

GENERAL DYNAMICS
Ordnance and Tactical Systems

NDIA Small Caliber Presentation
St. Marks Powder
A General Dynamics Company

May 16, 2006



A Leading Supplier Of Propellants For Military Applications

- BALL POWDER® Propellant Loaded in over 95% of U.S. Military small arms ammunition



- Loaded Internationally in over a dozen countries for their Small Caliber Military Applications
- Ability to develop and deliver propellants specifically tailored to customer requirements.

St. Marks Powder Research and Development

Resources

- Dedicated pilot plant
- Analytical and process Laboratories
- Ballistic test ranges
- Modeling and simulation capabilities



Activities

- Product and Process development and optimization
- Technical services to customers
- Support to operation: process, products and materials
- Contract R&D

The St. Marks Quality Program: Designed to Drive Continuous Improvement in Performance

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Customer focused
Team management approach
Closed-loop design

Comprehensively integrated:

- Strategic planning
- Employee training and development
- Product design and development
- Supplier quality assurance
- Production
- Testing
- Customer service
- Performance review/improvement



ISO 9001 certified since 1994.
ISO 14001 and OHSAS 18001
certified in 2004.

Lead Free 5.56mm BALL POWDER® Propellant

Green 5.56mm BALL POWDER® Propellant

Projectile 62.0 grain, 20" barrel

<u>Propellant</u>	<u>5.56mm round</u>	<u>Velocity(ft/s)</u>	<u>Pressure(psi)</u>
WC 844	Standard M855	3020	55,000
SMP® 842	Green 5.56mm	3020	54,200

- BALL POWDER® Propellant designed for lead-free projectiles and primers
- Propellant additives developed for barrel decoppering



5.56mm M995(AP) BALL POWDER® Propellant

5.56mm Enhanced Performance

M995 projectile 52 grains: 20" barrel

<u>Propellant</u>	<u>Velocity(ft/s)</u>	<u>Pressure(psi)</u>
WCR 845® AP	3340	56,500



- High energy BALL POWDER® Propellant formulation designed for maximum performance
- Increased loading density of BALL POWDER® Propellant enhances ballistic performance

5.56mm Frangible BALL POWDER® Propellant

5.56mm Frangilbe

5.56mm Frangible projectile 55.0 gr, barrel 20"

<u>Propellant</u>	<u>Velocity(ft/s)</u>	<u>Pressure(psi)</u>
WC 747	3165	52,000

- BALL POWDER® Propellant designed for frangible projectile
- Propellant designed for proper 5.56mm gun functioning



5.56mm Flash Suppressed BALL POWDER® Propellant

- St. Marks Powder has developed propellant additives which reduce flash for 5.56mm ammunition



