M67 Fragmentation Hand Grenade Building Blocks to an IM Compliant Item

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Outline

- Overview of Item
- IM Issues
- Baseline
- Explosive Effort
- Fuze Effort
- Venting Effort
- Conclusion

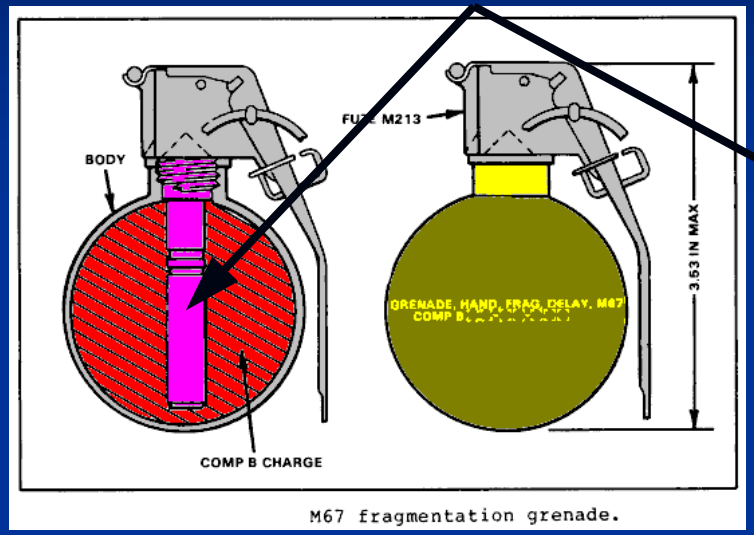
M67 Overview

- The M67 fragmentation hand grenade is a widely used (Army, Marine Corps) munitions It currently does not meet the IM requirements.
- Close Combat Item – Hand thrown munitions

M67 FULL UP GRENADE

Small Item – Big Problems

- Imbedded Detonator



M67 fragmentation grenade.

- Comp B

- Large Quantities per unit pack – 30 M67s per box ~5.55 kg (16.8 lb) of Comp B

Baseline Testing – Mass Detonation

Before

After

Initial Investigation
Explosive Fill

- Initial engineering consensus predicted Composition B to be the main contributor to the failure of the M67.
- Two parallel efforts were conducted.

- Engineering Level tests to prove Comp B to be the main problem
- Alternative Explosive Fills were investigate to replace Comp B

Engineering Level Test Results

- The problematic Comp B was disproved as the primary contributor of the IM failure.
- The M213 fuze was determined to be the primary contributor to the failure of the M67, due to the inline nature of the C70 detonator in addition to the sensitive material which includes Lead Styphante and Lead Azide.

Alternative Fill Result

- PAX 41 and PAX AFX 196 were down selected and chosen to run preliminary performance and IM test to determine their effectiveness
- The alternative explosives decrease the performance while only increase the IM safety by a marginal factor.

Solutions

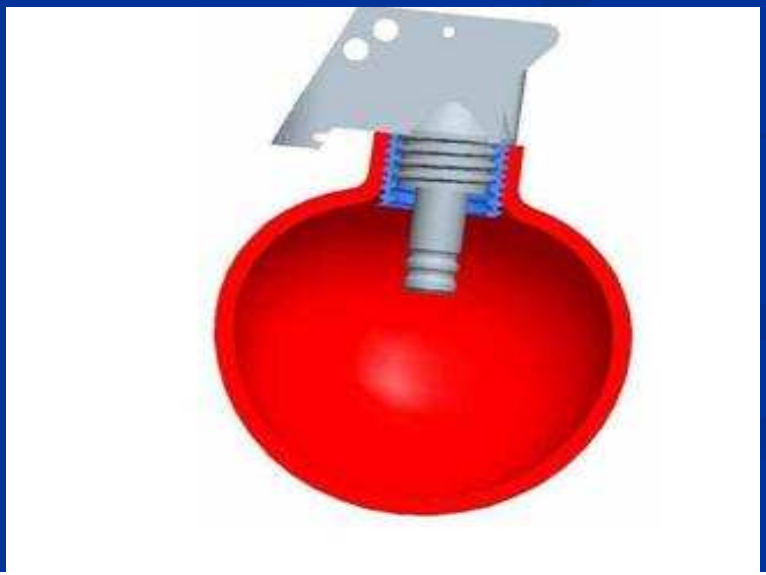
- To improve the current fuze a Micro Explosive Mechanism (MEM's) technology detonator is being designed at Picatinny. This effort should help to mitigate bullet and fragment impact, as well as sympathetic detonation.
- Using lesson's learn from the 81 mm Mortar, a melt-able insert design effort has been implemented and tested. This effort should help to mitigate fast and slow cook off.

