# INITIATION TRIALS OF IMX-104 IN 81MM MORTARS

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

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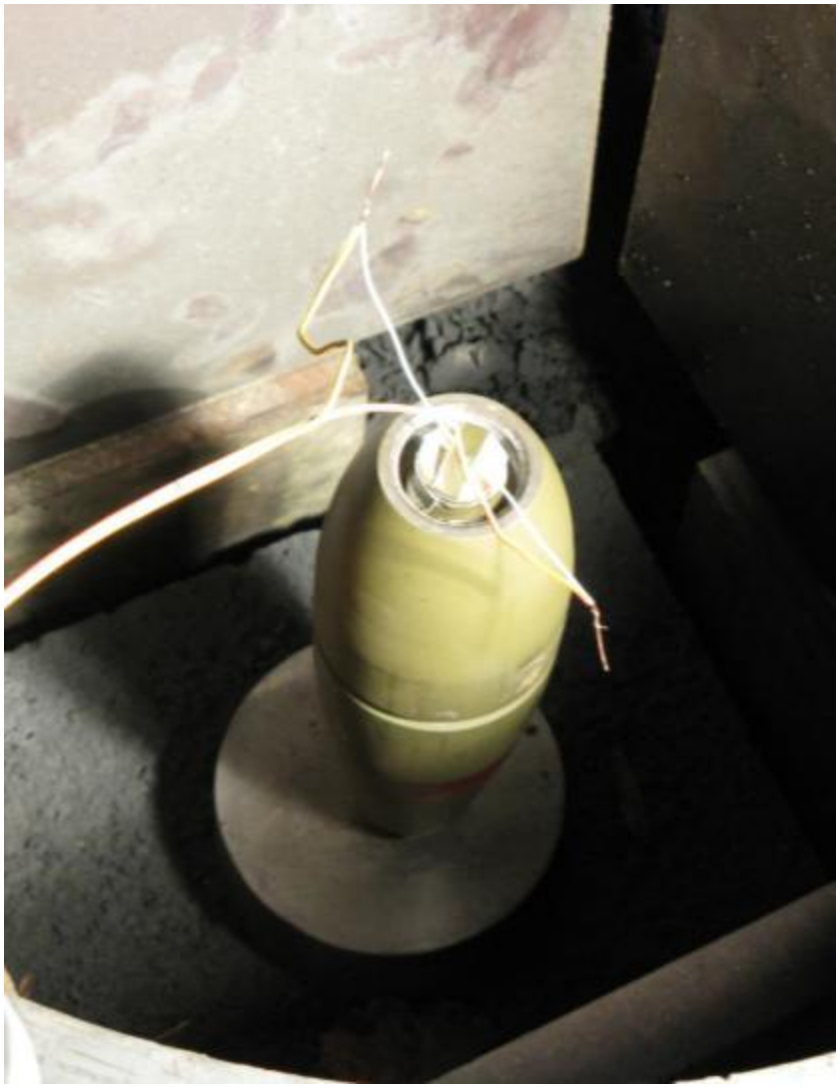
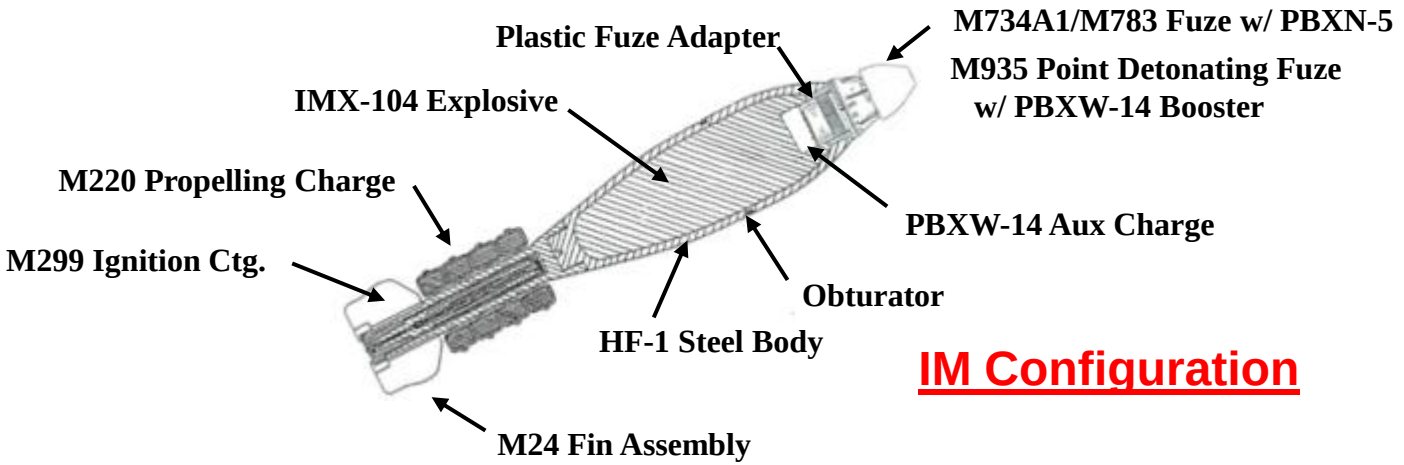


