Shaped Charge Initiation Test Configuration for IM Threat Testing

Ernest L. Baker, William Poulos, James Pham, Tim Madsen, Brian Fuchs
U.S. Army ARDEC, Picatinny, NJ 07806-5000
Outline

• Background
• RPG Summary
• PG-7V Characterization
• Surrogate development
• Test Description
• Summary
• The RPG-7 (Rocket Propelled Grenade type 7) launcher is widely available and used throughout the world.
• The RPG-7 shaped charge threat is of particular concern for Insensitive Munitions (IM) development.
• Production RPG-7 grenades observed to have erratic performance

• PEO Ammunition request to ARDEC:
  – Investigate a US built shaped charge configuration for reproducible performance
  – Develop an associated shaped charge initiation test configuration for IM threat testing
The RPG-7 rocket launcher is widely used
Photographs of confiscated RPGs
Many millions of the RPG grenade variants have been produced.
The nose cone significantly affects the shaped charge jet characteristics.
81mm shaped charge with an aluminum buffer plate is used

RPG

81MM-SC, LX-14
AL

2.00 in

4.00 in

6.00 in

Test Configuration

1. ALL DIM IN INCHES
2. EXPLOSIVE: LX-24
3. 3.001" SHAPED CHARGE, BASELINE CONFIGURATION COPPER LINER
4. BOOSTER - PARKS
5. DETONATOR: RP-2
DRAWING NUMBER: L314381/RDEC
Booster and liner drawings
Experimental Jet Characterization

**7-581**  
T1 = 204.4 us, T2 = 359.1 us, T3 = 374.2 us, T4 = 481.1 us  
Tip Vel = 0.62 cm/us

**7-582A**  
T1 = 204.31 us, T2 = 359.24 us, T3 = 374.1 us, T4 = no image  
Tip Vel = 0.617 cm/us
Experimental Jet Characterization

Jet Length, cm

Velocity, cm/us

Threat Test Development

Experimental Jet Characterization

Jet Length, cm

Velocity, cm/us

Threat Test Development
Experimental Jet Characterization

Jet Diameter, cm

Velocity, cm/us

- 7-581
- 7-582A
Experimental Jet Characterization

- Break-up time (us)
  - 7-581
  - 7-582A

- Velocity, cm/us
Back of Al plate represents probe nose position of the RPG
For threat testing place the back of Al plate in geometric position to represent RPG attack probe nose position.
Horizontal or Vertical Test Setup used for testing against IM targets

- Fabricate and assemble as shown on drawings
- Allow for ½” stand off between aluminum cylinder and target
- If using in the vertical position use the threaded leveling rods (3) to ensure proper alignment
- If using in the horizontal position use the threaded leveling rods (4) to ensure proper alignment
- If using stripper plate use ½” steel plate with 2” diameter through center hole
NOTES:
1. SHORT THREADED RODS WHICH ONLY PASS THROUGH A SINGLE TRIANGLE ARE TO BE USED FOR LEVELING
2. LENGTH OF LEVELING RODS IS UP TO YOUR DISCRETION - MINIMUM 1.1"
3. RODS WHICH PASS THROUGH TOP AND BOTTOM TRIANGLES ARE USED IN CONJUNCTION WITH NUTS TO HOLD ASSEMBLY TOGETHER
4. LENGTH OF RODS USED TO HOLD ASSEMBLY TOGETHER IS APPROX. 16"
5. STEEL STRIPPER PLATE IS OPTIONAL
6. TACTICAL STANDOFF IS AT BOTTOM OF ALUMINUM CYLINDER (#2)
7. ASSEMBLY CAN BE USED IN A VERTICAL OR HORIZONTAL POSITION
Test Configuration
TEST CONFIGURATION

NOTES:
1. ALL UNITS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
2. MATERIAL: ALUMINUM (DENSITY 2.7-2.8 g/cc)
3. CONFORMS WITH ASME Y14.5M-1994

DRAWING SIZE X

REVISED

ALUMINUM CYLINDER

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Test Configuration

NOTES:
1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
2. MATERIAL: ACRYLIC
   (PLASTIC RECOMMENDED, MATERIAL IS UP TO YOUR DISCRETION)
3. THREADED HOLES ARE DRAWN FOR 1/4 - 20 SCREW SIZE
   (SIZE IS UP TO YOUR DISCRETION)
4. THRU HOLES ARE DRAWN FOR 1/4-20 THREADED ROD
   (SIZE MAY BE ADJUSTED DEPENDING ON DIAMETER OF ROD USED)
5. CONFORMS WITH ASME Y14.5M - 1994
Test Configuration

NOTES:
1. USE OF STRIPPER IS OPTIONAL
2. MATERIAL: STEEL
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED
4. PLATE IS USED TO ALLOW FIRED CARTRIDGE JET TO PASS THROUGH HOLE, WHILE KEEPING AWAY EXCESS DEBRIS

ARDEC, PICATINNY ARSENAL, NJ

DRAWN BY:  
DATE: 12/13/89

CHECKER:  
ENGINEER:

DRAWING APPROVAL:  
SIZE: B  
DRAW NO.: TGP20078REV1

DESIGN APPROVAL:  
SCALE:  
SHEET: 1 of 6
Summary

• RPG IM threat test configuration
  – Designed to produce typical RPG characteristics
    • Consistent performance
    • Represents a “well built” RPG
    • Simple test setup
      – Fab/load/test of LX-14 surrogate warheads completed
      – Test protocol and drawings
      – Broadly used within the U.S. for RPG IM threat testing
• Greater threats can be simulated by removing or reducing Al buffering