



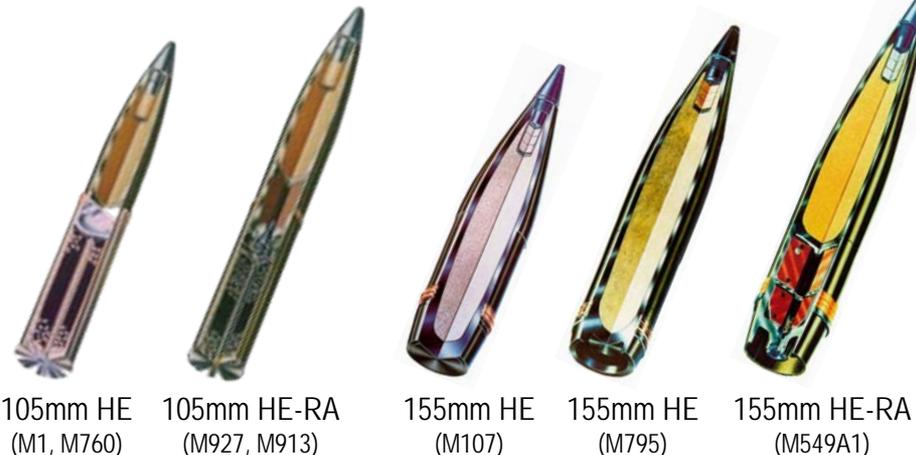
Common Low-cost IM Explosive Program to Replace Comp B

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Common Low-cost IM Explosive Program

Artillery HE Projectiles



Baseline Explosive = TNT

TNT filled Projectiles FAIL all IM Tests

➤ ISSUE:

- ✓ Ammunition loaded with TNT & Comp-B explosives have poor IM results
- ✓ Current HE items require IM Waiver
 - IM explosives identified under prior efforts
 - Specific to individual program requirements
 - Lacked commonality
 - Some IM improvements – still need waiver
 - NTIB Cost Impacts

Mortar HE Cartridges



Baseline Explosive = Comp-B

Comp-B filled Cartridges FAIL all IM Tests

➤ CORRECTIVE ACTION:

- ✓ Investigate new IM Explosives with intention to insert into production in near-term



IM Test Results

Mortar Baseline (IMB scored)

Reactions:	VI No Sustained Reaction	V Burn	IV Deflagration	III Explosion	II Partial Detonation	I Detonation

IM Test:	FCO	SCO	BI	FI	SCJI	SD
Passing Criteria	V	V	V	V	III	III
60mm (Comp-B)	II	III	V	III	I*	I*
81mm (Comp-B)	II	II	IV	III	I*	I*
120mm (Comp-B)	II	I	I	I	I*	I*

* Assessment (not tested)

60mm



Steel Body

0.8 lb Explosive Filler
[Comp-B]

81mm



Steel Body

2.0 lb Explosive Filler
[Comp-B]

120mm



Steel Body

6.6 lb Explosive Filler
[Comp-B]



IM Test Results

Mortar Current (IMB Scored)

Reactions:

VI No Sustained Reaction	V Burn	IV Deflagration	III Explosion	II Partial Detonation	I Detonation
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IM Test:	FCO	SCO	BI	FI	SD	SCJI
Passing Criteria	V	V	V	V	III	III
60mm (Comp-B/PAX-21)	II	III	V	III	(I)*	(I)*
81mm (Comp-B)	(II)*	(II)*	(III)*	(III)*	(I)*	(I)*
120mm (Comp-B)	II	I	I	I	(I)*	(I)*

** with PAX-21 and Intumescent Coating

() * Assessment -- not tested

60mm



HF1 Steel w/ PAX-21

0.8 lb Explosive Fill
[PAX-21]

81mm



Steel Body
HF1 Steel w/ "A1"

2.0 lb Explosive Fill
[Comp-B]

120mm



Steel Body

6.6 lb Explosive Fill
[Comp-B]



