

GENERAL DYNAMICS

Ordnance and Tactical Systems

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"Strengthening Capability through People and Technology"

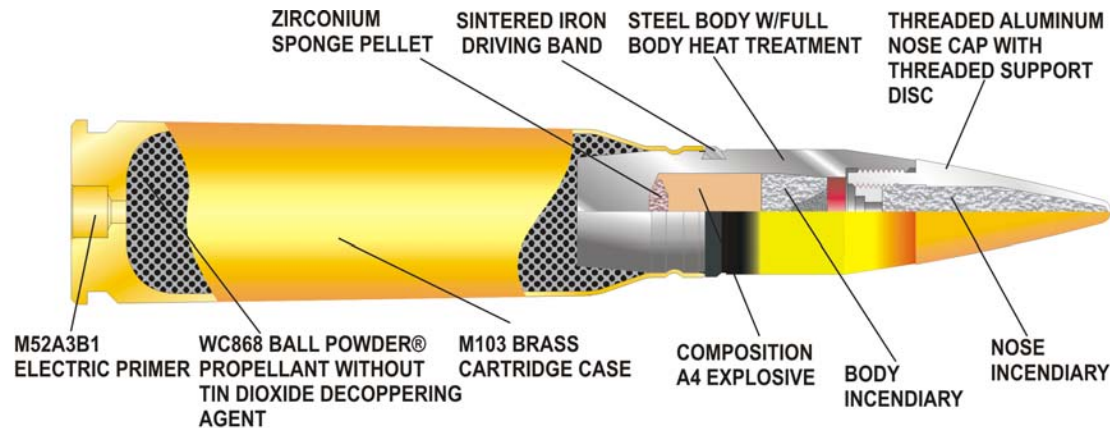
GD-OTS 20mmx102mm Mechanically Fuzed Projectile Program
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Introduction:

GD-OTS 20mm Fuzed Cartridge Alternative

- For the last several years, GD-OTS has invested funds into the development of a mechanically fuzed variant to the 20mm PGU-28A/B.



PGU-28A/B
Cartridge

- GD-OTS has made a conscious effort to make safety a number one priority during the development process.
- Fuze has been designed to operate with delay or point detonating mode.
- Fuze has capabilities in calibers other than 20mm.

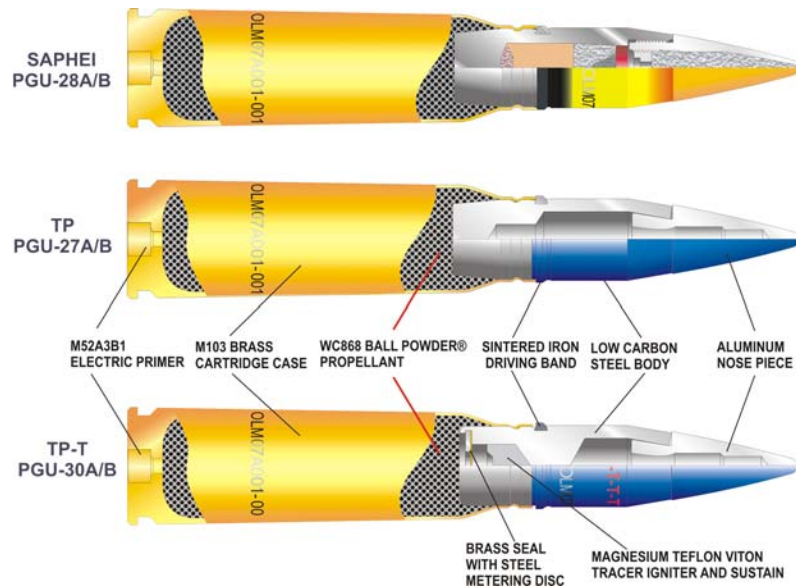
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Cartridge Safety and Performance Requirements

- **Configuration Requirements**

- Fully compliant with current PGU-28A/B Cartridge envelope.
- Ballistic match with current 20mm PGU family of ammunition.



