

Small Caliber Propellant Solutions for the U.S. Military

**St. Marks Powder
A General Dynamics Company**

May 19, 2010



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

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.



Flash Reduced Pistol Ammunition for the U.S. Military

45 ACP

Applications – Ball, Frangible, Green Primer, Green Bullet

45 ACP M1911 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



Baseline



St. Marks BALL POWDER®
Flash Suppressed Propellant



Flash Reduced Pistol Ammunition for the U.S. Military

9mm NATO M882

- The currently fielded WPR® 289 St. Marks BALL POWDER® Propellant used in the 9mm NATO M882 cartridge is designed to be clean burning with reduced flash



St. Marks Powder Flash Testing in 9mm MANN Barrel



St. Marks Powder IR&D effort in short barrel 5.56mm

5.56mm BALL POWDER® Propellant

Standard 5.56mm M855 Projectile, 62.0 grains – IR&D testing in various length MANN Barrels

Barrel Length	Propellant Development Candidate	Velocity @78 feet (ft/s)	Mouth Pressure (psi)	Port Pressure (psi)
20"	WC 844 (5.56mm M855 Baseline)	3,022	56,370	16,387
20"	WCR 845®S/SMP® 843	3,017	54,822	16,373
20"	SMP® 842	3,087	59,221	16,064
14.5"	WC 844 (5.56mm M855 Baseline)	2,752	55,756	16,487
14.5"	WCR 845®S/SMP® 843	2,756	54,855	16,582
14.5"	SMP® 842	2,825	58,830	16,204
11.5"	WC 844 (5.56mm M855 Baseline)	2,624	56,262	23,767
11.5"	WCR 845®S/SMP® 843	2,610	53,698	24,156
11.5"	SMP® 842	2,691	58,747	24,059



St. Marks Powder IR&D effort in short barrel 5.56mm

- St. Marks Powder has developed optimized BALL POWDER® Propellant solutions for reduced flash in short barrel applications

Propellant Development work in a 11.5” Mann Barrel without a Flash Suppressor



WC 844 (Baseline Propellant for 5.56mm M855 Ammunition)



WCR 845®S/SMP® 843 Reduced Flash (Propellant Development Candidate)



5.56mm Subsonic Propellant Research & Development Effort

5.56mm Subsonic/Flash Suppressed

Tested in HK416 Weapon @ 21.0 grns.

<u>Propellant</u>	<u>Temp</u>	<u>Velocity (ft/s)</u>
SHP 771 X7081	150°F	1,167
	70°F	971
	- 20°F	834
	-65°F	824



- All rounds functioned in a HK416 Weapon at all Temperatures
- Need to reduce velocity at 150°F to achieve subsonic velocity at all temperatures