Program Objectives



➤ Common Low-cost IM Explosive Program

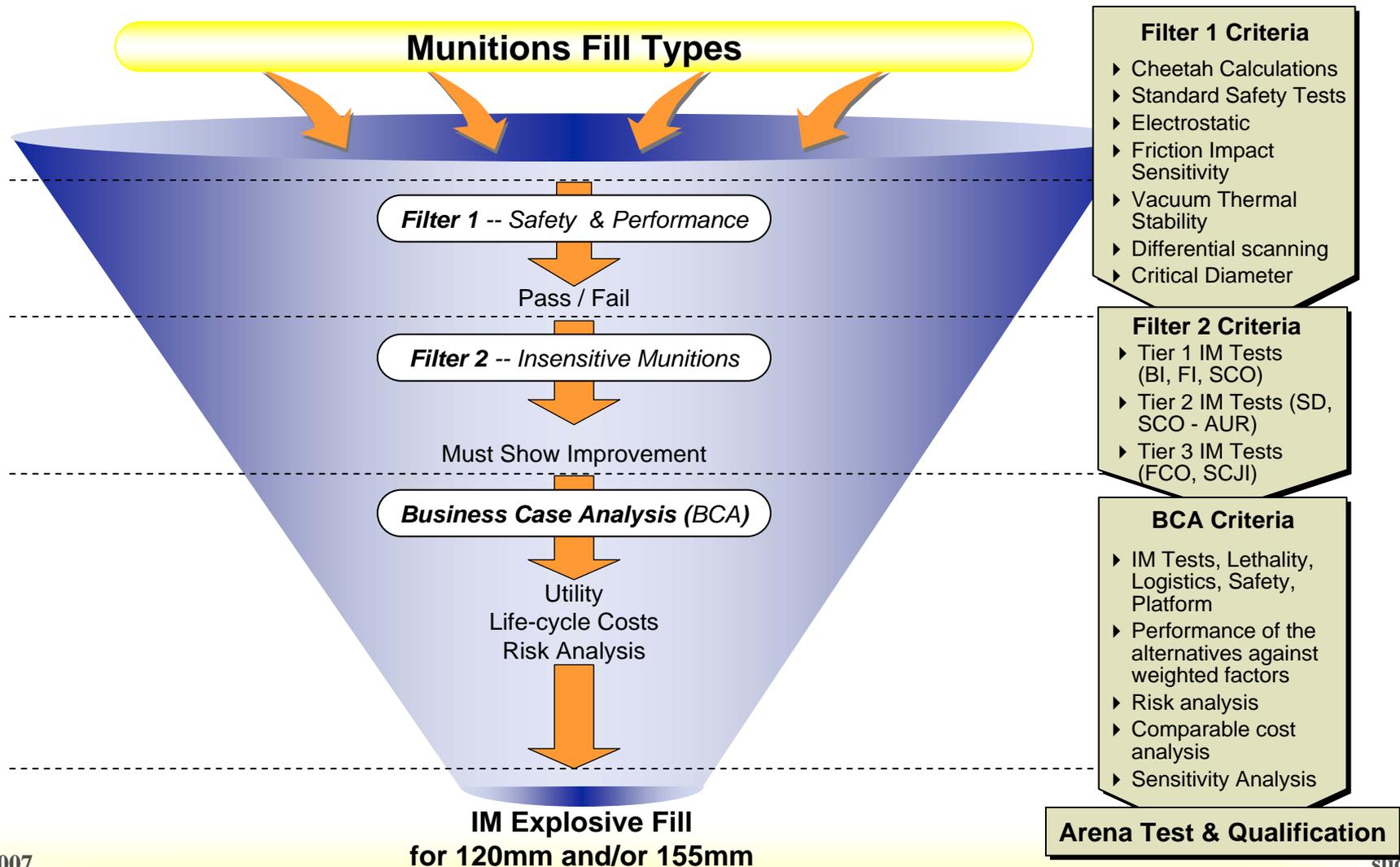
✓ New IM Explosive for Artillery and Mortar applications that are:

- **Effective**
 - Maintain Lethality with minimal or no degradation
- **Less Sensitive**
 - If not fully compliant, must show improvement over Baseline explosive
- **Affordable**
 - Artillery Cost Drivers = Steel Body Material & Explosive Fill
 - Mortar Cost Drivers = Steel Body Material, Fuze & Propelling Charges
- **Producibile within the National Technology and Industrial Base (NTIB)**
 - Infrastructure
 - Raw Ingredients
 - Explosive formulation
 - Projectile Load, Assemble & Pack (LAP)
- **Other Considerations**
 - Intellectual Property Rights
 - Demilitarization
 - Environmental

Primary Objective is to provide a Common IM Fill
-- Or --
one common TNT replacement (Artillery)...
...and one common Comp-B replacement (Mortars)

Common Low-cost I.M. Explosive Program

➤ “Funnel” framework to progressively screen candidates





Common I.M. Explosives Program



➤ Strategy:

- ✓ Identify Potential Candidates
- ✓ Establish I.M. Test Configuration for Candidates
- ✓ Execute IM Test Protocol
- ✓ Conduct Business Case Analysis for successful candidates

Previous testing
in different configuration



Candidate Explosive Fills



➤ Sources:

- ✓ **Historical / Government / Industry / Foreign**
- ✓ **QFD conducted by ARDEC**
- ✓ **PEO-AMMO IM Thrust Programs**
- ✓ **Navy and Air Force Explosives**
- ✓ **Industry efforts**

- ✓ **Melt-pour**
 - Inert binder
 - Energetic binder
 - Nitrate salt-based
- ✓ **Cast-cure**
 - Inert binder
- ✓ **Press-fill**
 - Inert binder



Test Configuration

➤ Established IM Test Configuration for Comp B Program

✓ 120mm M934A1 HE cartridge as test vehicle

- Live fuze
- Reduced thread steel fuze adapter
- No container for BI, FI, SCO (except SCO AUR)
- Monopaq® & Barriers for SD only





Mortar IM HE Test Protocol



•Tier 1

- BI – 7.62mm AP, 2 tests
- FI – Army Fragment, 2 tests
- SCO – 50F/hour heating rate, 2 tests

	Bullet Impact

	Fragment Impact

	Slow Cook-off

must show better than baseline in 1 of 3

•Tier 2

- SD – 3 live & 1 inert, donor initiated via modified fuze, in Monopaq® with barrier, 2 tests
- Calibration test, detonate one single round, 1 test
- SCO AUR + Monopaq®, – 50F/hour heating rate, 1 test

	Sympathetic Detonation

	Slow Cook-off (AUR)

Conduct Business Case for successful candidates

•Tier 3

- SCJI – 2 tests
- FCO – 2 tests

	Tier 3 SCJI & FCO

Protocol Considerations:

- Cost of Test
- Ease of Setup
- Threats for Comparison to Baseline
- Reaction Level for proceeding



Program Status



✓ Candidate fills selected

- 23 Explosives considered for TNT & Comp-B replacement
 - 9 Explosives selected (melt-pour & cast-cure) for Comp-B
- Explosive formulations completed for 6
- Hardware loading completed for 2

✓ Schedule

Comp B - Replacement

Phase 1

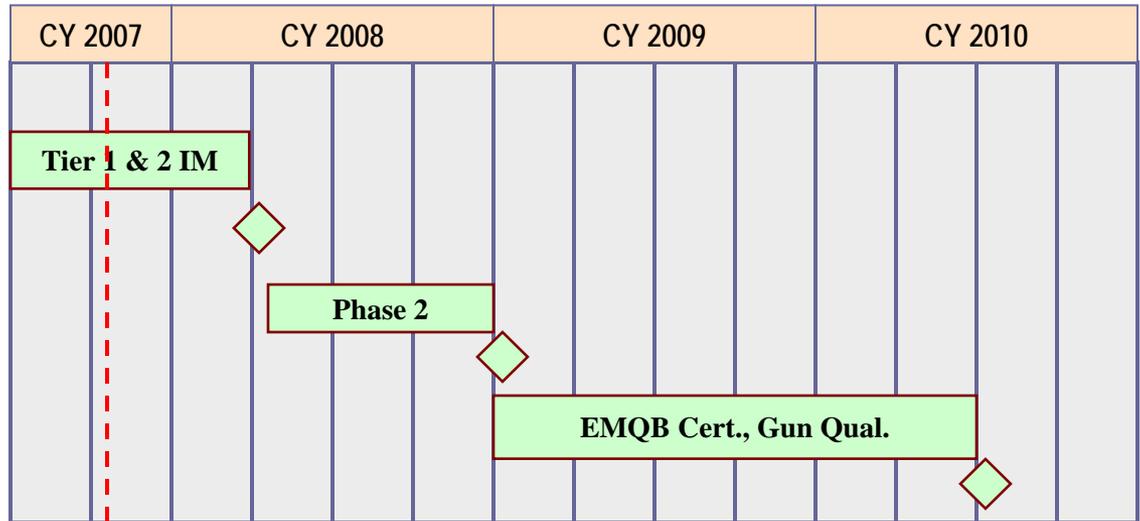
- Identify & Test Candidates
- Downselection

Phase 2

- Tier 3, Lethality, BCA

Phase 3

- Qualification



Today



Acknowledgements



- **ARDEC**
- **ARL**
- **Navy IH**
- **Industry**