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Performance Requirements

• Design Requirements (Delay Fuze) per AS6120

- Function after impact with .063 inch aluminum plate at 200 yards
- Delayed function after impact with .080 inch aluminum plate at 200 yards
- Function after impact with .080 inch aluminum plate @ 75° NATO at 200 yards
- Produce a low order reaction of the body explosive after initiation
- Defeat 3/8 inch RHA @ 45° obliquity with a probable ballistic limit velocity of 2786 ft/sec

• Design Requirements (Point Detonating)

- Function after impact with .063 inch aluminum plate at 200 yards
- Function after impact with .080 inch aluminum plate @ 75° NATO at 200 yards
- Produce a high order reaction of the body explosive after initiation
- Defeat 3/8 inch RHA @ 45° obliquity with a probable ballistic limit velocity of 2786 ft/sec

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Fuze Requirements

- Must fit within PGU 28A/B Nose envelope.
- Must be within reasonable range of current PGU 28A/B pyrotechnic nose mass.
- Must be able to function across all temperature extremes.
- Must be able to defeat light skin targets at both low and high graze angles.
- Safety
 - Survive acceleration at high temperature and pressure launch
 - Fully compliant with Mil-Std-1316
 - Fully compliant with Mil-Std-331 and Mil-Std-810 cartridge safety and environmental requirements
 - Fully compliant with Mil-Std-1751

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Cartridge Description

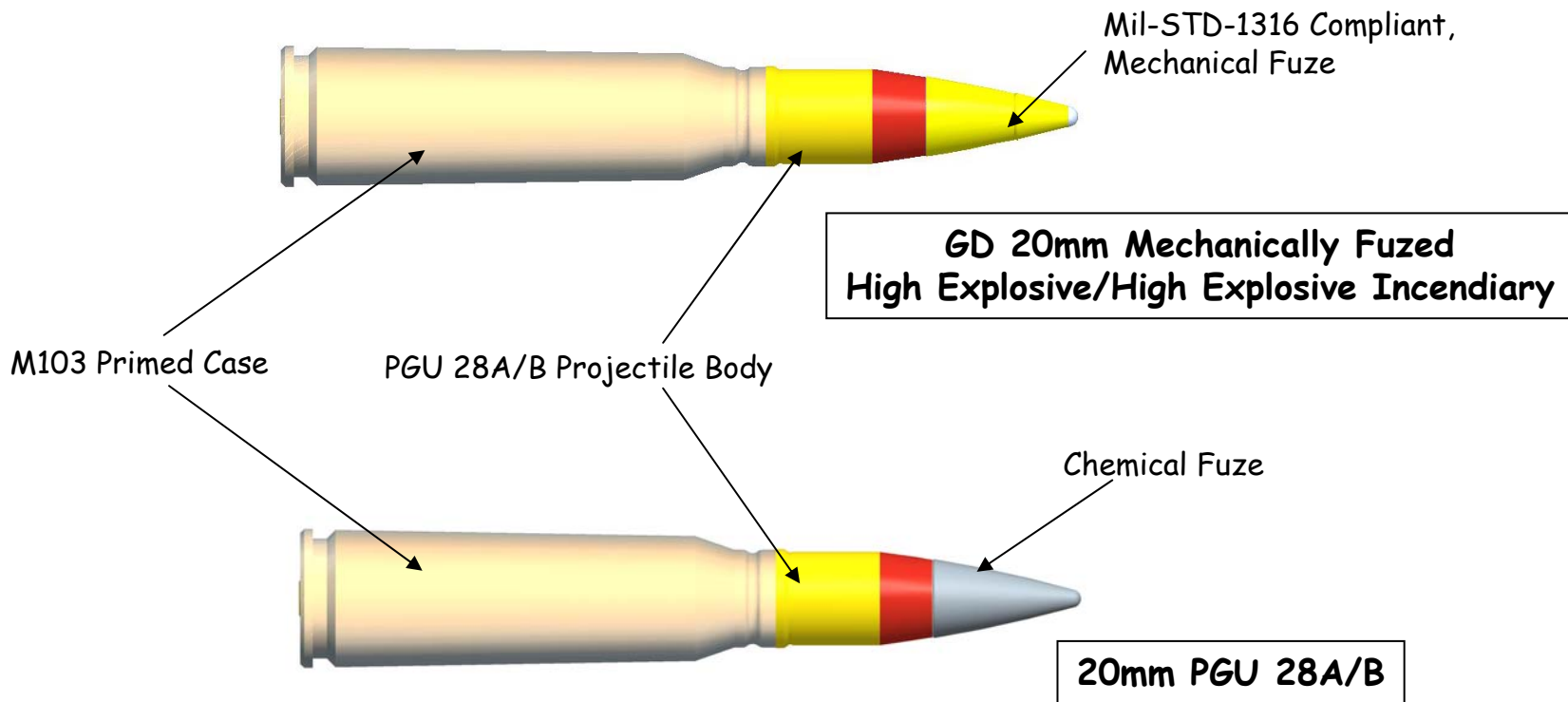
- The **General Dynamics-OTS** solution utilizes the following:
 - A ball rotor approach fuze similar to the M505 that employs dual independent safeties and can function in either the delay or point-detonating mode.
 - Ballistic match to the 20mm PGU family of ammunition.
 - Meets the 20mmx102mm Cartridge envelope.
 - Utilizes components common to the 20mm PGU family of ammunition.

