

24554 - Blast Amplifying Projectile Bodies For Medium And Large Caliber Projectiles:

By:

**Howard D. Kent, ADG LLC,
Robert Folaron, nP Technology LLC**

&

AM General And Mandus Group
"The Mobile, Agile, Lethal Artillery Team"

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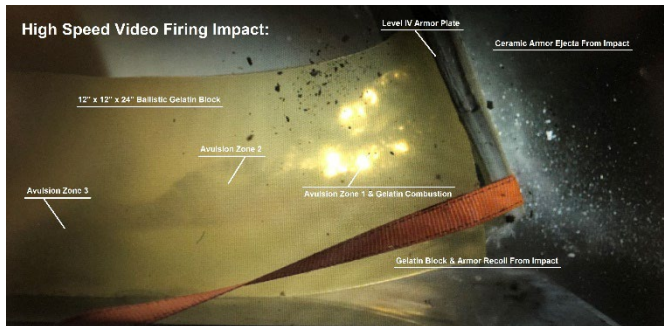
NDIA White Paper Series, Future
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Presenting: The AM General / Mandus Group Hawkeye Weapon System

Introduction To nP Technology Molded Projectiles:



L-R: nP Molded AP Defeating NIJ IV, 3 Foot Diameter Flash From nP 0.50 SOT, *Super Vel "FRAP"* 9mm Photo nP Projectile



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Introduction:



Colorado Springs, CO
Made In The USA



nP Technology LLC Develops And Manufactures Small Caliber Projectiles In Support Of Military, Law Enforcement, Government Agencies, And Commercial Needs. **nP** Specializes In Rapid Projectile R&D, Developed And Built On Process-Matched High Volume Molding Systems, Ready-To-Load.

*"Supporting Our Warfighters
With Projectile Technology"*



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Introduction:



<https://np-technology.com/>

Advanced Armor Piercing Frangible Ammunition To Defeat Current & Emerging Threats

The "Soft-Hard" or "Hard-Soft" Approach Defeats Modern Body Armor

Dual Purpose Armor Piercing And Personal Defense Handgun Ammunition:

Presenting Super Vel Ammunition

In The Past, Handgun And Submachine Gun Ammunition Was A Choice Between Stopping Power Or Armor Penetration. Either Way, Transferred Energy Was An Expanding Bullet Or Penetrated Soft Armor With Minimal Energy Transfer.

FRAP

Super Vel FRAP Proprietary Designers Defeat Both Modern And Unarmored Targets With No Compromise Of Penetration Or Stopping Power.

Caliber	30.06 (6.8x45) (FRAP)
Weight	180 Grain (3.2 Grams)
Velocity	1400 FPS (428 MPS)
Case	300 PFC (7.9 G)

SUPER VEL

For Absolute Optimal Control

POC: Mr. Michael Schar
Super Vel Ammunition Company
Hesperon, Nevada, USA
Phone: 702.222.4527
E-Mail: michael@supervel.com

POC: Howard L. Korn, AIG, LLC Phone: 818-214-6024 - Mail: howard@sig.org
NDA Future Force Conference 2022, Austin, TX

Three Months From Poster To Product

The Frangible Armor Defeating Project's Story

"Success Based On A Non-Traditional | Traditional Contractor Initiative"

7.32 NATO Projectile At Only 2.375 fps Defeats Level IV Ammo.

Penetration NDI
NATO Level IV Standard

Ceramic Stand
Armor Plates And "201" Of Ballistic Gel Penetrated With D4-LB600 Yaw Projectile

A Different Twist On 338 Caliber Armor Piercing Projectile Penetration And Accuracy:

Leveraging Mach Accuracy And High Penetration Developments To Improve All Performance.