# Background

- 81mm mortars (M889A1, M889A2, M821A2) are switching to IMX-104 in the main fill
- Due to the insensitivity IMX-104 (larger critical diameter than Comp B and PAX-21), the initiation train requires the inclusion of a PBXW-14 auxiliary charge
- What follows is the initiation reliability of 81mm mortars




**IM Configuration**

# PBXN-5 Fuze to IMX-104 Main Fill

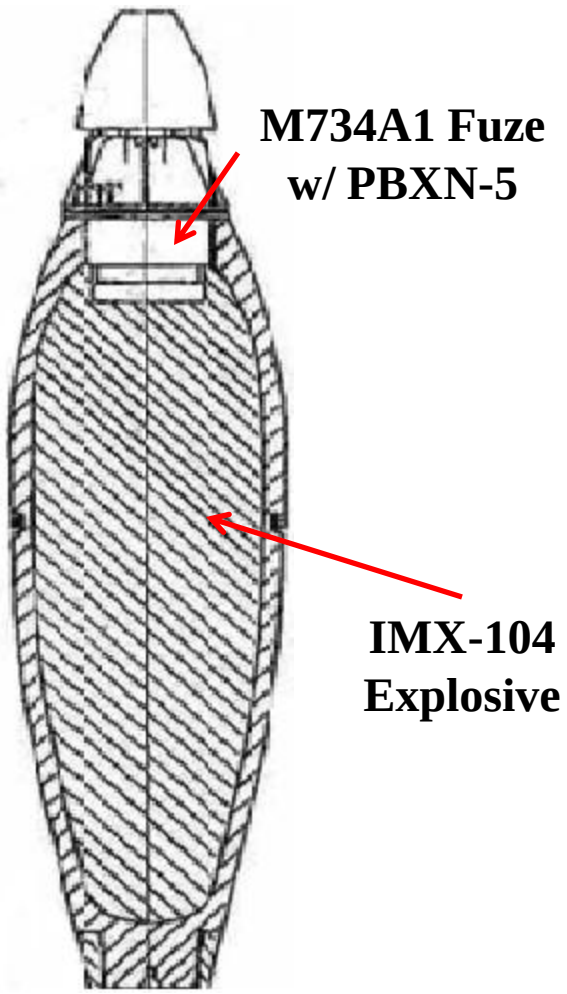
Determine if the PBXN-5 fuze booster alone can reliably initiate IMX-104

SCO results show that current fuze configuration with both 60 and 81mm IMX-104 filled mortars are IM compliant (Type V reaction)

# PBXN-5 Fuze to IMX-104 Main Fill

Configuration

- 81mm
  - M734A1 Fuze
    - PBXN-5 Lead
    - Standard density PBXN-5 fuze booster
  - IMX-104 Main Fill
- Three rounds initiated at ambient, hot, and cold temperatures



