



**2014 Joint Armaments
Forum, Exhibition &
Technology Demonstration
for Small Arms; Guns,
Ammunition, Rockets &
Missile Systems**

Event #4610

May 12-15, 2014

Phoenix, AZ

*“Balancing Armament
Innovation and Readiness
Improvements within Budget
Constraints”*

GENERAL DYNAMICS
Ordnance and Tactical Systems

Approved for Public Release
PAO 215-14

LW30mm SMP®855 Propellant Development

Government and industry working together to balance armament innovation and readiness improvements within budget constraints.



Government



Industry



PIE-T M788 M789 TP-
 TP HEDP Spotter

LW30mm Ammunition: Background

The US Army's Apache helicopter has experienced M789 HEDP ammunition issues in the field that require Government and industry attention:



Issue:

1. Long term ammunition exposure to high temperature storage can result in a propellant chemical breakdown resulting in higher pressures that damage the Apache's LW30mm M230 weapon
2. Projectile muzzle velocities at temperature extremes do not match the weapon fire control which result in missed targets



PIE-T M788 M789 TP-
 TP HEDP Spotter

LW30mm Propellant Solution

PMMAS, ARDEC, GD-OTS, and St. Marks Powder® have worked together to develop, test, load M788 and M789 qualification lots, and conduct qualification testing to resolve the performance issues.

Solution:

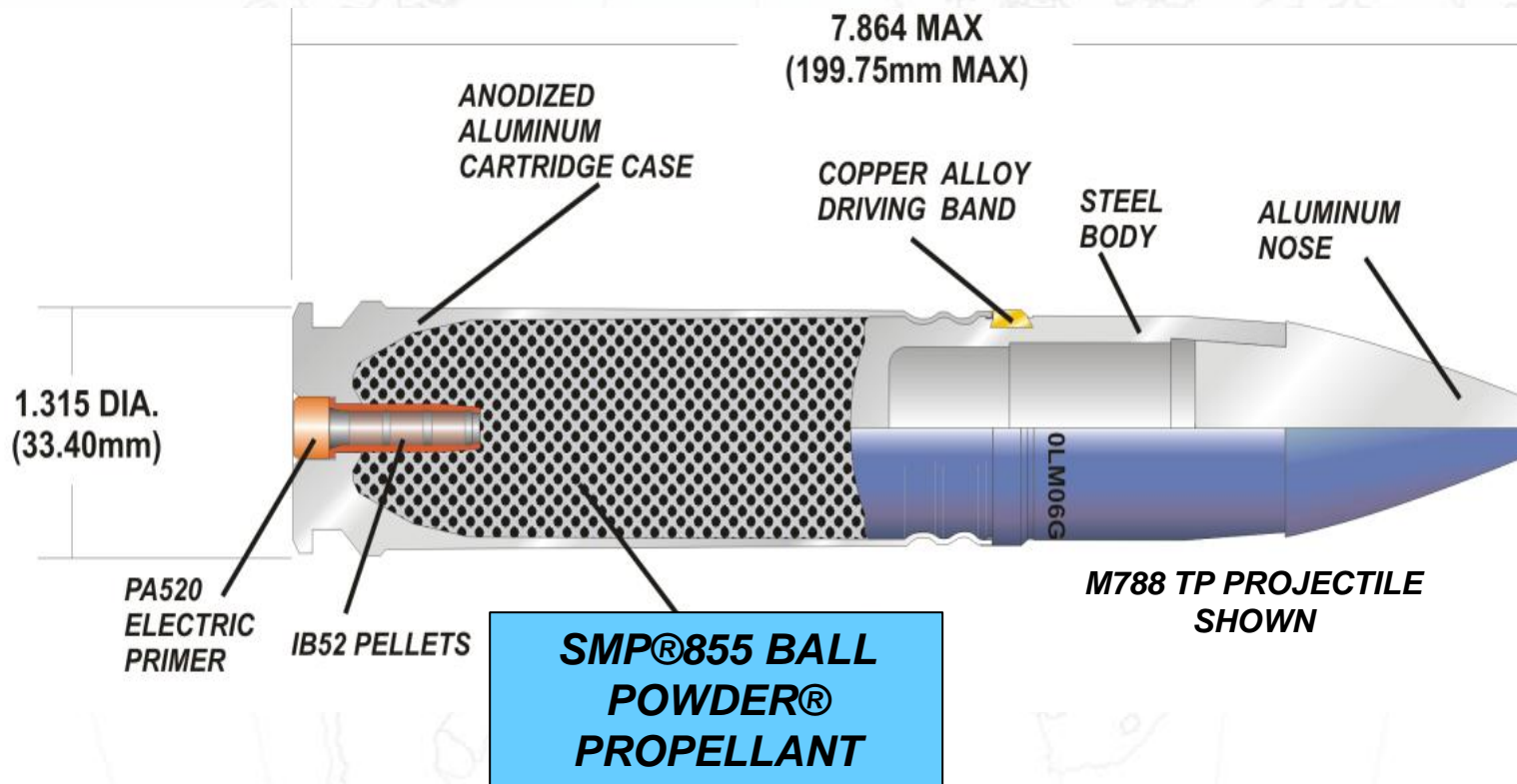
SMP®855 Ball Powder® Propellant from St. Marks Powder® was developed using stabilizing chemicals to endure robust high temperature storage and