Modern Projectile Designs Provide Related Energy Downgrade. A Key To Armor Penetration Aerodynamic Advances In Bulle Design Incorporated Include Longer And More Resilient Projectile Bodies, An Annotated Ammunition Bullets, Tip And Extended Tapered "Rear Tail"

Features:

- Isolated Black-Anodized Aluminum Shell-C TC
- Tungsten VAC Rod-Type Penetrating Component
- Monobloc Solid Copper Alloy Projectile Body
- Hard Frangible Body Impact Component
- Full Caliber "Ball Tail" For Improved BC

Benefits:

- Aluminum Tip Creates Impact Flash On Steel
- Insulated Construction Eliminates Temperature Low Sideball Friction
- Low Drag Design Yields Improved Long-Range Hit-And-Velocity
- Consistent Manufacturing For Greater Accuracy

Available Projectiles Include: 0.300" nP06, 0.308" nP08 And 0.510" nP50 Designs

Accuracy: As The Power In The Word Is Usless Without Accuracy... Our 338 nP08, nP06 And nP50 Are APO Testing Units (nP06) Using 400 Grains

Penetration: Our Penetration 0.300 nP08, nP06 And 0.510 nP50 Copper Tip nP08, nP06 And nP50 Will Penetrate Under USAMRIID Using Normal Range Conditions. Tested On JRTD, Wood Bone And Concrete Armor

"Now You Can Have Accuracy AND Armor Penetration"

POC: Robert Edelman, CEO, Phone: 214.926.2470, E-Mail: rob@np-technology.com
POC: Howard L. Korn, AIG, LLC, Phone: 818-214-6024, E-Mail: howard@sig.org
NDA Future Force Conference 2022, Austin, TX

National Armaments Consortium Member

US Army CCDC ARDEC ARL CRADA: Molded Projectile Technology
Armor Defeating FR-AP, Training, Energetic SOT, SRTA, Marking

NDIA Armaments, Small Arms, Guns & Missiles Committee Presenters



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nP Technology Molded vs. Forged Projectiles:



nP Technology 20mm Low Collateral Damage Training Round



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nP Technology Molded vs. Forged Projectiles:

Consistent And Accurate Polymerized Nano-Particle Construction



Copper Or Brass Nano-Particles



Tungsten Nano-Particles



Iron Or Steel Nano-Particles

Metallic Powders May Be Blended To Achieve The Desired Cost, Weight And Performance

nP Technology Molded vs. Forged Projectiles:

With Molded-In Features For Aerodynamics And On-Target Effects



Ballistic And Penetrative Tips, Tracer Cups, Gas Checks And Semi-Jackets

Clockwise From Top Left: Winchester Silvertip, Benjamin Nosler Pellets, ALCO Bullets, Barnes TSX, CVDS Windscreens, US M80A1 Projectile, US 0.50 Spotting Round, Corbin Bullet Cups, Corbin Gas Checks, Swagedies.com Bullet Jackets



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nP Technology Molded vs. Forged Projectiles:

If Pre-Fragmented Outperforms Natural Fragmentation, What Is The Steel Case For?

FORGING:

- *Massive Infrastructure
- *High Energy Costs
- *High Labor Costs
- *Generally A Single Production Line
- *Limited Output



MOLDING:

- *Minimal Infrastructure
- *Lower Energy Costs
- *Lower Labor Costs
- *High Volume Production

Want More Output?
Just Add Another Machine...

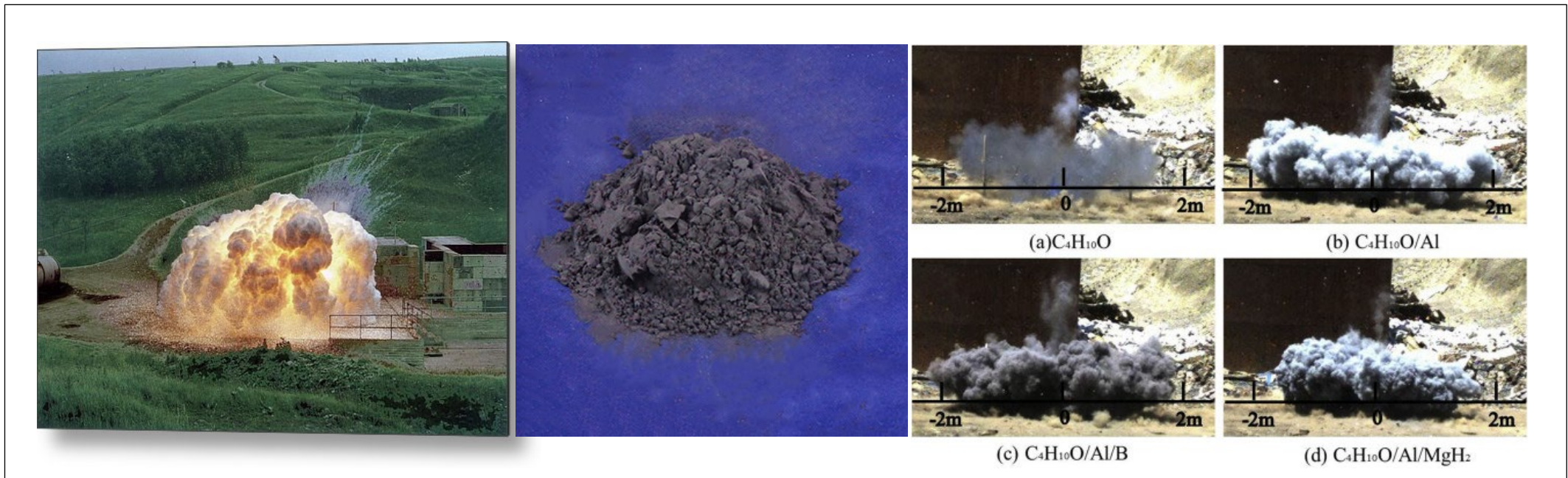
Above Left: Command-SMFI Photo, Above Right: nP Technology Photos