GD-OTS developed a cartridge to meet the requirements of the USAF and leverage commonality with existing technology and manufacturing processes.

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Cartridge Description

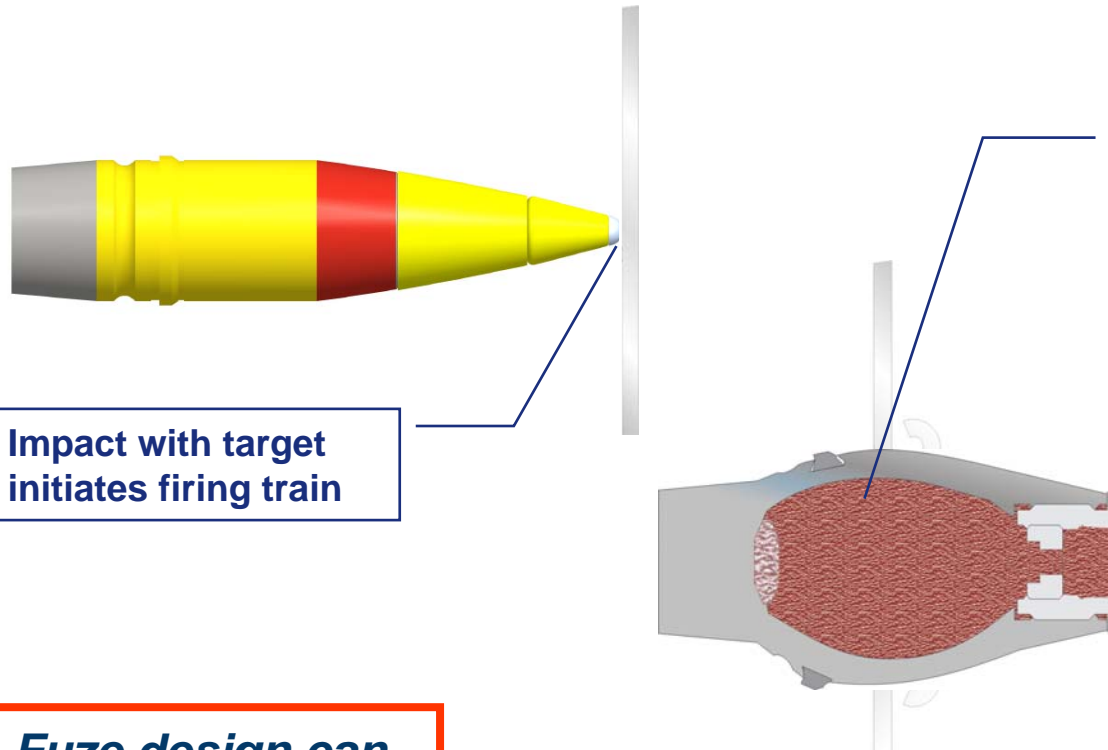


-Cartridges utilize same propellant and LAP facility.

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GD-OTS 20mm Fuzed Cartridge Alternative



•In PD configuration, body detonates immediately following impact with target.

•Delay mode mimics performance of current PGU-28A/B.

Impact with target initiates firing train

Fuze design can be tailored to meet customer requirements.

