



Insensitive Munitions & Energetic Materials Technology Symposium



Qualification of 120mm Rifled Ammunition in Support of the Expeditionary Fire Support System (EFSS)

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EFSS Program Overview



Expeditionary Fire Support System is a U.S. Marine requirement for a weapon system that must be:

- Internally transportable in MV-22 Osprey
- Max range 8 km
- Close supporting
- Accurate
- Immediate Response
- Lethal indirect fire



EFSS System Description



An EFSS system consists of:

- Two Prime Movers
- Ammunition Trailer
- 120mm Rifled Mortar
- Full Suite of 120mm Rifled Ammunition



Mortar and Ammunition Background



TDA Basic 120mm Rifled Mortar and Ammunition

- Developed in the early 1970s
- In service with 24 countries, including 4 NATO army's and Japan.
- Over 500,000 rounds fired
- Rifled barrel provides a spin stabilized projectile.
- Maximum range of standard rifled ammunition is 8km
- GD-OTS teamed with TDA to bring rifled mortar capability to EFSS platform

Standard 120mm Rifled Ammunition



TDA 120mm Standard Ammunition Suite

- High Explosive (HE) – 4.2 kg of TNT
- Practice – 0.5 kg of black powder for spotting
- Illumination – 1.9 kg flare
- Obscurant/Incendiary (Smoke) – 2.8 kg of White Phosphorous

All four types of ammunition share the same Tail Charge Assembly



120mm Rifled Ammunition for USMC



Key elements identified to ensure better Insensitive Munitions Characteristics for EFSS ammunition

- Replace sensitive energetic materials with Navy approved IM equivalents
- Provide a venting path to release pressure within the projectiles and containers
- Equip with Navy approved IM fuzes
- Package containers with supporting materials that separates and falls away for the round with extreme heat.

EFSS HE Ammunition Upgrade

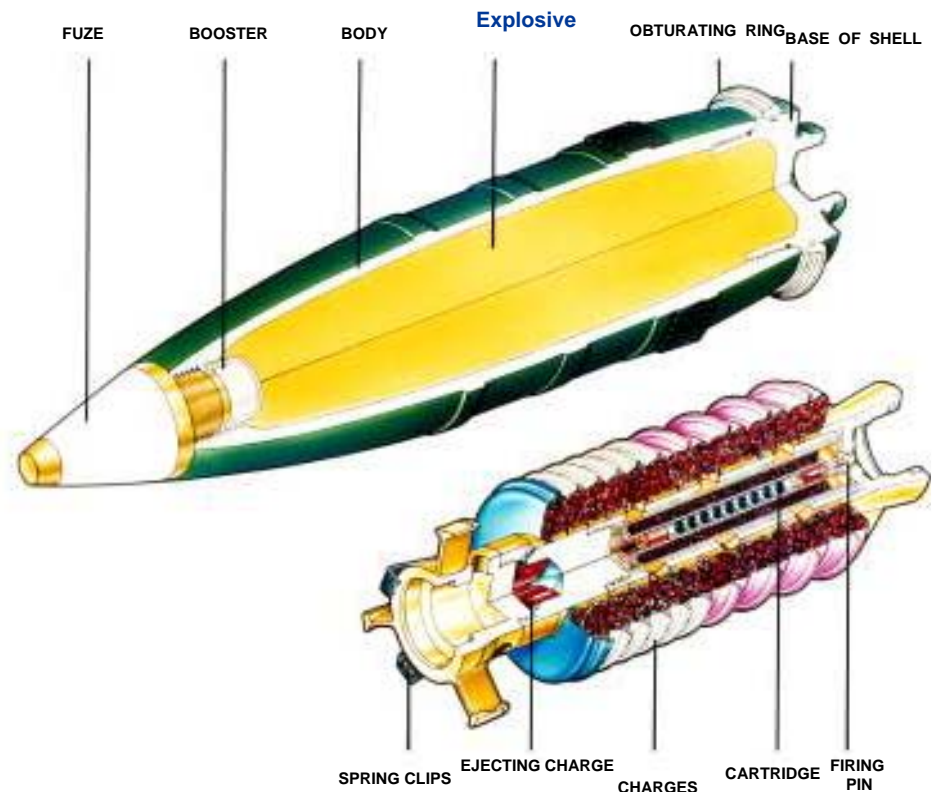


Modifications to HE Projectile

- Replace TNT fill with PBXW-128 (HMX based)
- Equip with an M767A1 fuze utilizing a PBXN-5 booster
- Add a fuze venting liner between the projectile body and the fuze

