The Application of New IM Explosive Candidates in the M795 Projectile

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Background

- **Common Low-cost IM Explosive Program**
  - James Rutkowski

- **The Characterization of IM Explosive Candidates for TNT Replacement**
  - Brian Roos

- **Explosive Ingredients and Compositions for the IM M795 Artillery Ammunition**
  - Andrew Wilson
• Here I will provide the detailed IM test results for M795 filled with IMX candidates
Review of Filter 2 for IM Candidates

- “Funnel” framework to progressively screen candidates

**Filter 1 Criteria**
- Cheetah Calculations
- Standard Safety Tests
  - Electrostatic
  - Friction
  - Impact
- Vacuum Thermal Stability
- DTA
- Critical Diameter

**Filter 2 Criteria**
- Tier 1 IM Tests (BI, FI, SCO)
- Tier 2 IM Tests (SD)
- Tier 3 IM Tests (FCO, SCJ)

**BCA Criteria**
- IM Tests, Lethality, Logistics, Safety, Platform
- Performance of the alternatives against weighted factors
- Risk analysis
- Comparable cost analysis
- Sensitivity Analysis

**Munitions Fill Types**

- IM Explosive Fill for 120mm and/or 155mm
System Enhancements for IM

- Venting Technology for Cook-off Environments
  - System Solution --- Explosive-alone cannot satisfy Cook-off
  - 155mm Artillery Concepts

Incorporated Venting Solutions

- Standard Lifting Plug Will Not Pass (Type III)
- Partial Venting (Type IV)
- Meltable Fuze Plug (Type V)
FCO Results

Mil-Std-2105C, Liquid Fuel Fire, Witness Plate & Pressure Gage

IMX-101  Pass
IMX-102  Pass*
IMX-103  Pass

*Based on new lifting plug
MIL STD 2105C / 50F/hr / Precondition 145F / Witness Plate & Pressure Gage

Pass

IMX-101
IMX-102
IMX-103

Pass
MIL STD 2105C / 6000 ft/s Army Fragment / Witness Plate & Pressure Gage
Bullet Impact

Mil-Std-2105C / .50 Caliber AP Bullet / Witness Plate & Pressure Gage

IMX-101 Pass
IMX-102 Pass
IMX-103 Fail - Equivalent to TNT (Type IV)
Sympathetic Detonation

Mil-Std-2105C, Diagonal Configuration, Witness Plate & Pressure Gages

All Pass
May 4th, 2007 (Picatinny Arsenal)

Test Set-up with 50mm SCJ

3 “Large” Pieces NO Detonation PASS

4 “Large” Pieces NO Detonation PASS

Mil-Std-2105C, Unconditioned Jet, Witness Plate & Pressure Gages
May 17th, 2007
(Picatinny Arsenal)

Test Set-up with 81mm SCJ

Examples
Conditioned SCJI

81mm Shaped Charge
LX-14 with Al conditioning plate
JSIMTP standard
RPG-7 Surrogate
IM Results Summary

– Demonstrated IM Compliance
  • With Pass all IM tests

<table>
<thead>
<tr>
<th>IM Test:</th>
<th>FCO</th>
<th>SCO</th>
<th>BI</th>
<th>FI</th>
<th>SD</th>
<th>SCJI</th>
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<tbody>
<tr>
<td>Passing Criteria</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>III</td>
<td>III</td>
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<tr>
<td>M795 Baseline (TNT)</td>
<td>FAIL</td>
<td>FAIL</td>
<td>FAIL</td>
<td>FAIL</td>
<td>FAIL</td>
<td>FAIL</td>
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</table>

IMX-101
- PASS
- PASS
- PASS
- PASS
- PASS
- PASS

IMX-102
- (PASS)
- PASS
- PASS
- PASS
- PASS
- PASS

IMX-103
- PASS
- PASS
- FAIL
- PASS
- PASS
- FAIL

Passed SD
Passed SCJI

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Summary

• IM HE Loading of 155 mm Projectiles – Paul

Fielding this technology saves lives, facilities & assets

Demonstrated IM Compliance

Results far exceeded expectations

Suitable & Sustainable solution

Demonstrated PASS
SD, 50mm SCJI & 81mm SCJI