

Void Detecting 40mm Penetrator Grenade Fuse

By:

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Introduction:

Theme: Miniaturization Of Weapon Electronics Effect On Small Arms

Guided and intelligent *munitions continue to decrease in size as they increase in lethality due to precision and tailored effects*. As we see large aircraft bombs capable of guiding themselves to the target with multiple sensors and then exploding after penetrating aircraft shelters...we will soon see the same type of guidance and intelligence in fusing in small caliber rounds.

The following is a proposal not merely for a **Impact** or **Void Detecting Fuse**, but an introduction to a host of multi-purpose sensor based initiation systems that would allow point detonation, grazing, delay or other functions to be programmed prior to firing.

Two methods are recommended for a **Void Penetrating Grenade**:
An **Impact Sensor With Delay** or a **Void Detecting Sensor Fuse**.

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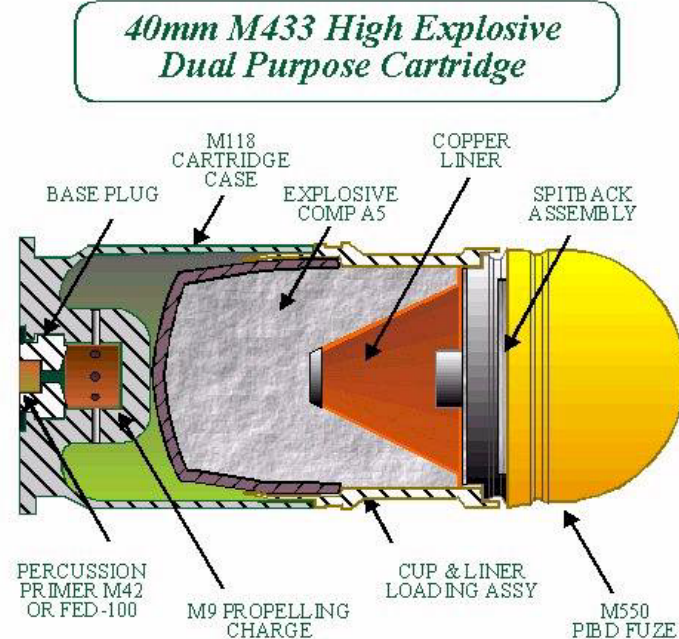
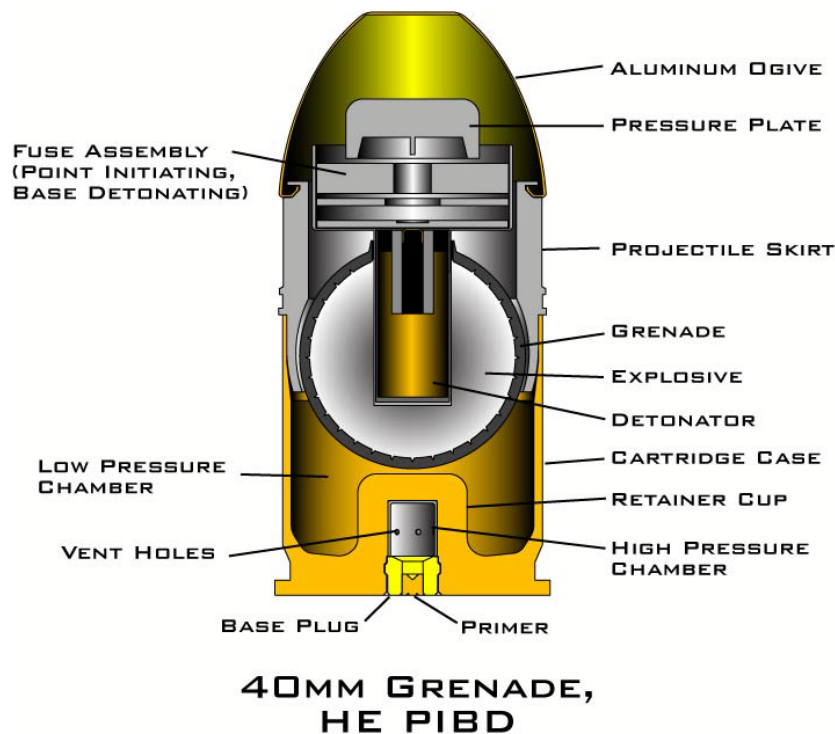
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The Problems:

Current Launcher Type Grenades Are Not Designed To Yield Blast Or Fragmentation Effects After Penetration:

- Most current grenades operate on a point detonation principle.
- Point detonating warheads waste explosive power for penetration.
- Explosives are most effective when tamped or in confined spaces.
- Even advanced Airburst Grenades are ineffective without access.
- Urban & Third World rural construction techniques present difficult cover.