# PBXN-5 Fuze to IMX-104 Main Fill

Ambient Temperature

– Run to Detonation

# PBXN-5 Fuze to IMX-104 Main Fill

Cold (-40°F for 48 hours)

– High Order Reactions

# PBXN-5 Fuze to IMX-104 Main Fill

Hot (145°F for 48 hours)

– Low Order Reactions

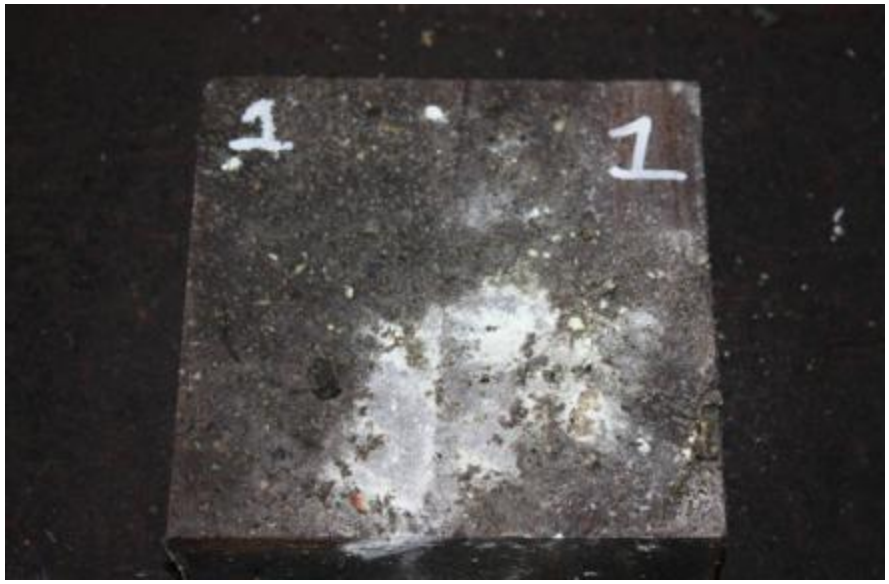
- Due to low order reaction, IPT determined that an auxiliary charge was necessary to overcome shock insensitivity and critical diameter effects of IMX-104 when using an PBXN-5 fuze booster