7.62mm M118 BALL POWDER® Propellant

7.62mm M118 Long Range/Flash Suppressed

Projectile 175 grns., Propellant Charge 42.3 grns., 22" barrel

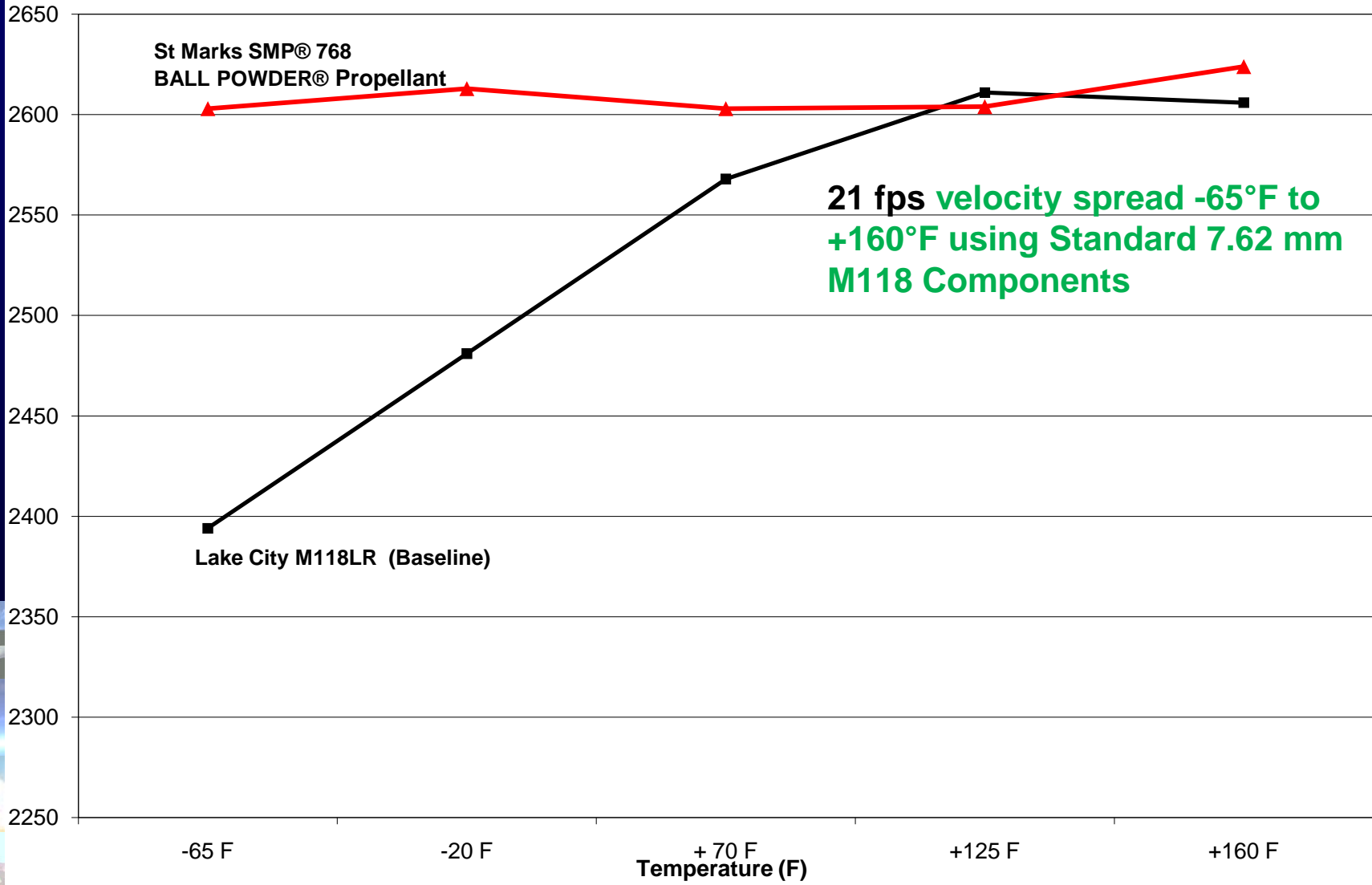
<u>Propellant</u>	<u>Temp</u>	<u>Velocity (ft/s)</u>	<u>Pressure (psi)</u>
SMP® 768	160°F	2,624	64,000
	70°F	2,603	58,800
	-65°F	2,603	53,700

- SMP® 768 has enhanced Temperature Sensitivity over conventional propellants with excellent long term, hot temperature storage properties



7.62mm M118 BALL POWDER® Propellant

Velocity and Storage Data of 7.62mm Rounds at Temperatures



7.62mm M118 BALL POWDER® Propellant

- Excellent Storage Properties

SMP® 768		
Storage Data	Velocity (ft/s)	Pressure (psi)
30 Days +70°F	2592	58700
30 Days +150°F/+70°F	14	-300
30 Days -40°F/+70°F	4	-200
Temperature Cycling	-10	-200



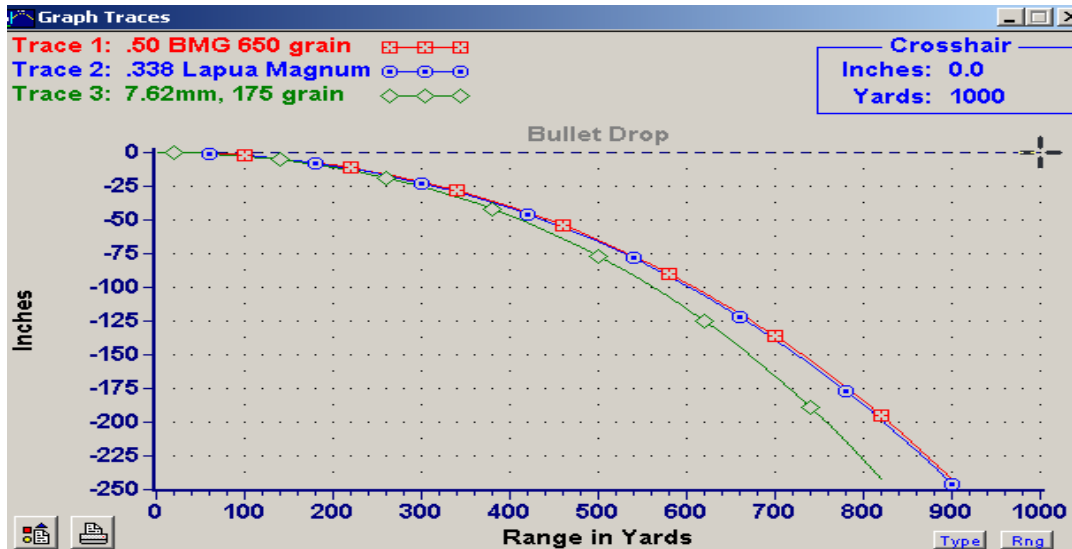
.338 Lapua BALL POWDER® Propellant Commercial Ammunition