- Produce normal operating pressures after exposure to long term high temperature storage
- Yield muzzle velocities that match the weapon fire control across temperature extremes



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LW30mm Apache Ammunition Description



Issue 1: Severe High Pressure Results after Long Term High Temperature Storage



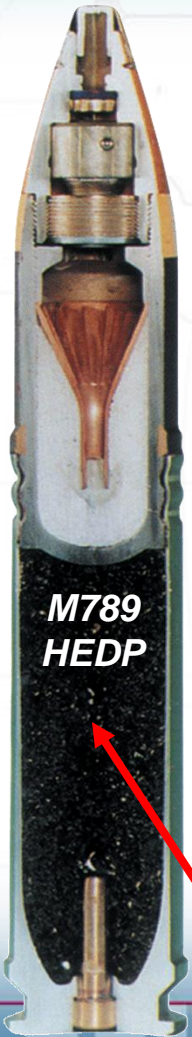
Damaged
Apache
LW30mm
M230
Weapon



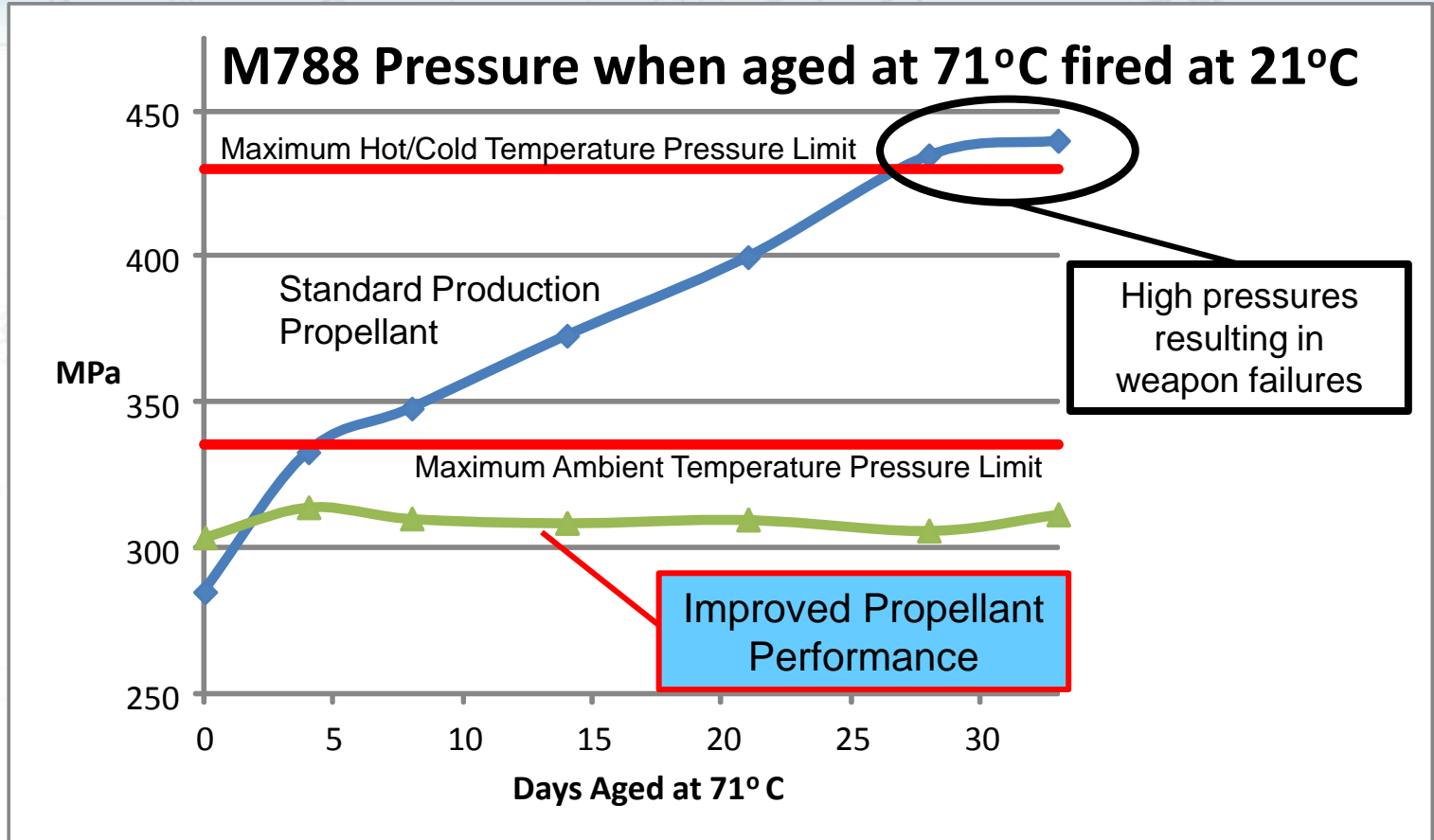
Damaged
LW30mm
M789
HEDP
Cartridges



Issue 1: Long Term High Temperature Stability Solution



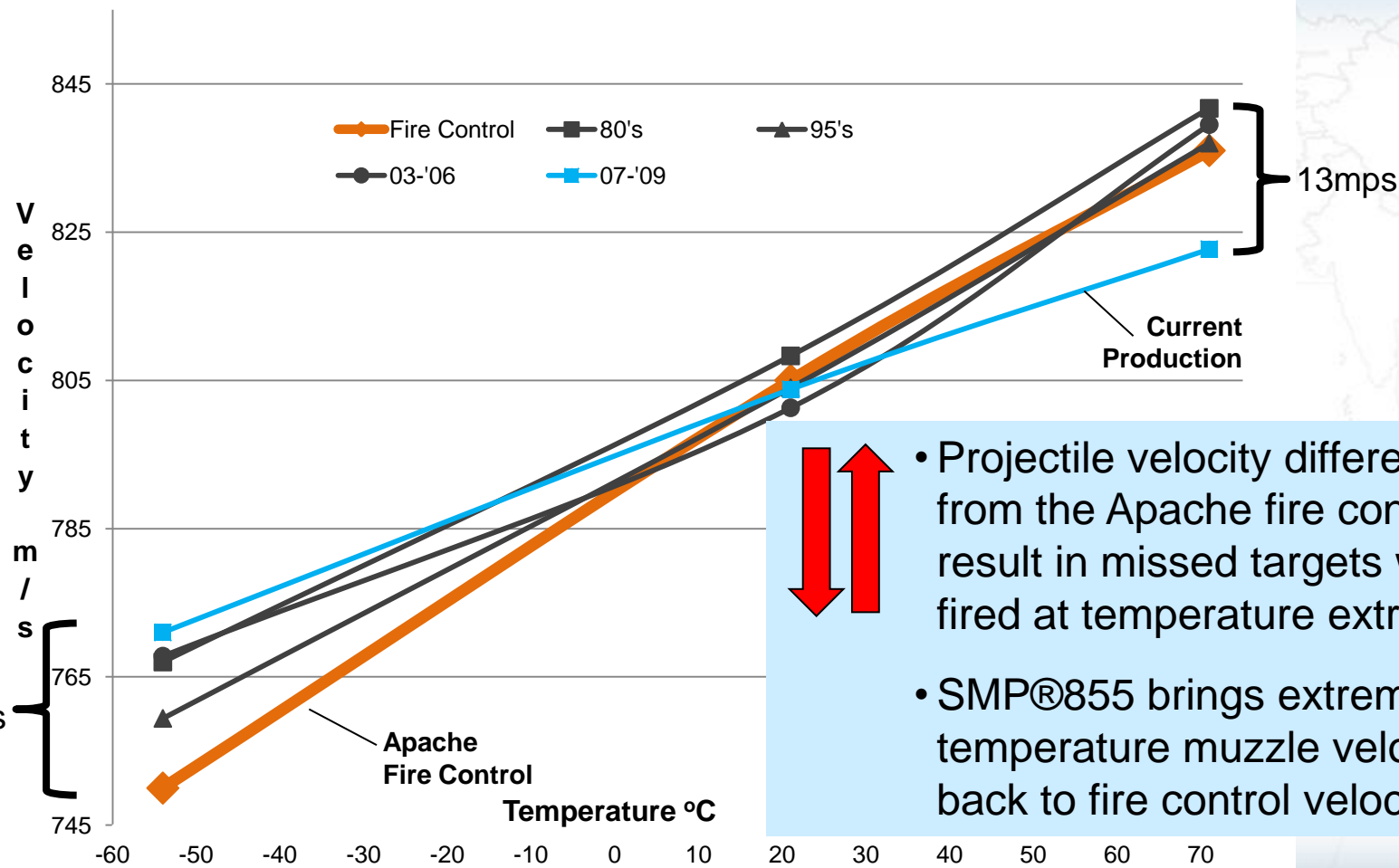
Propellant



High pressures resulting in weapon failures

Improved Propellant Performance

Problem 2: Apache Fire Control Muzzle Velocity Profile



• Projectile velocity differences from the Apache fire control result in missed targets when fired at temperature extremes