# PBXN-5 Fuze Booster to IMX-104 Vari-density

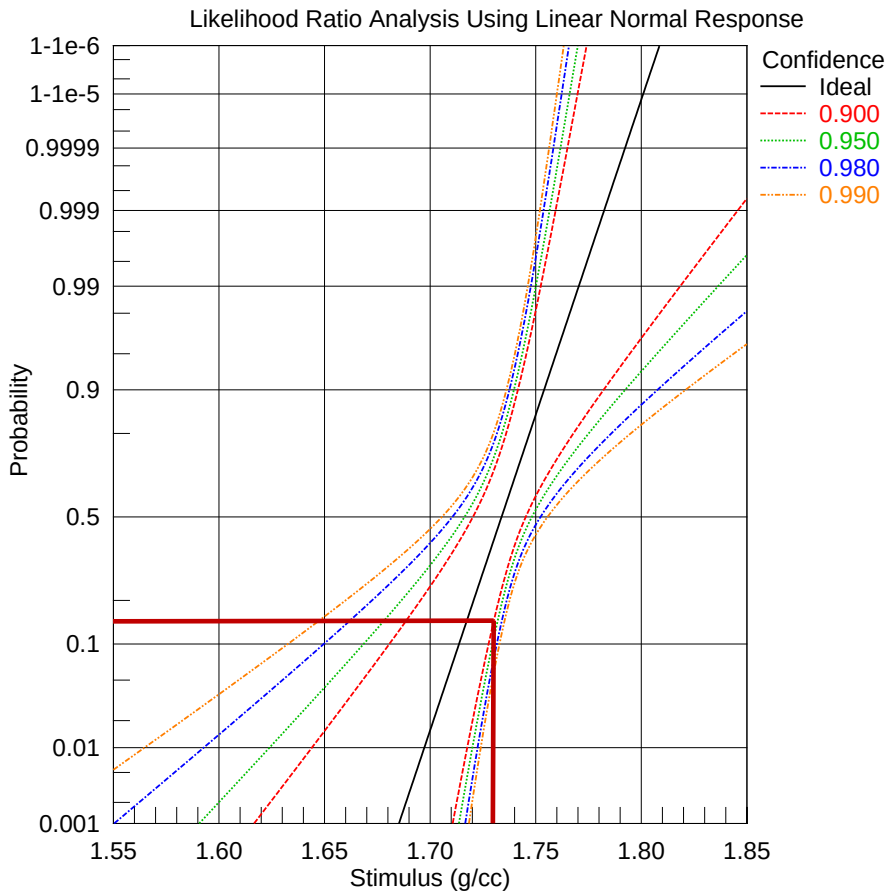
Configuration

- 81mm
  - M734A1 Fuze
    - PBXN-5 Lead
    - Standard density PBXN-5 fuze booster
  - IMX-104 Main Fill
- Tests verify that

  PBXN-5 fuze booster will not reliably initiation IMX-104 fill



# PBXN-5 Fuze Booster to IMX-104 Vari-density




50% point

Std dev 0.0157

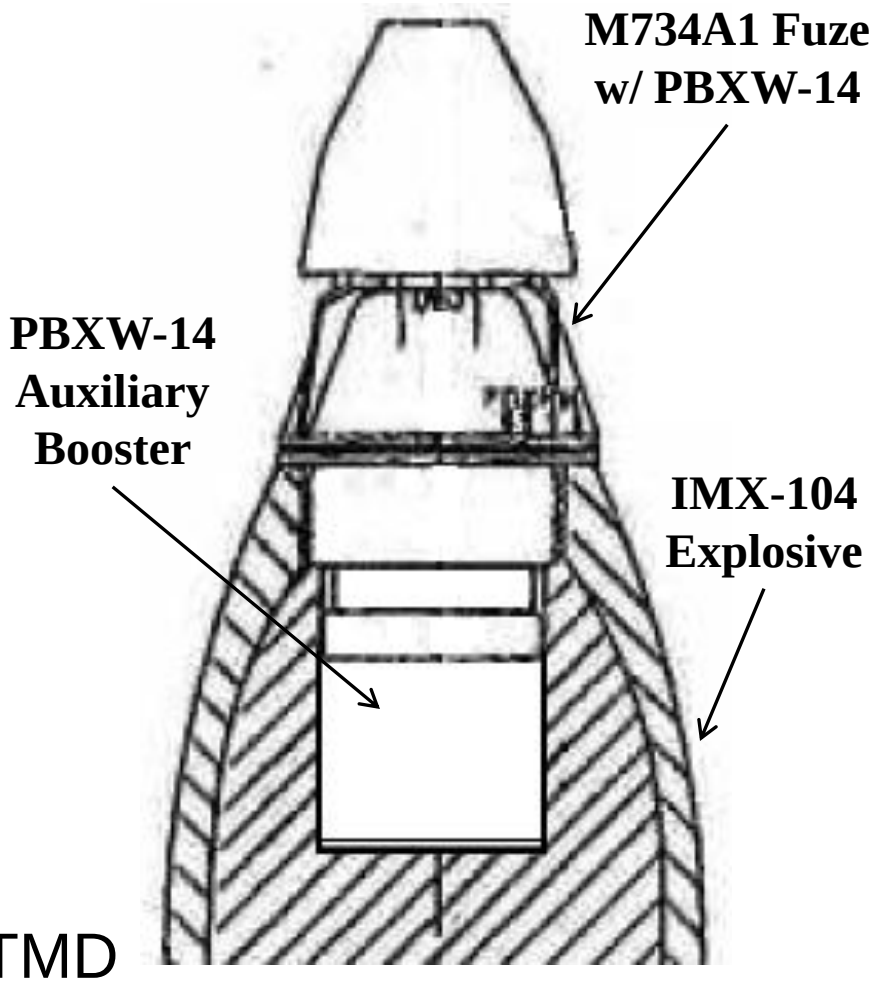
- At standard fuze booster density, there would be 15,000 failures per 20,000 shots
- At the highest test density (98% TMD), there would be 150 failures
- For desired 0.99995 reliability, the pellet has to be at 99% TMD