Examples Of Existing Grenade Types:



Left: Typical High Explosive Point Detonating Fragmentation Grenade.
 Right: US Point Detonating Shaped Charge & Fragmentation Grenade.

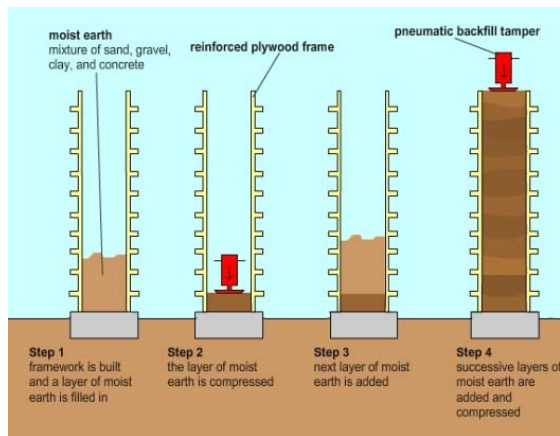
Examples Of Existing Grenade Types:

25-40mm, Air-Bursting/Point Detonating, Fragmentation & Shaped Charge



Left To Right: ATK 25mm HEAB, Proposed IMI 25mm HEAB, IMI 40mm HEAB, US 40mm HE-Frag, ROK 25mm HEAB, Russian VOG-25 40mm, US Type Point Detonating 40mm Shaped Charge, Photo Composite By Nildram.

Third World Construction Technique Barriers:



Clockwise From Upper Left: Unreinforced Masonry, Mud Brick Wall, Post & Lintel Reinforcement, Adobe Home Construction, Packed Earth Compound, Packed Earth Construction, Packed Earth Wall Design.

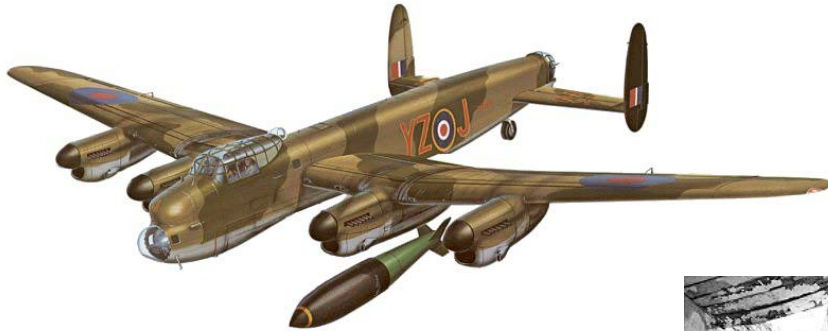
Third World Construction Technique Barriers:



Clockwise From Upper Left: Sandbagged Masonry Urban Construction, Defense News-Post Hellfire Strike Mud Brick & Timber Construction Pakistan, Heavy Timber Door, US Army WW-II House To House Urban Combat, DoD Photo Typical Military Reinforced Bunker, Staging Services LTD Set Prop Sandbag & Timber Doorframe.

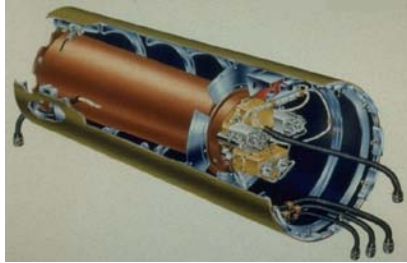
Historical Weapons For Detonation Within Voids Behind Barriers:

Enormous Air Delivered Bombs...



Clockwise From Top Left: Avro Lancaster WW-II Heavy Bomber, Barnes-Wallis Grand Slam, USAF TARZON Guided Weapon, Destroyed German WW-II Submarine Pen, German WW-II Operational Submarine Pen, Construction Supervised By German Atlantic Wall Defense Commander Field Marshal Erwin Rommel.