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nP Technology Molded vs. Forged Projectiles:

And In This Case An Entire Molded Projectile Body Made Of Energetic Material...



Above L-R: Aluminum Powder-The Health Safety Laboratory Science, Belmont Metals Black Aluminum, Science Direct Metal Powders



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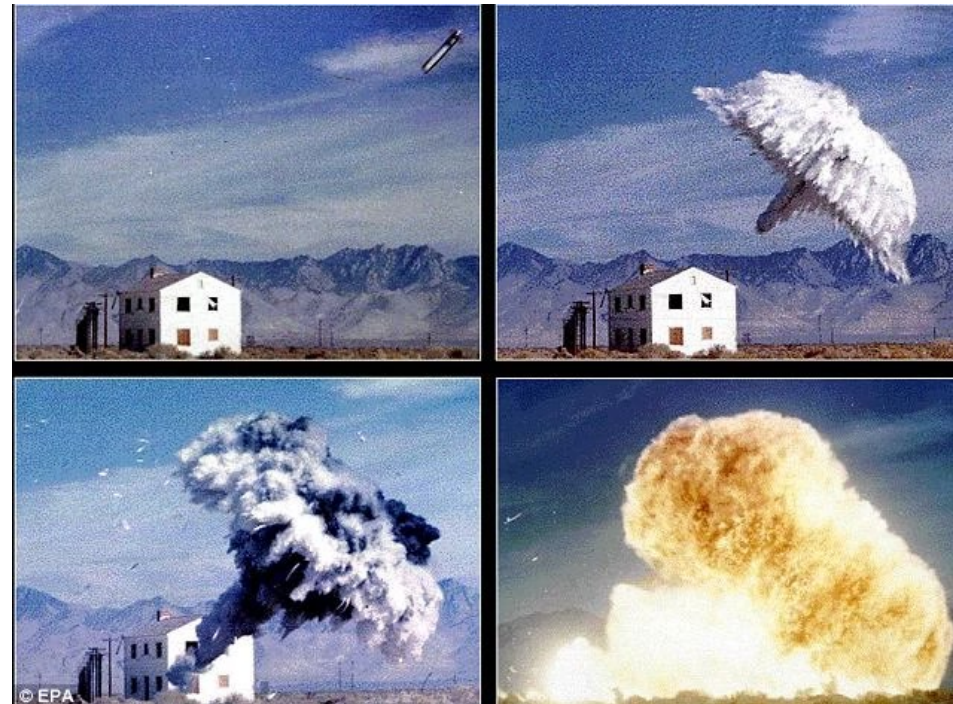
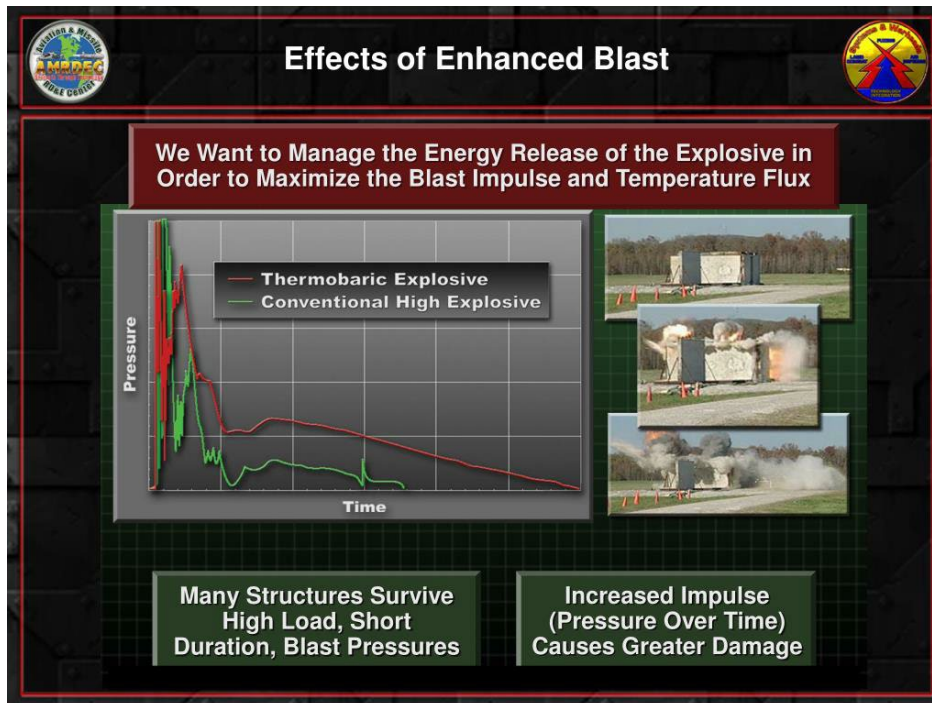
Theory Of Blast Amplifying Projectile Bodies :