# PBXW-14 Auxiliary Booster to IMX-104 Main Fill

Determine if PBXW-14 auxiliary booster can reliably initiate IMX-104

Configuration

- 81mm BLA
  - M734A1 Fuze
    - PBXN-5 Lead
    - PBXW-14 fuze booster
  - PBXW-14 aux. booster
  - IMX-104 Main Fill
- High density: aux. booster pressed approximately 97% TMD



# PBXW-14 Aux. Booster to IMX-104 Main Fill

- High Density Tests
  - All three tests had High Order reactions

# PBXW-14 Aux. Booster to IMX-104 Main Fill

Since all the rounds in the previous high density aux. booster test were detonations, low density tests were conducted

Configuration

- Rather than a pressed PBXW-14 aux. booster, loose PBXW-14 powder was poured into the charge cup
  - Lowest density, worst case scenario
- IMX-104 Main Fill

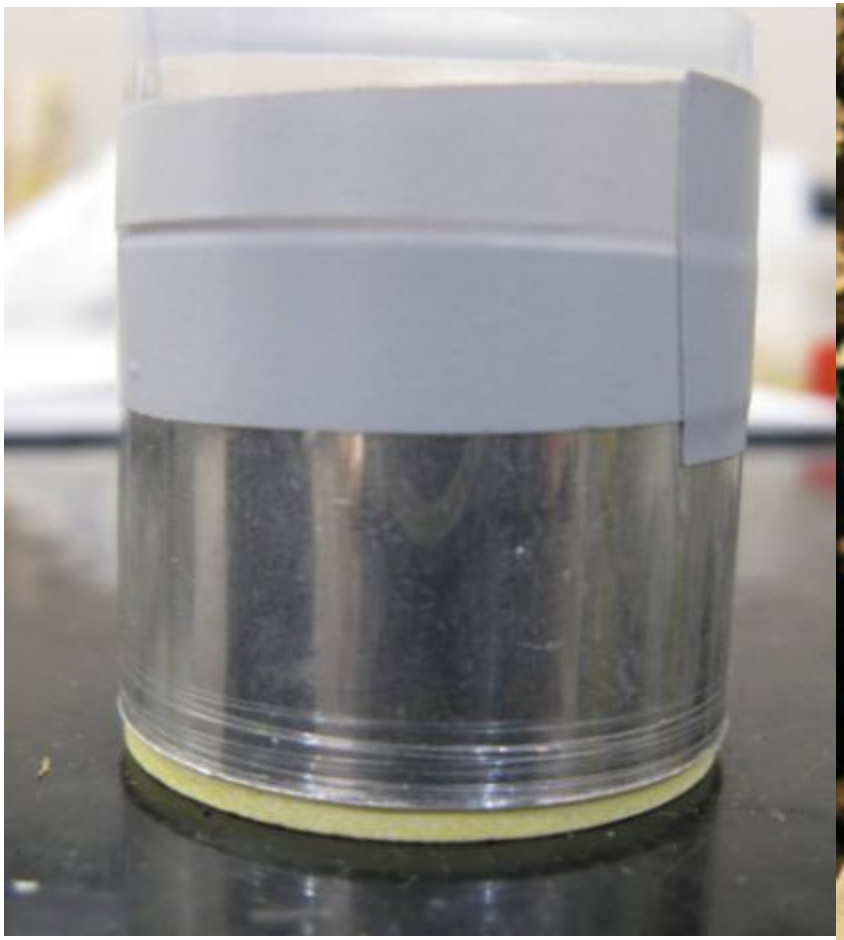
# PBXW-14 Aux. Booster to IMX-104 Main Fill