Design Constraint

- Maintain equivalent lethality
- Similar ballistics



EFSS Practice Ammunition Upgrade

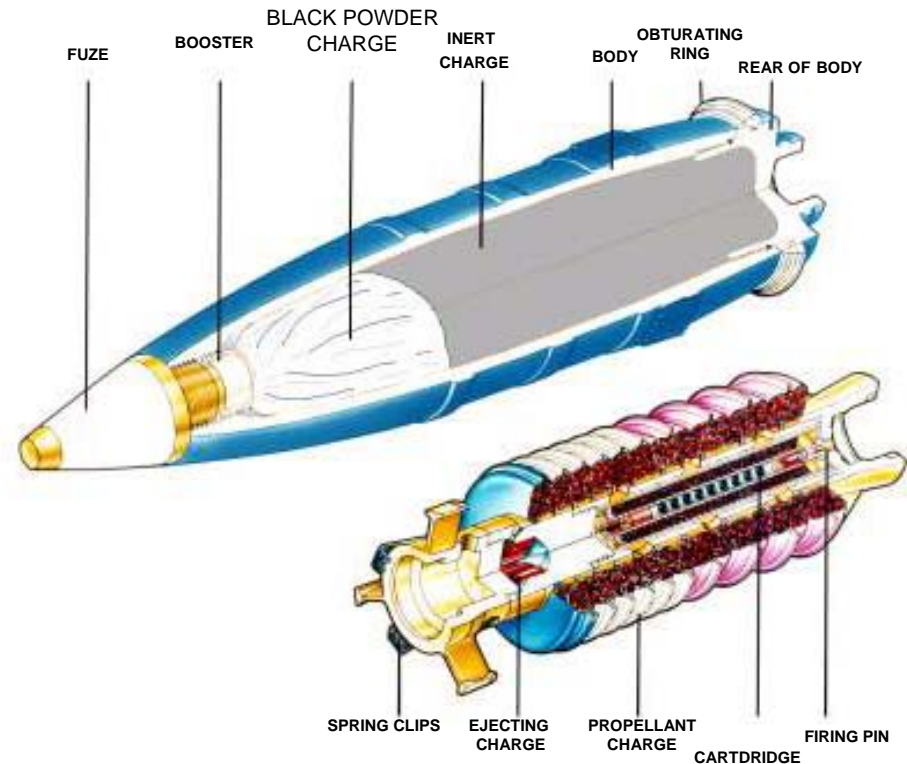


Modifications to Practice Projectile

- Equip with an M767A1 fuze utilizing a PBXN-5 booster
- Add a fuze venting liner between the projectile body and the fuze