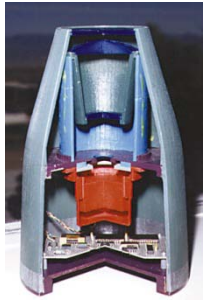
Modern Void Detection Fuse Programs:



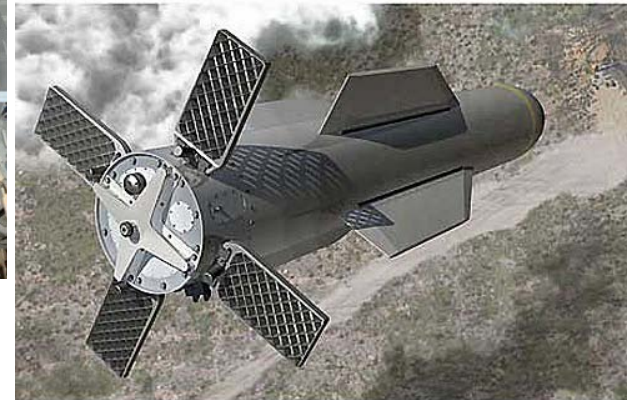
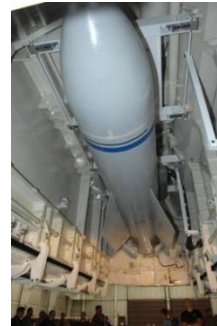
Martin-Marietta Pershing II Missile
W-80 Earth Penetrator Warhead



GD Small Diameter Bomb



Textron JDAM w/ Hard
Target Smart Fuse



AFRL/Boeing Massive Ordnance Penetrator

Miniaturization of Electronics & Minimization of Collateral Damage Trends:



VS.



2008 NDIA Gun and Missile Systems Conference & Exposition:
21 - 24 April 2008,
20mm Air Bursting Munitions for the M24 Cannon, by Erik Elmer
ABM Technical Lead ABM Technical Lead
ATK Armament Systems
http://www.dtic.mil/ndia/2008/gun_misile/brochure.pdf-all presentations here!!

Features:

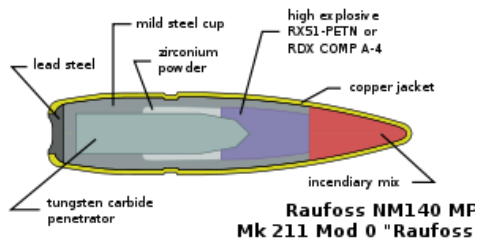
- Base fuze for improved forward fragmentation in air burst mode and superior penetration capability in PD and PD-delay modes
- SAPHEI-T warhead for high performance penetration
- Unique, cost effective Setback Generator (SBG) design
- Command Arm Safe and Arm (S&A) design – cost effective and flexible



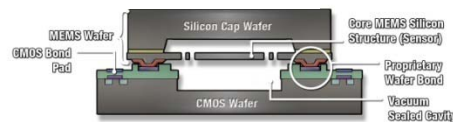
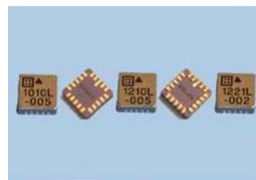
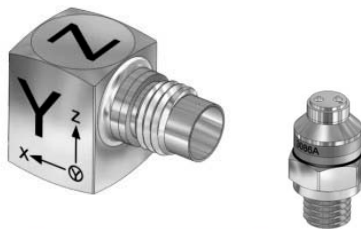
Clockwise From Top Left: Reduction In Size & Scale Of Weapon Electronics; 1970's - 2,000 Pound Class Laser Guided Aircraft Bomb, 1990's - ATK Excalibur 155mm Cannon Projectile/EDO Guidance, 2000's - ATK 25mm 242-C vs. Chain Gun (M-242 Automatic Cannon), ATK 242-25mm & 25mm Air Burst Grenades

Essential Elements of Void Detection Fuses:

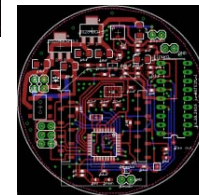
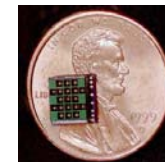
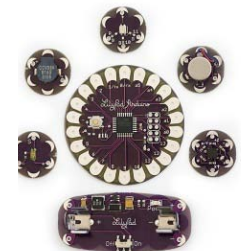
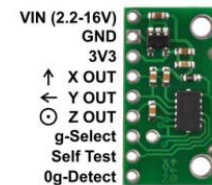
Body to transmit impact force, sensor to detect shock, circuitry to interpret impact signals and act on instructions, plus a standard initiation system.