- Low Density Tests (loose powder in charge cup)
  - W-14 at 43.9% TMD – High Order
  - W-14 at 43.6% TMD – High Order
  - W-14 at 42.1% TMD – Low Order

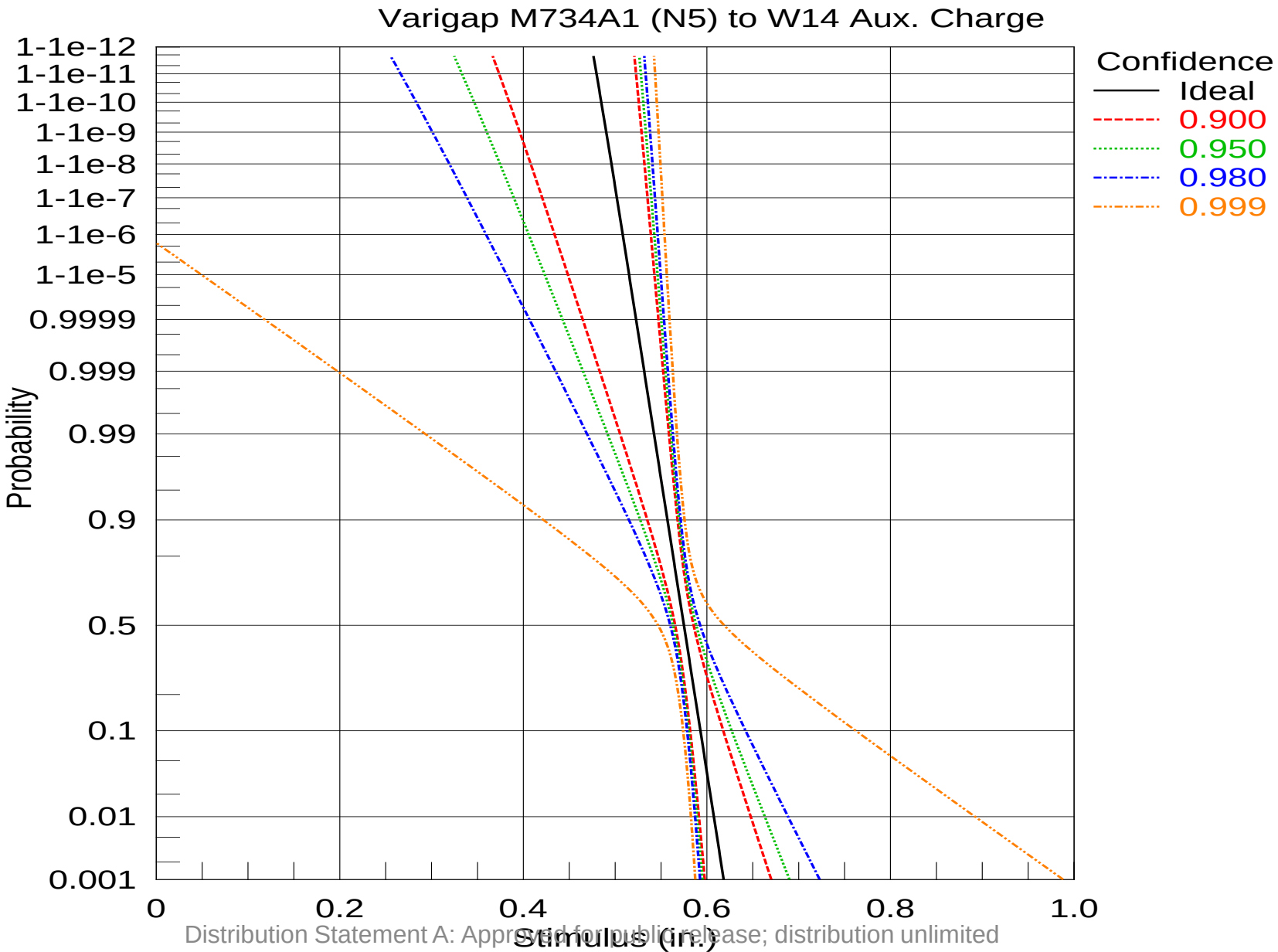
# PBXN-5 Fuze Booster to PBXW-14 Aux. Booster