• SMP@855 brings extreme temperature muzzle velocities back to fire control velocities

LW30mm Propellant Improvement Schedule

Task Description	Schedule
SMP®855 Qualification lot built	Complete
Build M788 TP and M789 HEDP qualification lots	Complete
US Army qualification tests	Q2 2014
M788 and M789 ECP approved	Q4 2014
Revised M788 and M789 performance specification	2015



Government and industry working together to incorporate SMP®855 into the LW30mm ammunition TDPs

LW30mm Propellant Qualification Matrix

Test Description	Test Rounds		Status
	M788	M789	
40-Foot Drop Test	440	440	Q2 2014 completion
Sympathetic Reaction Test 1	440	440	Q2 2014 completion
Sympathetic Reaction Test 2	440	440	Q2 2014 completion
Liquid Fuel External Fire	440	440	Q2 2014 completion
Transportation Vibration at Temperature	95	-	Passed
Temperature- Humidity	105	-	Passed
Extreme Temperature Storage	40	-	Passed
Temperature Shock	95	-	Passed
Pressure, Velocity, and Action Time*	150	-	Passed
Temperature, Humidity, and Altitude	30	-	Passed
Aircraft Vibration	90	-	Passed
Toxic Fumes	20	-	Passed
Test Spares	220	-	
Thermal Characterization	Components	-	Passed
High Temperature Stability	Propellant	-	Passed
* All testing except PVAT conducted by the USG	2605	1760	Totals

Summary

- PMMAS, ARDEC, GD-OTS, and St. Marks Powder® have successfully worked together to bring SMP®855 propellant through qualification
- Solution addresses ammunition issues reported from the field:
 - Ammunition propellant capable of handling long term high temperature storage
 - Ammunition propellant that complies with the Apache fire control extreme temperature muzzle velocities



*“Innovation and Readiness
Improvement within Budget Constraints”*

Points of Contact

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