Aluminum Powder Explosion-The Health Safety Laboratory Science

Theory Of Blast Amplifying Projectile Bodies :

The Shock Of The Initial Explosion Creates A Flammable Particulate Cloud...



Above L-R: US Department Of Defense Graphics And Images, Fuel Air Explosives

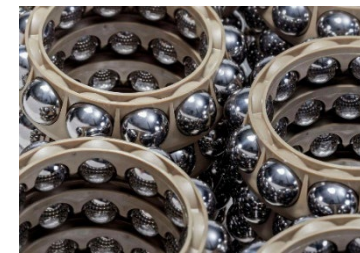
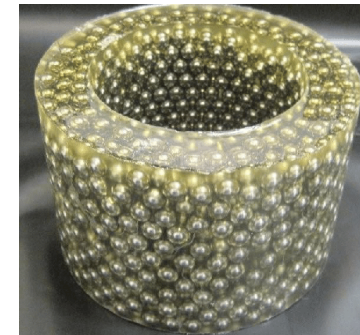
Theory Of Blast Amplifying Projectile Bodies :

Preformed Fragmentation With Lower Cost Assembly Is The Future...

Fragmentation Technology

Natural Fragmentation	Embossed Fragmentation	Preformed Fragmentation
Wasted Mass/Energy	Less Wasted Mass/Energy Improved Lethality, Low Cost	Efficient Mass/Energy Optimized Lethality, More Cost
<i>Least Cost</i> <i>Least Efficient</i>		<i>Most Cost</i> <i>Most Efficient</i>
M151 Warhead	Pearson or V-Notch Scoring	Tungsten fragments