German Tank Gun Saboted 105mm AP Projectiles, ATK MK-211 Mod 0, HE-API 7mm Core "45-60-0" Point Configuration.

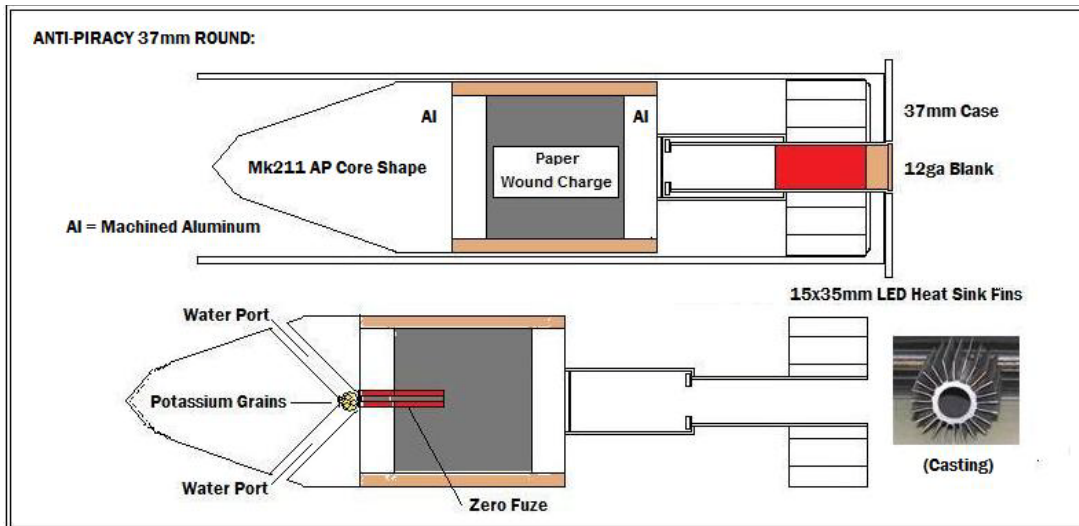


DYTRAN One & Three Axis Miniature Piezo-Crystal Accelerometers, MSI Corp. Miniature Monolithic "Chip" Accelerometers, Typical Anvil-Type MEMS Design.



Miniature Accelerometer Support Electronics: Clockwise From Top Left; DigiKey Micro PS, SJRIEKNL MMIC, DYTRAN Inline Amp, Byung Jun, MEMS Penny Scale.

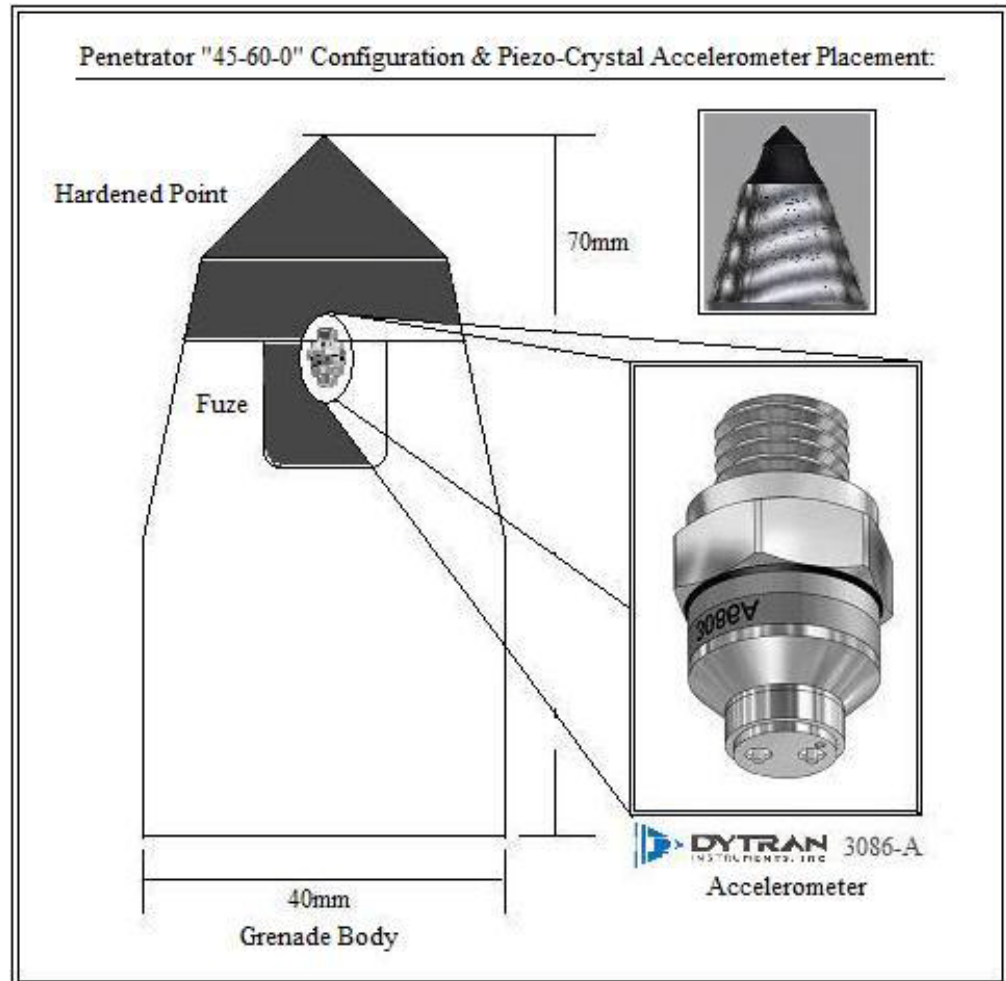
Origin Of Concept: 37mm Anti-Piracy Round