- Vari-gap analysis
- Standard density PBXN-5 fuze booster to PBXW-14 auxiliary booster
  - Solid plastic attenuator inserted into gap
- Dent depth was recorded and a 50% failure point determined

# PBXN-5 Fuze Booster to PBXW-14 Aux. Booster

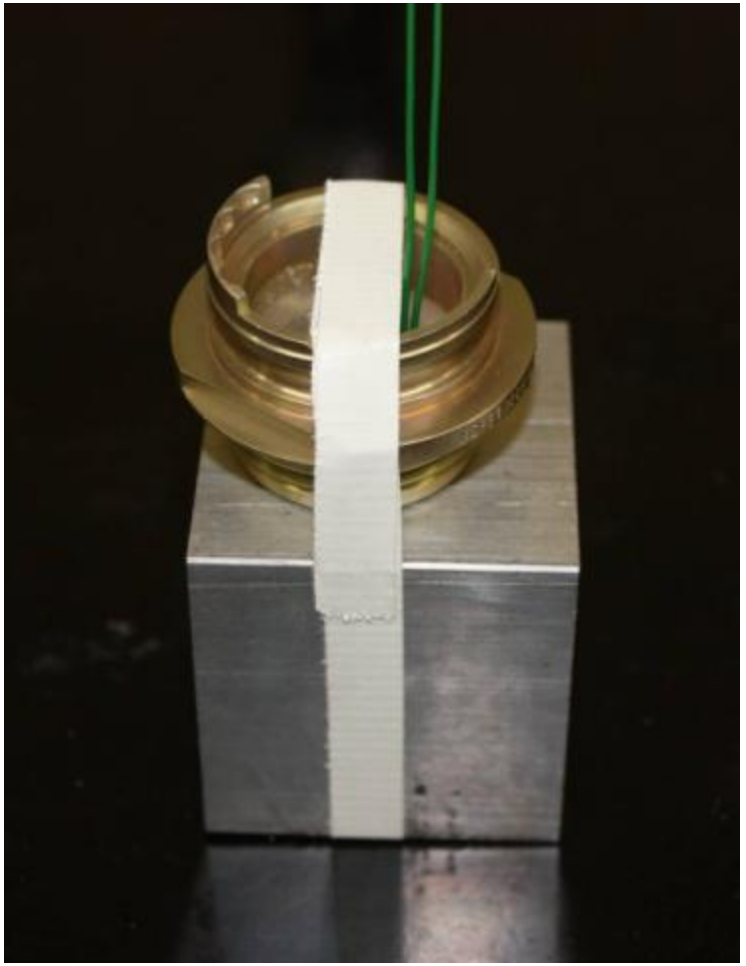


# PBXN-5 Fuze Booster to PBXW-14 Aux. Booster



# RP-3 to RP-87 Comparison

- Early tests used the RP-87 detonator
- There was concern the RP-87 might be overdriving the train
- RP-3 is closer in output to fuze
- Two sets of tests:
  - Detonator to lead
  - Lead to booster