Optimization Balances Cost and Performance



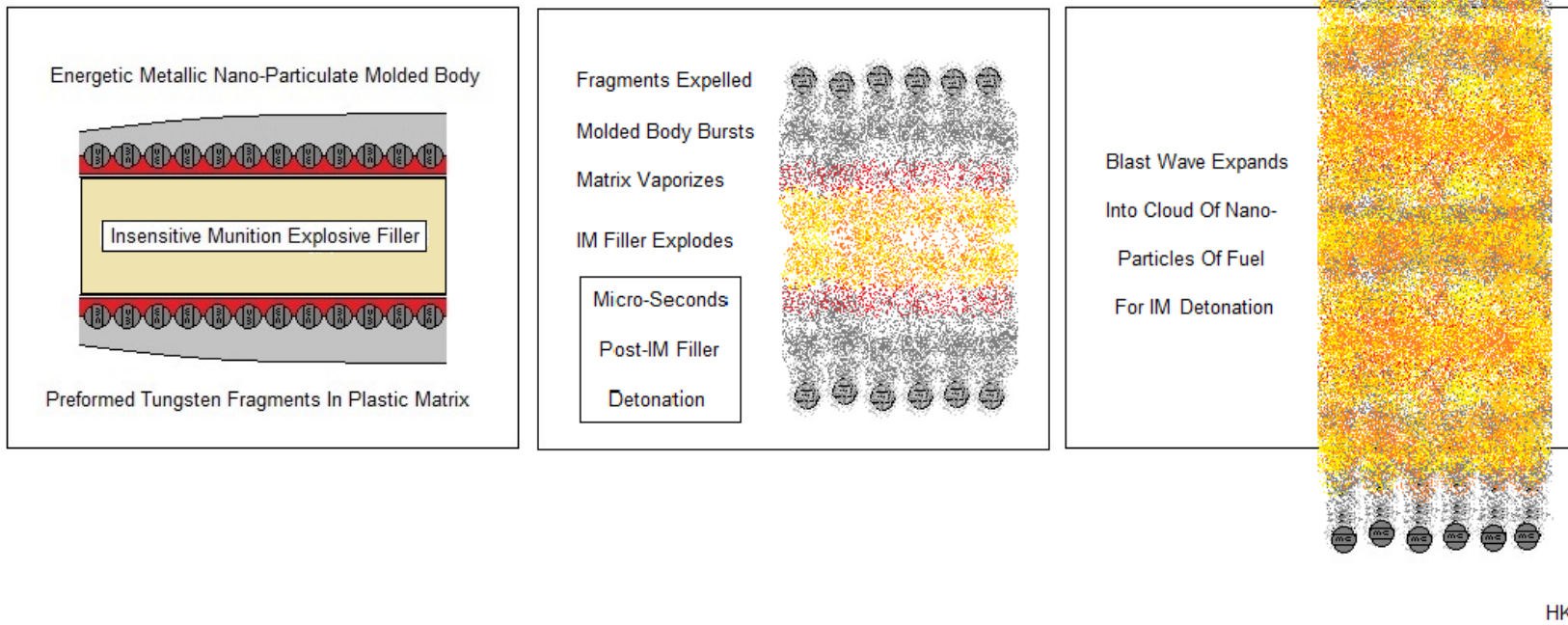
Clockwise From Upper Left: Epoxy Matrix
Science Direct Widener et al, Dreamstime.com
Magnetics, Bowman International Roller Type
Bearings, SKF Polymer Cage Ball Bearings.

Above: US Department Of Defense Graphics

Theory Of Blast Amplifying Projectile Bodies:

Theory Behind Projectile Body Blast Participation:

The Same Metals Used To Construct Fuel Air Munitions Are Incorporated Into The Molded Projectile Which Bursts Into Nano-Particles Post Detonation Ahead Of The Blast Wave...



Theory Of Blast Amplifying Projectile Bodies:

U.S. 105mm M-1 Cutaway:
Heavy Steel Forged Naturally Fragmenting Body

Labels on the left side of the cutaway:

- Fuze Well Requires Front Mass
- Explosive Volume
- Additional Machining Steps To Profile And Weld Drive Band

Labels on the right side of the cutaway:

- Threaded Fuze Well
- Naturally Fragmenting Body

Text in a red-bordered box at the bottom right:

Pre-Formed WC Fragment Matrix Molded Body Projectile With Formed On Drive Band And Fuze Well Threaded Insert Possible...

14 Oktobar Photo

Design Freedom Elements Of nP Molded vs. Traditional Projectiles:
"Using A Molded Body Frees The Artillery Shell Designer From Forging Constraints"

Labels for the Traditional M-1 105mm HE (left):

- Fuze Well
- Bourrelet
- Forged Steel Body (Naturally Fragmenting)
- Drive Band

Labels for the Proposed nP Molded Projectile Technology 105mm Enhanced Blast/Fragmentation (right):

- Fuze Well Insert
- Cylindrical Core
- Molded Body Made Of Plasticized Aluminum/Barium/Magnesium
- Forward Drive Band
- Pre-Formed Fragments (Plastic Fragmentation Matrix)
- Drive Band
- Steel Base Insert

VS.