MEM's Detonator

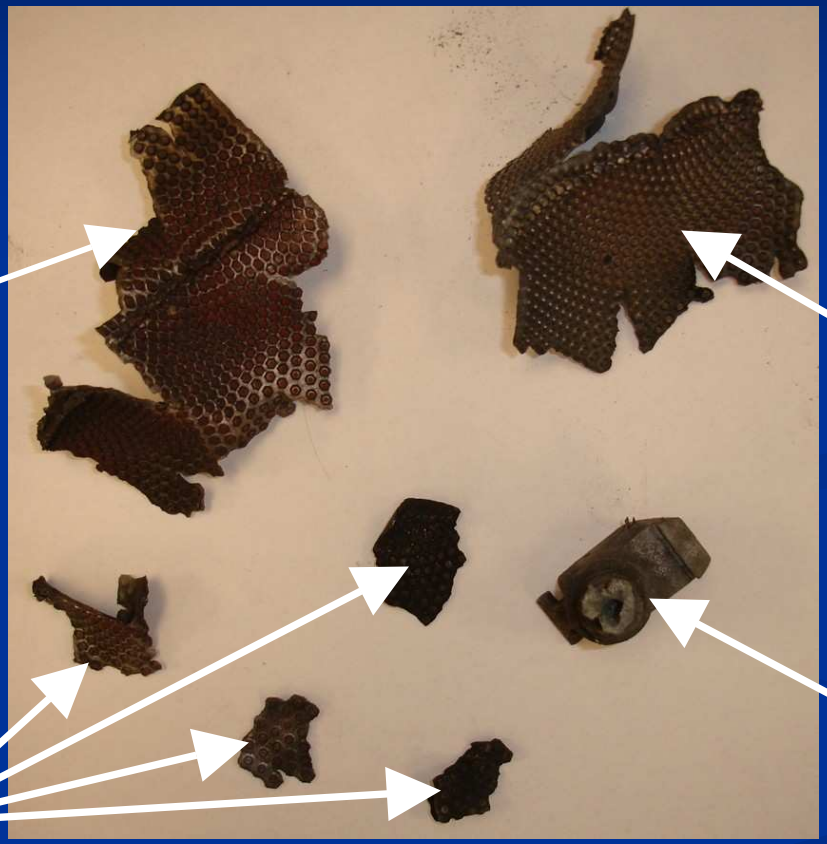
- This effort implements an out of line detonator that is activated by the heat created by the delay column in the M213 fuze.
- The energetic material in the MEM's detonator will also be less sensitive as well as decreased in size compared to the current M213 detonator.
- Preliminary tests of this fuze are expected to be conducted late in fourth quarter FY06.

Melt-able Insert

- A low melting plastic is place between the fuze and the metal body of the M67. This should allow for the fuze and the body to separate during a cook off situation
- At the present time a partial success has been had with a live fuzed, Comp B filled M67.



FCO Test - M67
Using Melt-able Insert



Found < 1m away from test stand

Found ~ 3m away from test stand

Found inside or next to test stand

Found ~ 5m away from test stand

153.37 out of 210 grams Recovered

Conclusion

- The alternative explosives were not as beneficial as expected.
- Modifying the fuze is necessary to obtain IM compliance.
- Future IM testing along with performance test will be conducted before and changes are made to the production of the item.

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