# RP-3 to RP-87 Comparison

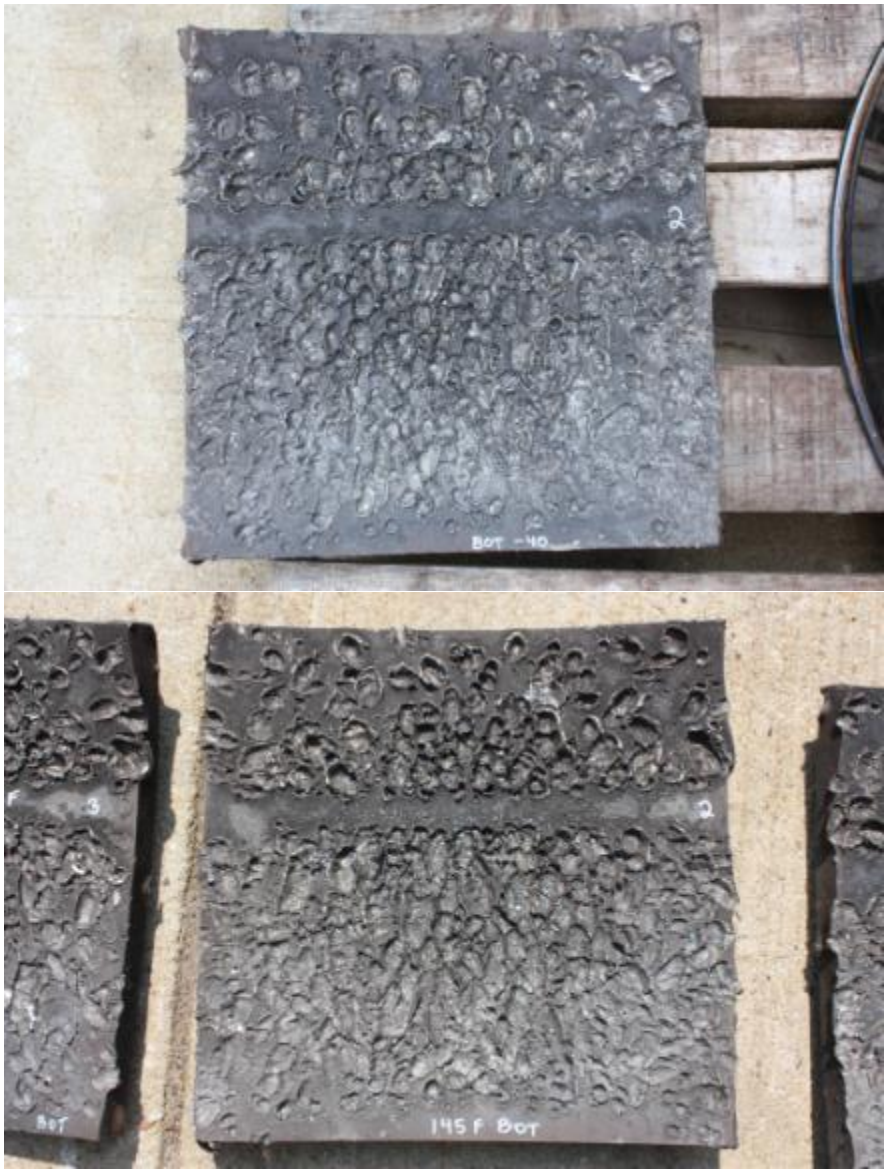
- As a result, switched to using RP-3 in initiation tests

| Detonator to Lead Average Dent Depth (in) | |
|---|---|
| S&A | 0.0704 |
| RP-87 | 0.0773 |
| RP-3 | 0.0696 |

| Lead to Booster Average Dent Depth (in) | |
|---|---|
| S&A | 0.105 |
| RP-87 | 0.108 |
| RP-3 | 0.105 |

# 81mm Hot/Cold Tests

- Full initiation train:
  - RP-3 detonator
  - PBXN-5 lead
  - PBXN-5 fuze booster
  - PBXW-14 auxiliary booster
  - IMX-104 main fill
- 145°F
- -40°F
- All rounds functioned high order



# Summary of 81mm Testing

- IMX-104 exhibited slow run up to detonation in 81mm mortars when using only a PBXN-5 fuze booster
  - A fewer number of fragments from the body above the obturator as compared to Comp B baseline fragmentation profile
  - It was concluded that an auxiliary charge will be necessary in the 81mm explosive train

- PBXN-5 has been selected as the fuze booster material
- PBXW-14 has been selected for the auxiliary booster

# QUESTIONS?

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