Advantages of nP technology (right side):

- Use Any Fuze Well Insert Or None
- Allows The Use Of Formed Energetics
- Greatly Improved Fragmentation
- Atomized Bodies Participate In Blast
- Potential Accuracy Enhancements
- Enables Special Purpose Bases



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Compatible With NATO Standards For Insensitive Munitions:

Discussion Of: **AOP-39**

POLICY FOR INTRODUCTION AND ASSESSMENT OF INSENSITIVE MUNITIONS (IM)

Basic Features Of IM As Applied To Artillery Projectiles Include:

- 1) Casualty Of Burning Only If Subject To Heating, Fragmentation And Small Arms Fire To 12.7mm @ 850ms.
- 2) Historically Methods Are Reducing Density And/Or Confinement.
- 3) Basis For Generalization Of Greater Volume Needed For IM For Identical Effect Of Standard Munitions.



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Conclusions:

- **The Future** Is Clearly More Accurate, Longer Ranged And More Effective Ammunition For Large Caliber Artillery Which Will Require “Match Grade” Performance.
- **The Method For Increasing The Blast** Of A Lighter, Pre-Formed Fragment Body While Precisely Encapsulating The Contents Can Only Be Performed By Molded Projectiles.
- **Insensitive Munition Standards** May Be Advanced By Using A Smaller Amount Of Actual Core IM Explosives With The Addition Of Fuel And Oxidizer Externally.

Recommendations:

Make A Less Expensive, Lighter Projectile With Increased Range, Lethality And Accuracy:

1. The Molded Projectile Body Is Lighter, Contributes To Enhanced Blast And It Allows For Increased Velocity Without Excessive Pressure.
2. Increased Velocity, All Other Things Being Equal, Means Increased Range.
3. Lighter Projectiles With Enhanced Fragmentation And Blast That Can Accommodate Advanced Features Means: All Things Are Not Equal...
4. Suitable For RAP And Base Bleed, Offsetting Balance For Guided Fuze Bodies.



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Credits:



POC: Howard D. Kent, CEO, Phone: 818-314-8636, e-Mail: HKent@Peak.org



POC: Robert Folaron, President, Phone: 214-924-9473, e-Mail: rfolaron@np-technology.com



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Credits:



POC: RADM Samuel Kupresin, USN-Ret., CEO, Mandus Group LLC
e-Mail: SamK@mandusgroup.com Phone: 888-988-8502



POC: COL Michael Evans, USA-Ret., Director of Soft Recoil Technology & Mobile
Fires Capabilities, AM General Corporation
e-Mail: Michael.Evans@AMGeneral.com Phone: 574-237-6222, 734-502-8322



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Abstract:

24554 Blast Amplifying Projectile Bodies For Medium And Large Caliber Projectiles:

A Molded Projectile Application Which Enhances Explosive Filler Effects...

There is a need for solutions to the problem in high explosive projectiles where insensitive formulations may need to occupy more space to accomplish the same effects as earlier types...which leads to a crowding out of the metallic body area for designers. So we are then left with either weaker rounds with less explosive power behind reduced fragmentation or ones with more blast effect and reduced fragmentation due to a loss of material.

Typically, the projectile body is made of a solid metal forging or casting which blasts apart creating variously sized fragments, frequently requiring multiple operations for pre-fragmentation. These contain the blast momentarily, but do not otherwise combust or contribute to the explosion. Insensitive explosives reportedly require thinner or smaller amounts of body to even make fragments of. But ***what if this bulkier or smaller quantity of explosive could rely on a performance boost from the projectile body itself?***

Proposed is a Molded Projectile Body which consists, in part or entirety, of nano-particulate metallic components typically found in explosive formulations. This would replace other forms of projectile body with one that actively participates in the explosion of the core and amplifies the weapon effect.

A molded projectile of this type can also incorporate pre-formed fragments within the body structure which can be used to generate more uniformly shaped fragmentation patterns as well. The round would then burst more powerfully, scatter uniformly shaped and perhaps less massive fragments in predictable patterns, potentially also reducing the range that collateral damage is done.

For example, one could encapsulate a hundred Tungsten balls in a plastic matrix over-molded with polymerized Aluminum as a 30mm projectile body structure filled with precisely arrayed fragments and made of a fuel precursor of the high explosive Amatol. High explosive fillers of traditional or insensitive designs would be applied as usual, but both would benefit from the molded projectile material addition. The body could also contain threaded wells and fuzed as in previous models or be designed for use of structural epoxy which may also contain blast enhancing components.



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