Design Constraint

- Maintain spotting ability
- Same ballistic to EFSS HE



EFSS Smoke Ammunition Upgrade

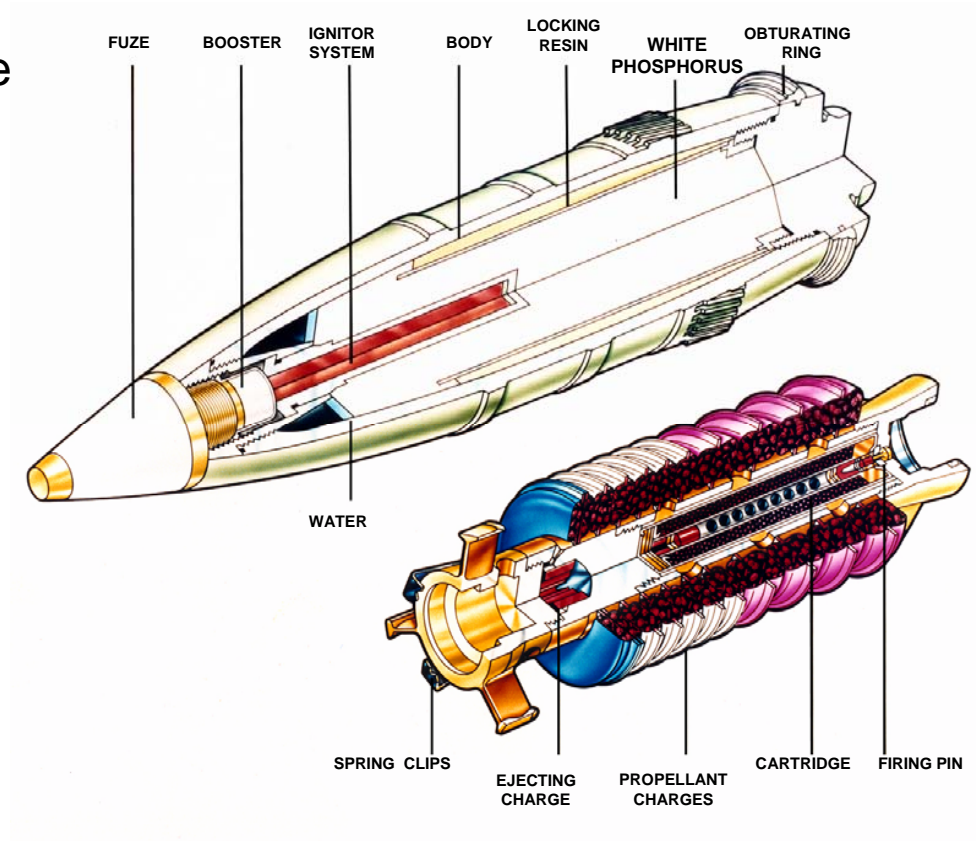


Modifications to Smoke Projectile

- Equip with an M767A1 fuze utilizing a PBXN-5 booster
- Replace Comp B igniter with PBXN-9

Design Constraint

- Maintain obscurant ability
- Similar ballistics

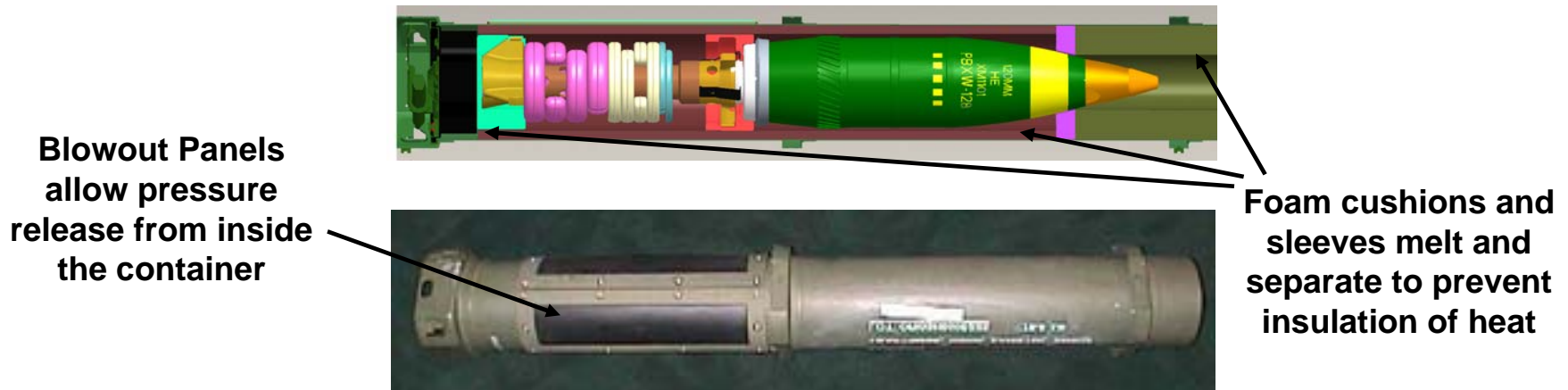


EFSS Container Assembly Upgrade



PA117 Vented Container Assembly for HE, Practice, and Illumination rounds

- Blow out panels allow pressure release
- Foam packaging separates and returns to resin form when heated
- Fuze has room to completely detach from projectile with heat and pressure