Clockwise From Upper Left: Royal Arms International 37mm Anti-Piracy Round Concept, Projectile & Hardened Penetrator Tip, Spike's Tactical Havoc 12", Time Magazine Photo, USN Photos: Somalia

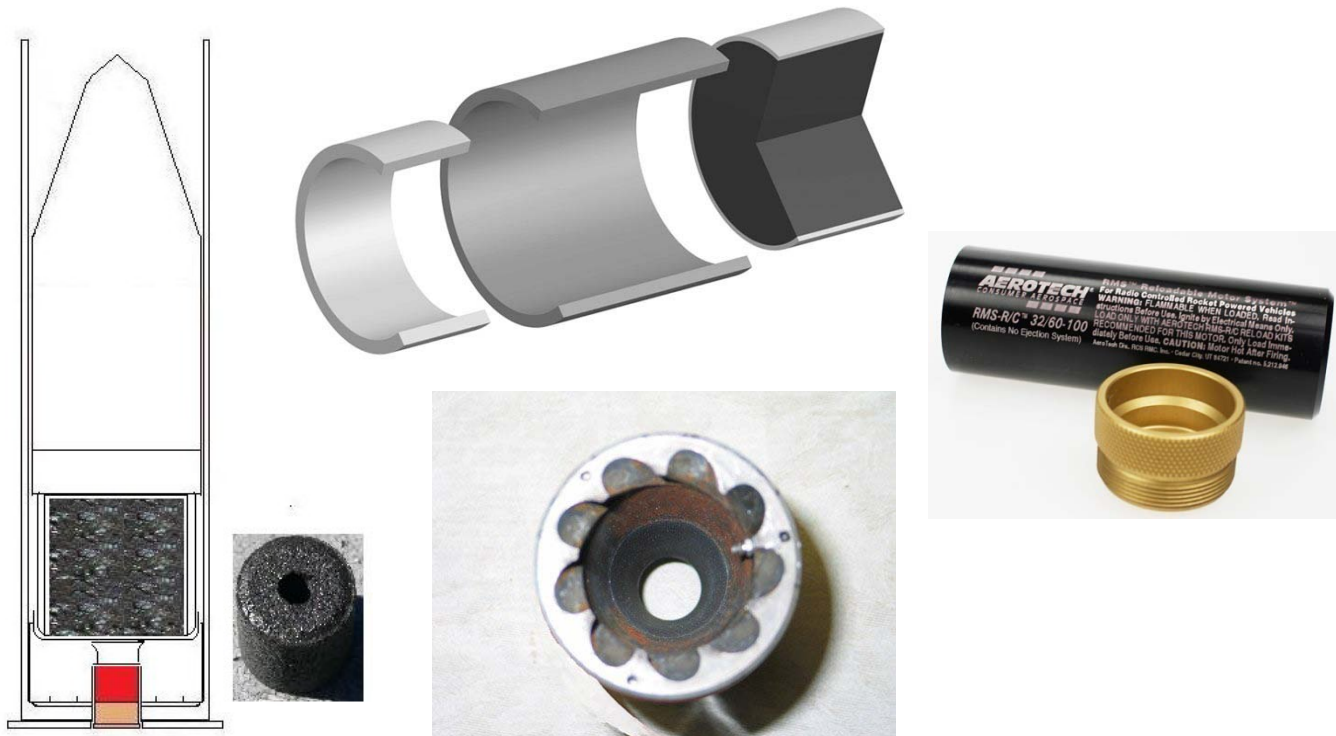
Proposed Features of Penetrating 40mm Grenade:

- 1) Steel AP Point Insert
- 2) Point Mounted Miniature Accelerometer
- 3) Reinforced Body Structure To Withstand Impact
- 4) Internal Battery & Sensor, Programmable Electronics
- 5) High Speed Electronic Warhead Initiator
- 6) Blast/Fragmentation Type Warhead
- 7) Rocket Boost Assist With Extended Length Round



Proposed Features of Penetrating 40mm Grenade:

Rocket Boosted Round:



Clockwise From Upper Left: ADG-Royal Arms International Anti-Piracy Round Based 8.25" 40mm Cartridge, Aerotech HDK Model Engine, Aerotech Solid Engine, Manurhin LRAC Pattern Spin Nozzle.

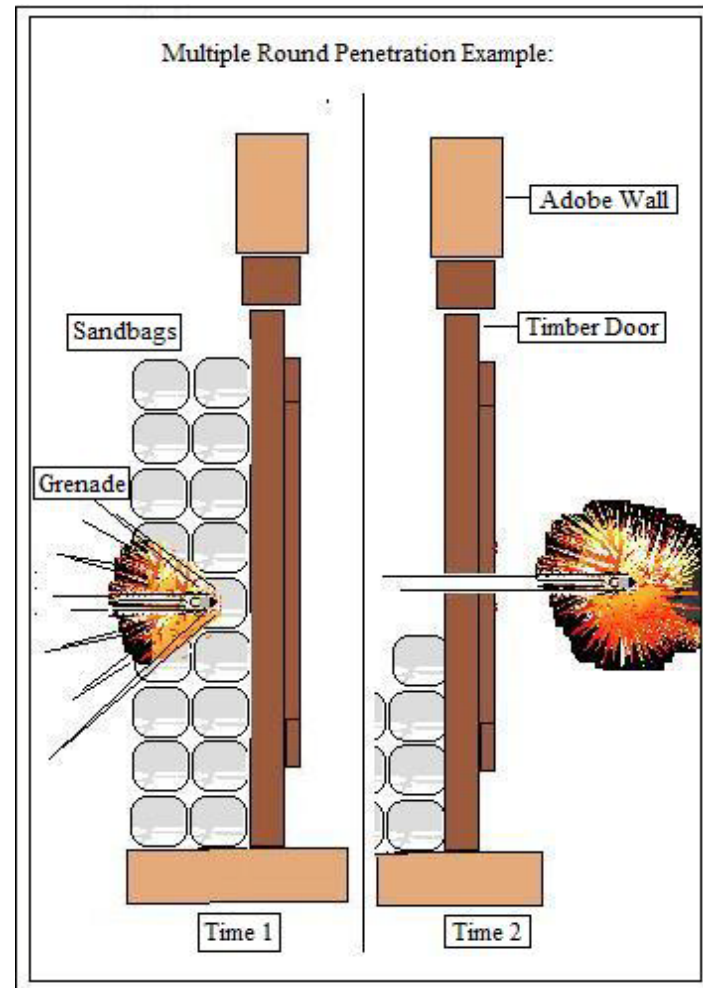
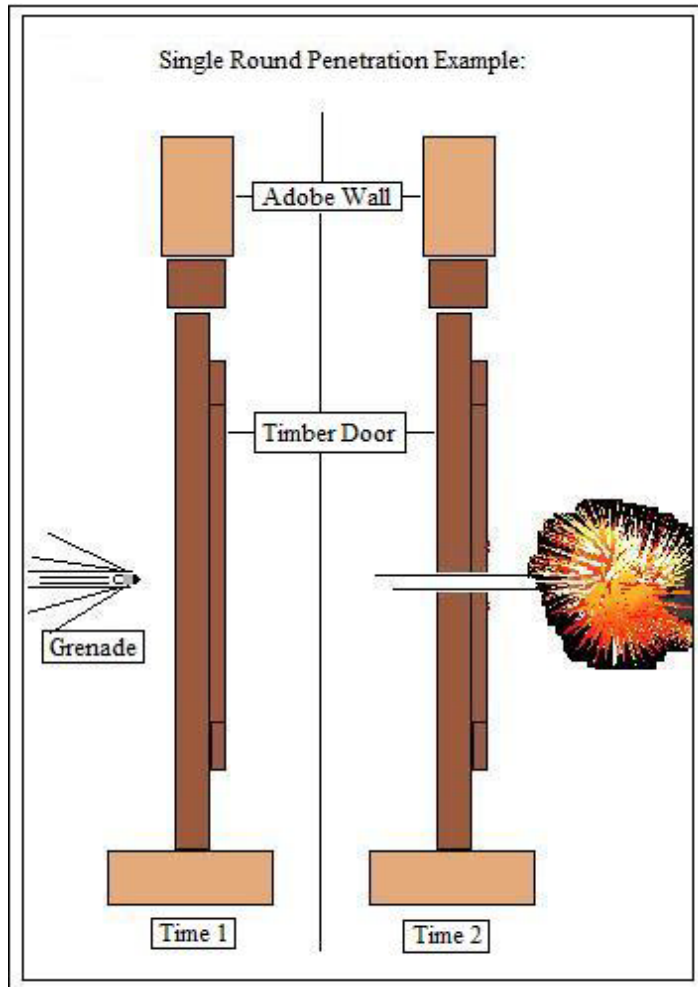
Proposed Features of Penetrating 40mm Grenade:

Extended Case:

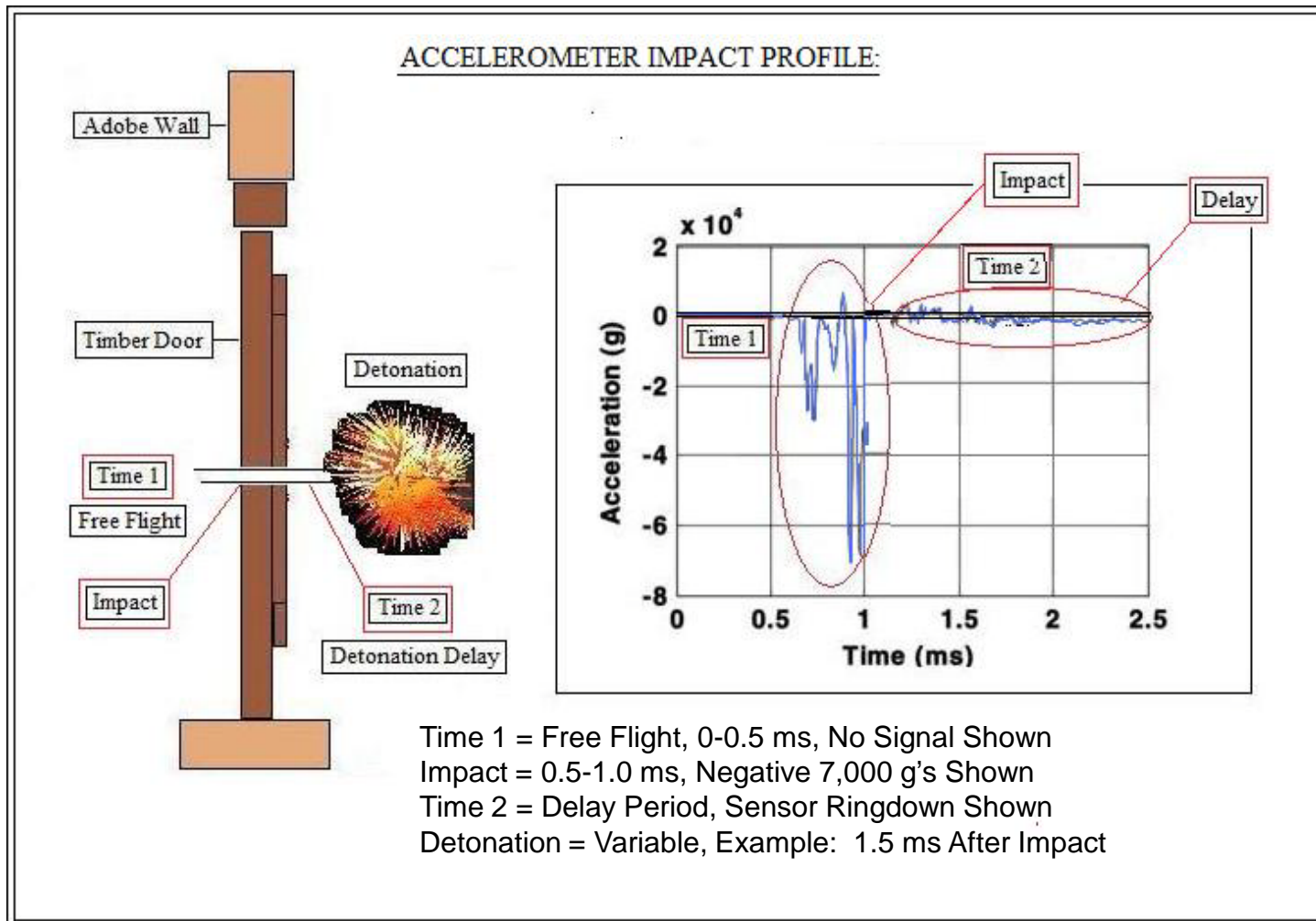


Left: US M-320 Side Opening Grenade Launcher By H&K Shown On Colt M-4A1 Carbine
Right: Extended 40mm Cases Based On 8.25" Length 37mm Flare Launcher Cartridges

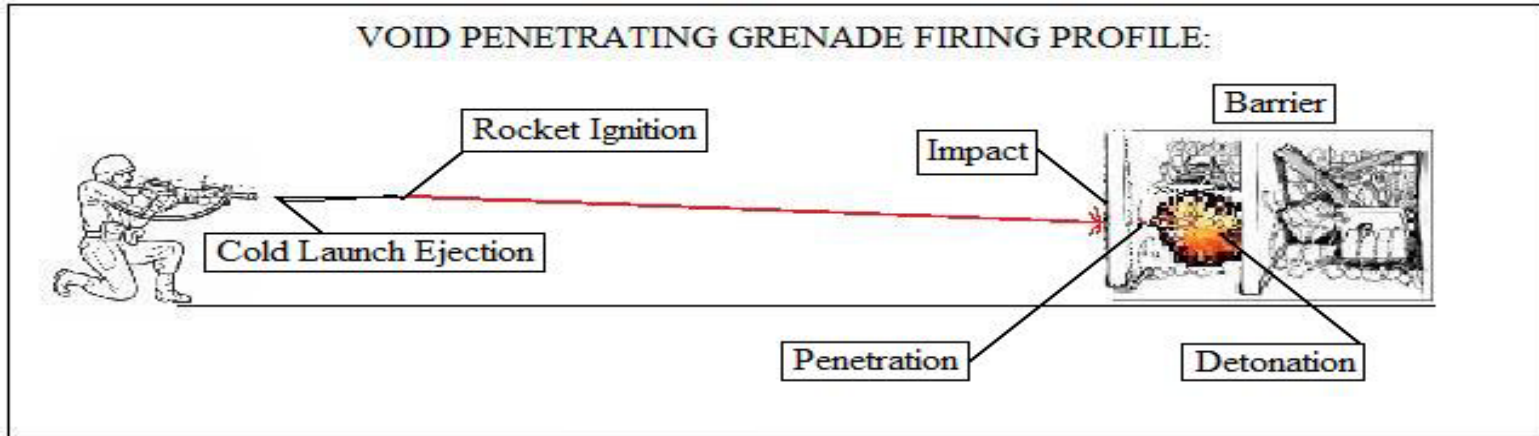
Single & Multiple Round Barrier Penetration Example:



Accelerometer Based Fuse Impact Profile:



Operational Scenario:



Left To Right: NATO Photo, Rocket Ignition, DN-Urban Barricades

Conclusion:

Miniaturization Of Rocket Assisted 40mm Penetration Round Is Possible

Extended Length Cartridges For The 40mm Greatly Expand Capability

Either “Impact With Delay” or “Void Detection Fuse” Are Available

Benefits Of A Penetrating 40mm Grenade:

- 1) Decreased Engagement Times Of Barricaded Opponents
- 2) Reduction In Collateral Damage To Address Barricades
- 3) Decreased Ammunition Expenditure To Reduce Barriers

Credits:



With Special Thanks To:

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Broden Resource Solutions LLC

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