5.56mm Mk262 BALL POWDER® Propellant

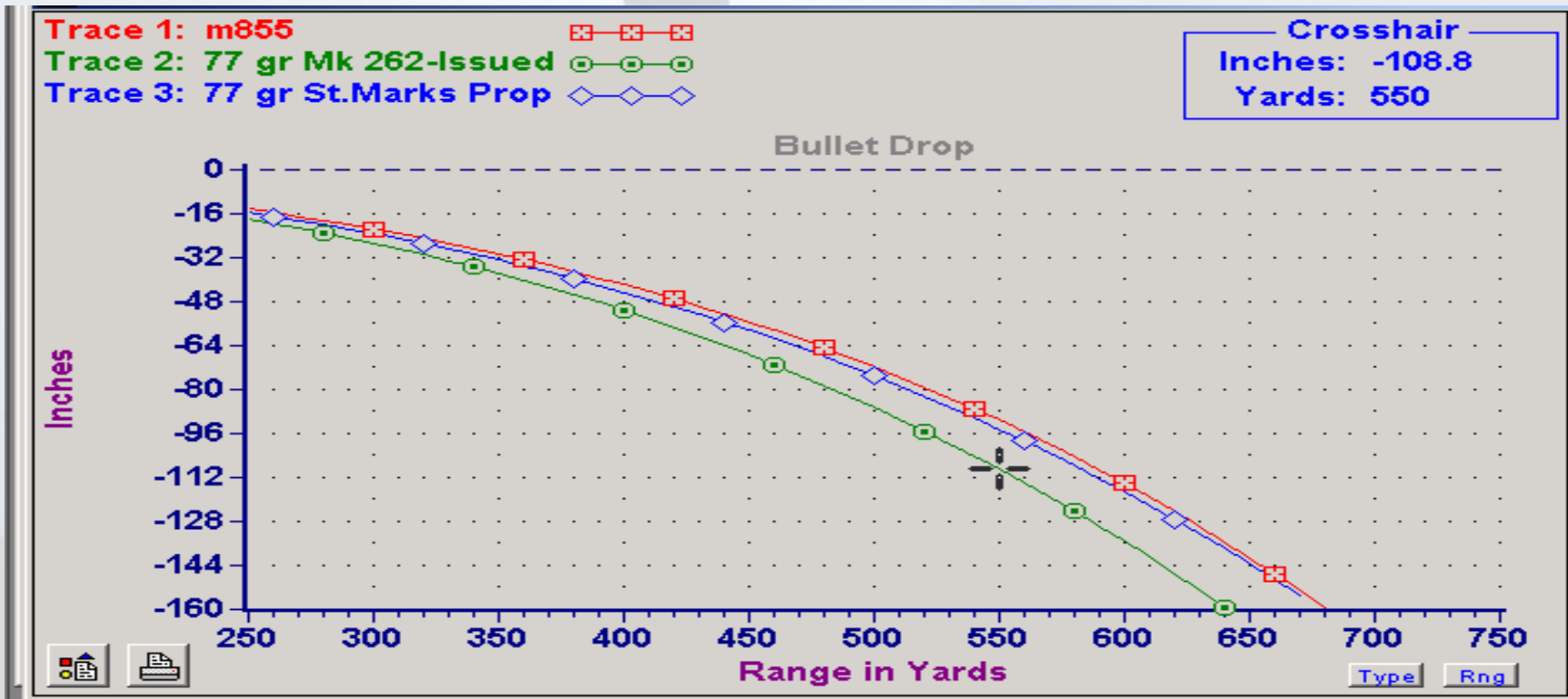
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Enhanced Performance 5.56mm 77gr. projectile

	Muzzle Energy	Mid Range Energy	Max Range Energy
M855	1256 ft-lbs	773 ft-lbs	347 ft-lbs
Current Mk 262	1265 ft-lbs	738 ft-lbs	420 ft-lbs
Mk262 Enhanced Performance	1368 ft-lbs	805 ft-lbs	460 ft-lbs

- > 100ft/s increase in performance with BALL POWDER® Propellant

5.56mm Mk262 BALL POWDER® Propellant

- *Same trajectory¹ as standard M855 and higher lethality with BALL POWDER® Propellant*



Lightweight Small Arms Technologies (LSAT)



- St. Marks Powder is working with AAI team in the development of a propellant charge for the JSSAP Lightweight Small Arms Technologies (LSAT) Program
- The objective is to reduce the gun and ammo weight by 30-50%
- St. Marks Powder is applying BALL POWDER® Propellant technology for 5.56mm Case Telescoped round, 33% cartridge weight reduction and equal lethality



5.56mm LSAT CTA
cased telescoped
round with BALL
POWDER®
Propellant



Standard
5.56mm M855

6.8mm SPC BALL POWDER® Propellant

6.8mm REM SPC ¹vs. 5.56mm M855

5.56mm M855 projectile 62.0 gr, 6.8mm projectile 115 gr, barrel 16"

<u>Propellant</u>	<u>Round</u>	<u>Velocity(ft/s)</u>	<u>K.E.(lbf-ft)</u>	<u>Pressure(psi)</u>
WC 844	5.56mm M855	2900	1157	55,000
SMP® 745	6.8mm REM SPC	2500	1593	53,000

- 6.8mm has ~40% more K.E. than the standard 5.56mm



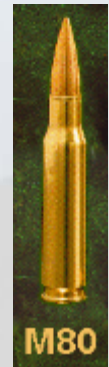
7.62mm BALL POWDER® Propellant

7.62mm M80 Ball Enhanced Performance

projectile 147 gr, barrel 22"

<u>Propellant</u>	<u>Velocity(ft/s)</u>	<u>K.E.(lbf-ft)</u>	<u>Pressure(psi)</u>
WC 846	2735	2442	50,000
High Performance BALL POWDER® Propellant	>2860	2670	50,000
Ballistic Improvement	> +125		

- ~10% Increase in Kinetic Energy



7.62mm SRTA BALL POWDER® Propellant

- St. Marks Powder has developed BALL POWDER® Propellant for 7.62mm Short Range Training Ammunition (SRTA)
- BALL POWDER® Propellant designed to give desired ballistic while maintaining proper gun functioning
- St. Marks has developed propellant additives for decoppering and to improve barrel wear



