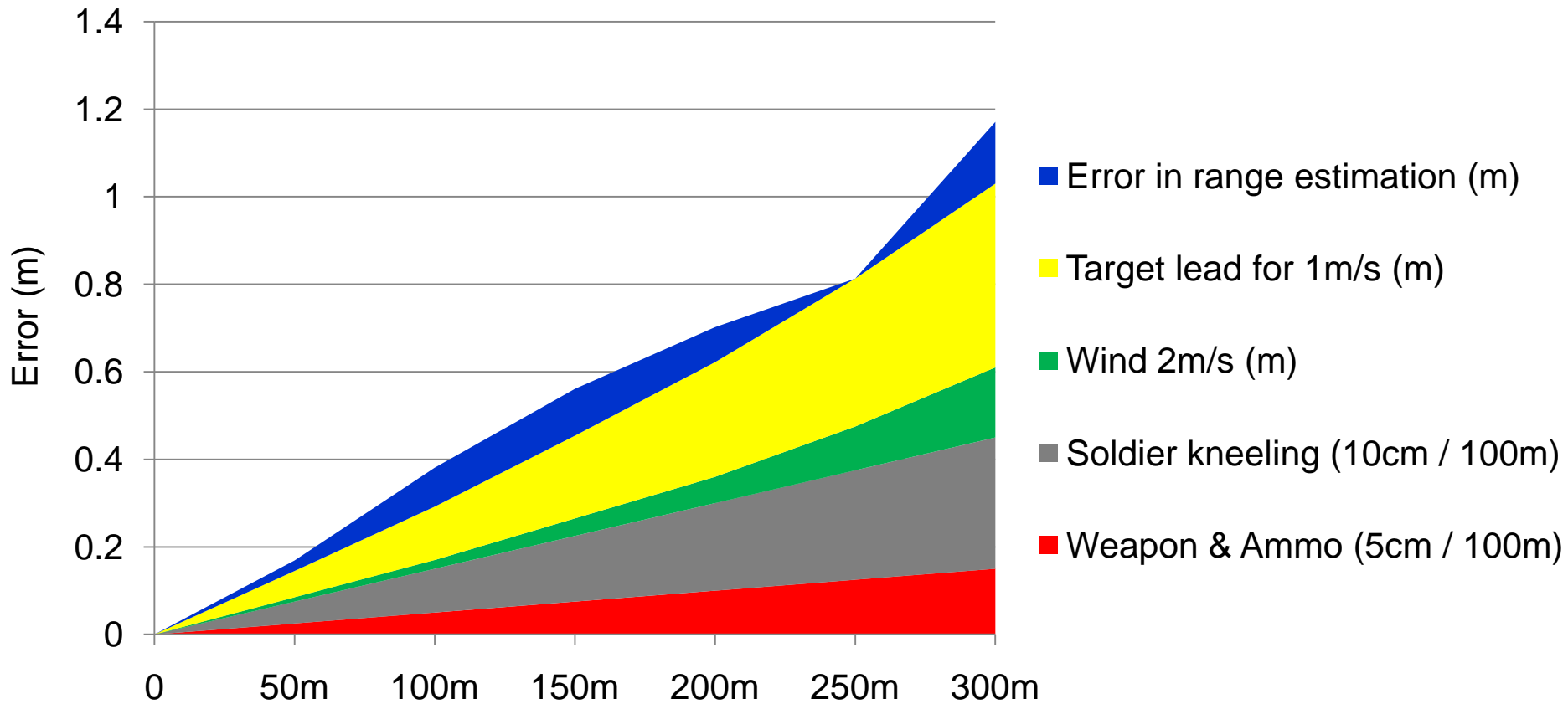




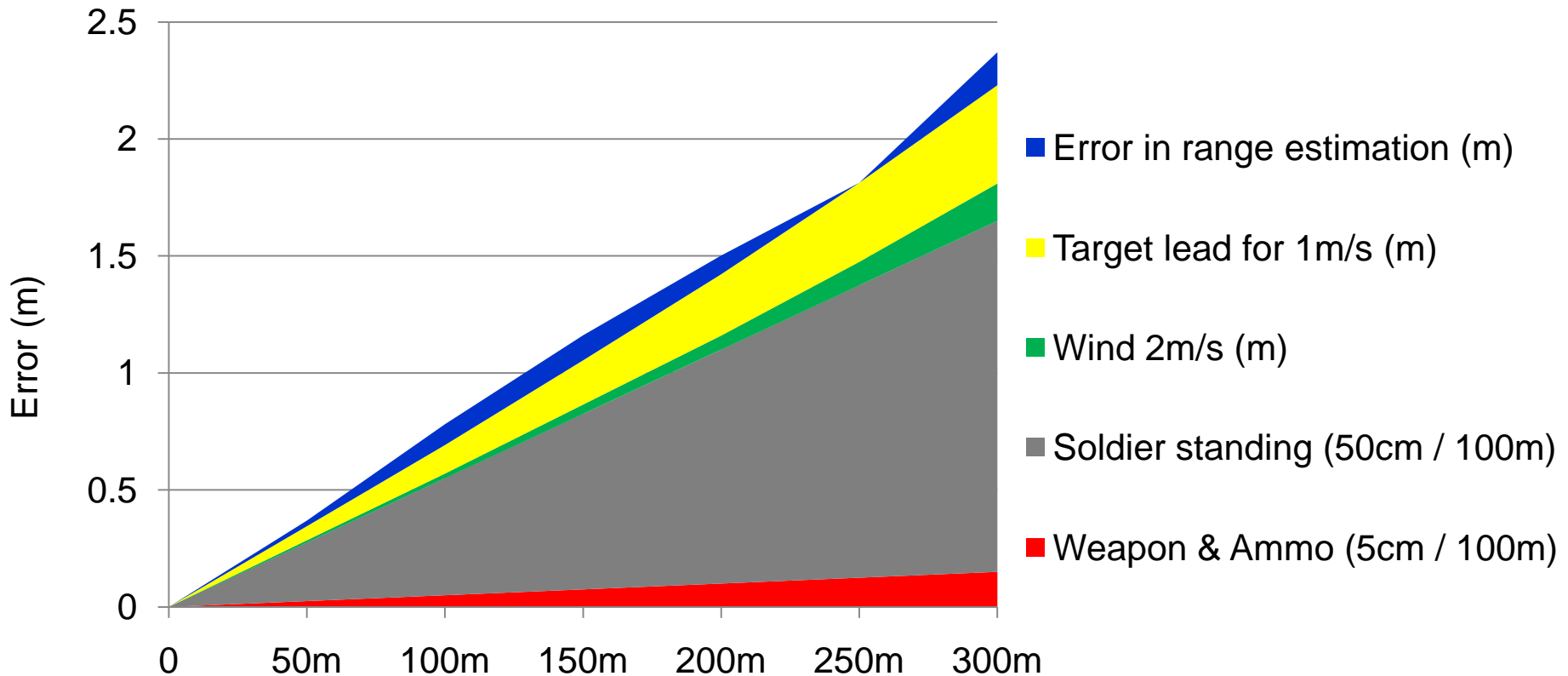
# 5.56 NATO Error Budget



# Error budget, kneeling, no stress



# Error budget, standing, stress





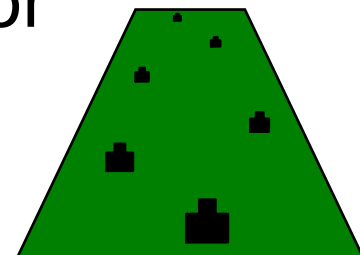
# “Internet rumors”

- Rumors about 5.56mm:
  - “Ineffectiveness at long range”
  - “Inconsistent wounding effect”
  - “Poor intermediate barrier penetration”
  - “Ease of deflection”
- There are no official documents that 5.56mm has failed in any NATO Army.
- Most NATO nations agree that the next generation of small arms weapons will also use the 5.56mm NATO caliber.



# Summary

- There is no problem with the lethality of the 5.56 NATO caliber!
- Most NATO nations are confident with the lethality of their 5.56 and 7.62 rounds!
- To increase small arms lethality, nations must better train their soldiers!
- Soldiers must “train as they fight!”
- If nations want to engage targets at long range, then it is not about rifle caliber, projectile or barrel length, it is all about ***training!***
- Or use the 12.7mm (.50 cal) HMG...





# Questions?

