Improved 12,7 mm (.50 cal) Multi Purpose (MK211) Anti Material Concept

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NAMMO Overview
- A Technology Driven Aerospace & Defense Group

- Corporate HQ in Norway
  - Presence in 9 countries
  - 2200 employees
  - Revenue $620 million (2013)
  - 85% defense / 15% civil

- Nammo Inc HQ in Virginia
  - Nammo Talley (SSA)
  - Nammo Pocal
  - Nammo Tactical Ammunition
  - Nammo Demilitarization
  - Nammo Composite Solutions

~ \( \frac{1}{3} \) USA & Americas

~ \( \frac{1}{3} \) Nordic

~ \( \frac{1}{3} \) Europe & ROW
Core Business & Technologies

• Ammunition
  – Specialty producer of small, medium and large caliber ammunition

• Shoulder-Launched Munitions
  – Advanced multi-purpose SLMs for current and emerging warfighter missions

• Missile Products
  – Highly engineered rocket motors, warheads, composite/metallic cases and actuation systems

• Demilitarization
  – World leader in safe and environmentally responsible recycling of ammunition and energetic materials
Nammo Has Supported US Ammunition Supply With .50cal MK211 for 31 years

- More than 30M projectiles delivered through Lake City AAP
  - Sniper and Machine Gun – linked configurations

- 2011: Nammo Tactical Ammunition established
  - Small quantity sniper ammunition assembly
  - Special Loads/Configurations
  - Research and Development Support
  - Improved Logistics Support (Foreign Trade Zone)
.50 Caliber Multi-Purpose Agenda

- Multipurpose Concept: 20mm Performance in a 12.7mm form
- Evolution of MP Ammunition: 21st Century Improvements
- Effectiveness Study results
- System Safety – Handling and Unexploded Ordnance (UXO)
- MP Training Analog: SG-M Round
.50 cal Multipurpose Concept
- Unleash the Potential

- Armor Piercing
- High Explosive
- Fragmentation
- Incendiary
.50 cal Multipurpose Concept
- *Unleash the Potential*

8 inch reinforced concrete, range 200 yards
Next generation .50 cal MP – F3

“New” PBXN-5 Explosive

“New” Cobalt Free Tungsten Carbide Penetrator

“New” Next Generation Propellant
Next generation MP: Better Penetration and “Temperature Stable Velocity”

<table>
<thead>
<tr>
<th>Penetration - Standard</th>
<th>Penetration – “F3”</th>
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</thead>
<tbody>
<tr>
<td>12.7 mm (0.5”) at 200 yds</td>
<td>22.0 mm (0.85”) at 200 yds</td>
</tr>
<tr>
<td>10.6 mm (0.4”) at 1000 yds</td>
<td>12.7 mm (0.50”) at 1000 yds</td>
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<tr>
<td>(Full penetration of 80 degree NATO target)</td>
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<table>
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<tr>
<th>Accuracy/Velocity Stability - Standard</th>
<th>Accuracy/Velocity Stability – “F3”</th>
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<tbody>
<tr>
<td>1.5 MOA</td>
<td>1.5 MOA</td>
</tr>
<tr>
<td>120 m/sec Delta Velocity from -50C to 70C</td>
<td>5 m/sec Delta Velocity from -50C to 70C</td>
</tr>
</tbody>
</table>
Next Generation Propellant
STANAG 4170 qualified & REACH compliant

Velocity/Temperature

Standard propellant

Next gen. propellant
Suppression Effect

Fragment zone

Approx. no. of fragments

12 10 8 6 4 2 0 m

LOF

5

10

15

P

H

MP

API

0.5

1.0

12 10 8 6 4 2 0 m
MP Effectiveness Study
Two Rounds Stop Light Armor at 1200m

- Light armoured vehicle defeated by an average of 1.4 MP rounds
  - @ 1200m in 0°, 45° and 90°
- > 3.5x better $P(k/H)$ than a standard AP round.

Figure 27 - Probability of Mission Kill Contour Map (Range = 1200m, View Angle = 90°)
MP Effectiveness Study
Five MPs Stop Armored Personnel Carrier at 600m

- The BTR-70 200m away defeated by 1-2 MP rounds.
  - 200m at 0° and 45°
- The BTR-70 600m away defeated by 4-5 MP rounds.
  - 600m at 0°

Figure 27 - Probability of Mission Kill Contour Map (Range = 200m, View Angle = 45°)
Multipurpose Safety

- No fuze/stored energy in the MP technology.
- **100% safe to handle even after firing.**
- Requires significant energy to start the pyrotechnic chain
- Impact velocity of ~1000 ft./s is needed to ignite the round.

- Lot Acceptance Tests to verify round safety round:
  - 50 ft. cartridge drop, nose down on an armor plate
    - **No ignitions - ever, and post-test round is safe to handle and fire.**
  - 8 ft. projectile drop, 3 lbs. load dropped onto projectile nose
    - **No ignitions - ever, and post-test projectile is safe to handle and fire.**
  - Muzzle sensitivity test – Rounds fired into aluminum sheet at 65 ft.
    - **No ignitions - ever**
SG-Marker Round

- Ball round with «flash-on-impact» similar to the MP round
- Trajectory match with MP Family
- No explosives/Can be used as a training round for the MP
- Zero UXO Hazard
- Easy for sniper/spotters to see impact without tracers
- Linkable for «low signature» impact report
Questions?

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