.338 Lapua Enhanced Performance

Projectile 300 grns., Propellant Charge 98.5 grns., 24" barrel

<u>Propellant</u>	<u>Velocity (ft/s)</u>	<u>Pressure (psi)</u>
OBP® 715	2,750	65,000

- > 90 ft/s increase in velocity over factory rounds with BALL POWDER® Propellant
- Enhanced .338 Lapua has similar trajectory as 50 Cal., 650 grain commercial ammunition



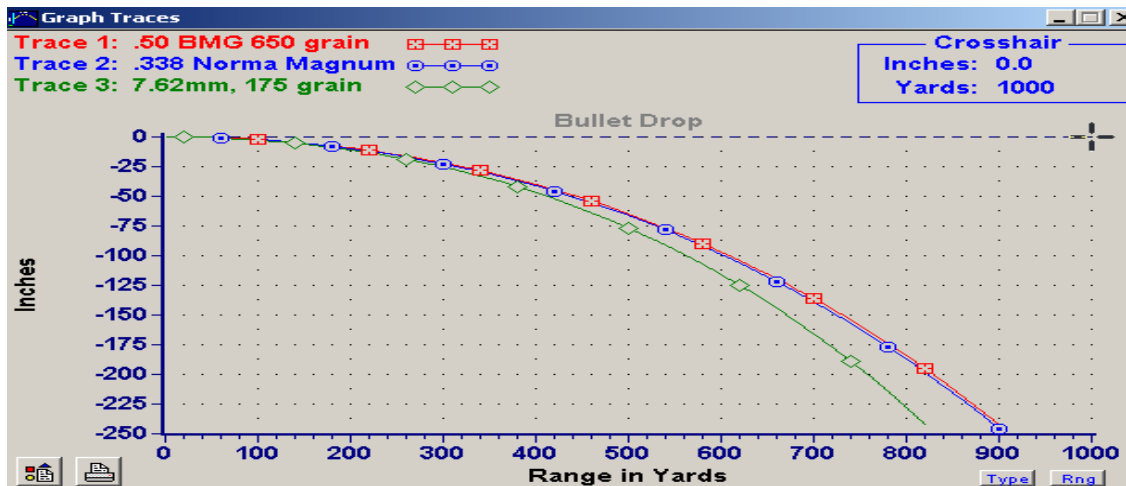
.338 Norma BALL POWDER® Propellant Commercial Ammunition

.338 Norma Enhanced Performance/Flash Suppressed

Projectile 300 grns., Propellant Charge 94.5 grns., 24" barrel

<u>Propellant</u>	<u>Velocity (ft/s)</u>	<u>Pressure (psi)</u>
OBP® 715	2,750	64,000

- St. Marks Powder sets the standard in velocity for this cartridge. No other propellant can match the energy, velocity and accuracy
- Enhanced .338 Norma has similar trajectory as 50 Cal., 650 grain commercial ammunition



.50 Cal. BALL POWDER® Propellant Commercial Ammunition

.50 Cal. Enhanced Performance/Flash Suppressed

Projectile 650 grains., 36" barrel

<u>Propellant</u>	<u>Velocity (ft/s)</u>	<u>Pressure (psi)</u>
WC 869	>3110	60,000

- > 200 ft/s increase in velocity over commercial .50 Cal., 650 grain ammunition using WC 869 (>14% increase in K.E.)



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