7.62mm Flashed Suppressed BALL POWDER® Propellant

St. Marks Powder has developed propellant additives
which reduce flash for 7.62mm ammunition



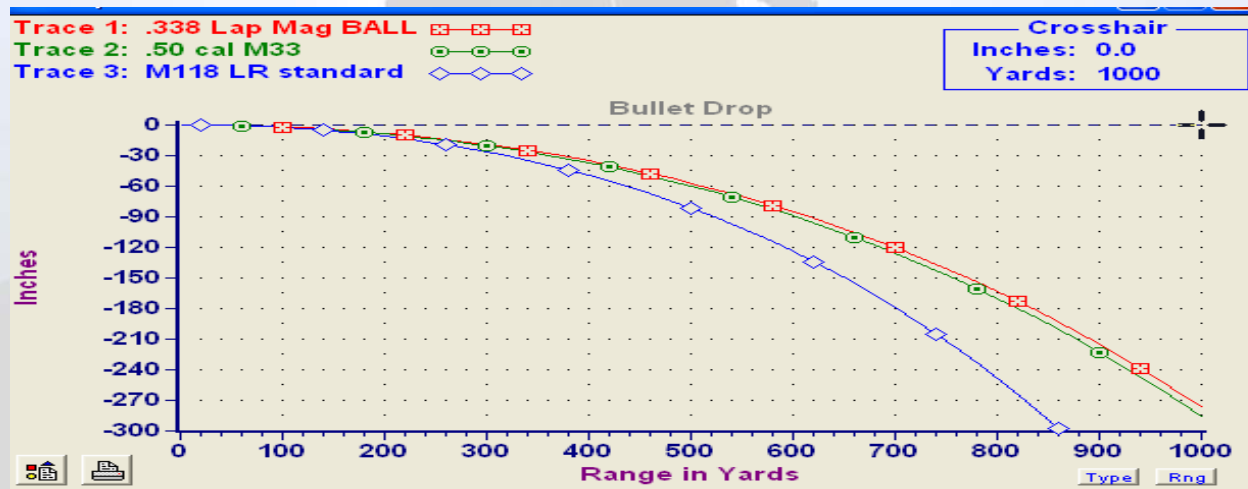
338 Lapua BALL POWDER® Propellant

.338 Lapua Enhanced Performance

Projectile 250 grns., Propellant Charge 100 grns, 24" barrel

<u>Propellant</u>	<u>Velocity(ft/s)</u>	<u>Pressure(psi)</u>
OBP® 716	3,000	64,000

- > 75 ft/s increase in velocity over factory rounds with BALL POWDER® Propellant
- Enhanced 338 Lapua has similar trajectory as 50 cal M33



50 Cal M33 BALL POWDER® Propellant

0.50 BMG M33 Enhance Performance

0.50cal M33 projectile 650 gr, barrel 36"

<u>Propellant</u>	<u>Velocity(ft/s)</u>	<u>K.E.(lbf-ft)</u>	<u>Pressure(psi)</u>
WC 860	2910	12214	60,000
WC 869	>3110	13932	60,000

- > +200 ft/s increase in velocity with WC 869
- > 14% increase in Kinetic Energy with WC 869



45 ACP BALL POWDER® Propellant

M1911 45 ACP Ballistic Specifications

Velocity 855 +/- 5 ft/s, Pressure 16,500 CUP max. avg.

- St. Marks Powder has developed a BALL POWDER® Propellant which meets 45 ACP specifications
- 45 ACP BALL POWDER® Propellant is designed to be clean burning with reduced flash



45 ACP Flashed Suppressed BALL POWDER® Propellant

St. Marks Powder has developed propellant additives
which reduce flash for 45 ACP ammunition



4.6 X 30mm PDW BALL POWDER® Propellant

4.6mm X 30 PDW BALL POWDER® Propellant

Projectile: 1.7 grams, propellant charge: 512 mg

<u>Propellant</u>	<u>Temp</u>	<u>Velocity(m/s)</u>	<u>Velocity(ft/s)</u>	<u>Press(bar)</u>	<u>Press(psi)</u>
OBP® 390	+21 C	688	2257	3,063	44,414
	-54 C	691	2267	3,107	45,052
	+52 C	669	2195	2,926	42,427

- OBP® 390 has enhanced performance over conventional propellants



Conclusion

- St. Marks has fielded propellant technology to enhance performance and reduce muzzle flash for a variety of applications.
- St. Marks has a dedicated Research and Development group that is available to resolve technical issues.
 - Working on next generation of Small Arms Propellants for Increased Lethality, Improved Barrel Wear and Reduced Flash