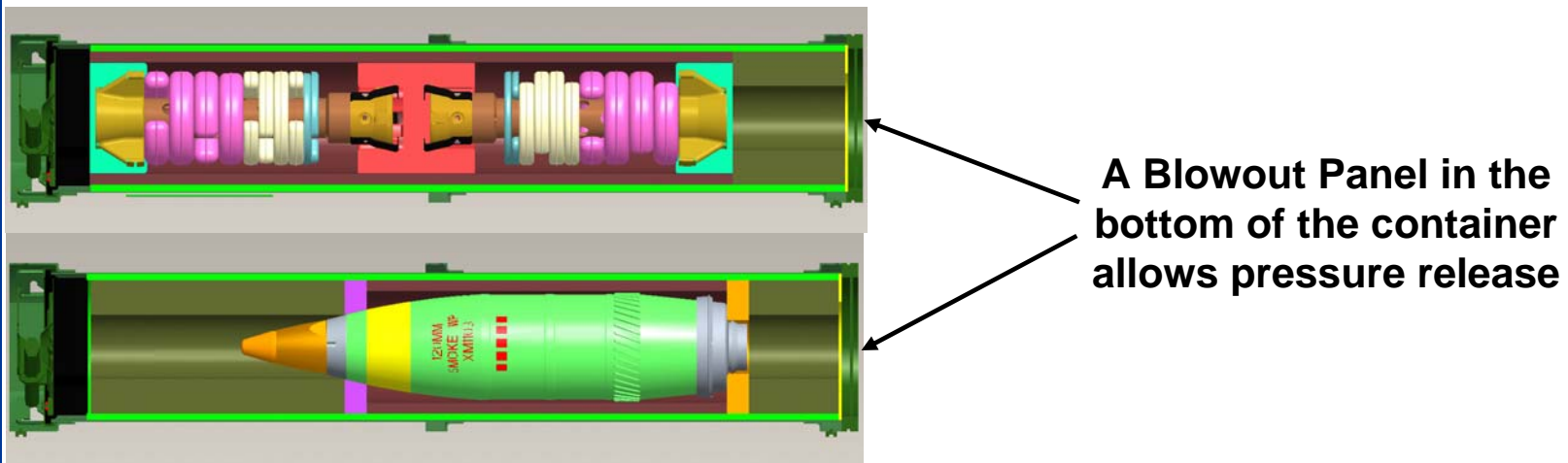


EFSS Container Assembly Upgrade



PA103A2 Container Assembly for Smoke only

- Blow out panel allow pressure release from the bottom of the container
- Foam packaging separates and returns to resin form when heated
- Smoke projectiles are stored and transported vertically to prevent air gaps in the white phosphorous resulting in poor ballistic performance



A Blowout Panel in the bottom of the container allows pressure release

EFSS Qualification Testing



90 EFSS rounds of each type were subjected to USN qualification tests

- Environmental/Durability simulated typical stockpile to target sequence and is based on the methodology of MIL-STD-810F
- Insensitive Munitions/Hazard Classification followed the form outlined in MIL-STD-2105C and 8020.8C and is driven by the Threat Hazard Assessment.

EFSS Qualification Results



	Fast Cook Off	Slow Cook Off	Bullet Impact	Fragment Impact	Sympathetic Reaction	Shaped Charge Jet Impact
Practice	IV	V	IV	III	Pass	(III)
Illumination	IV	V	IV	III	Pass	(III)
HE	IV	V	V	III	Pass	I
Smoke Round Tail Charge	(III)	IV	IV	III	(Pass)	(III)
Smoke Round Projectile	(III)	III	IV	III	(Pass)	(III)
Smoke Round/Tail Charge Mixed Pallet	III	(III)	(IV)	(III)	Pass	(III)

() Assessed Reaction Level

EFSS Qualification Results



HE Sympathetic Detonation

- Initiation with CH6 booster failed to function the donor round
- Illustrates IM characteristics of PBXW-128



EFSS Qualification Conclusion



- All qualification testing in accordance with the basic test plan have been completed and submitted for final approval
- Testing conducted at the following locations:
 - NSWC Dahlgren
 - NSWC Crane
 - NSWC Indian Head
 - Hawthorne
 - Eglin AFB
- Strategic plan for future improvements being evaluated