Evidence of PD function, 3x caliber holes left on 4'x4'x.080" Aluminum trigger plate

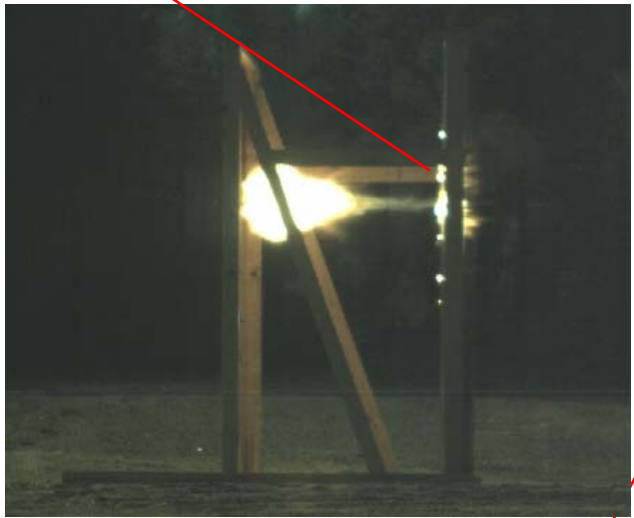
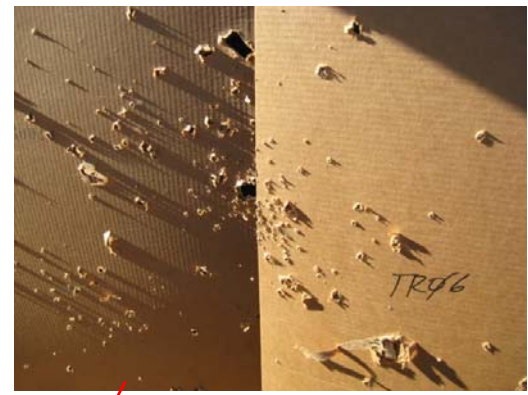


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GD 20mm Testing: GD-OTS 20mm Fuzed Cartridge Alternative

Fragmentation from detonating projectile body



Witness Panels Aluminum Trigger Plate

Witness Panels

Impact with .080" and .063" Aluminum at 200 yards. Detonation occurs thousandths of a second after impact, producing lethal fragments with a flash bang effect.

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GD 20mm Testing: GD-OTS 20mm Fuzed Cartridge Alternative



Graze Sensitivity test set-up.
.080" Aluminum Trigger
Plate set @ 75 degrees
NATO

Witness Panel
6' Behind
Trigger Plate



***Capable of defeating both air-to-air
and air-to-ground graze targets.***

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GD 20mm Testing: GD-OTS 20mm Fuzed Cartridge Alternative

Perforations of 3/8 Inch RHA. Meets penetration requirement per PGU-28A/B specification.



Penetration capabilities make the GD round highly effective against light armored targets.

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GD 20mm Testing: GD-OTS 20mm Fuzed Cartridge Alternative



Steel Construction

A vehicle, similar to enemy infantry carriers, was fired upon to test effectiveness against not only the vehicle but personnel. Mannequins were placed in the cab and bed of vehicle.

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GD 20mm Testing: GD-OTS 20mm Fuzed Cartridge Alternative



When fired against cab of truck, mannequins suffered fatal injuries including separation of three limbs from driver's body.

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GD 20mm Testing: GD-OTS 20mm Fuzed Cartridge Alternative



Projectile achieved mobility kill after first shot fired against the engine.



After 1st shot



After 5th shot

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GD 20mm Testing: GD-OTS 20mm Fuzed Cartridge Alternative



Projectile inflicted severe damage on each of the four mannequins when fired at truck bed.

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GD 20mm Testing: GD-OTS 20mm Fuzed Cartridge Alternative

VIDEO

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Test Summary: GD-OTS 20mm Fuzed Cartridge Alternative

Verification Tests	Delay Function	Point Detonating Function
Static Booster Testing	Complete	Complete
Booster Material Ballistic Evaluation	Complete	Complete
Low Drag Shape Concept	Complete	Complete
Explosive Train Development	Complete	Complete
Explosive Train Down Select	Complete	Complete
Detonation Delay	Demonstrated at Temperatures	N/A
Armor Penetration	Met Requirement	Expected to meet requirement per PGU-28A/B specification
Projectile Sensitivity	Demonstrated	Demonstrated at Temperatures
Long Range Sensitivity (600m)	Test Not Performed	Demonstrated
Point Detonating Function	N/A	Demonstrated at Temperatures
Fragmentation	Demonstrated	Demonstrated
Graze Sensitivity (75 Degrees)	Demonstrated	Demonstrated at Temperatures
Function and Casualty	Demonstrated	Demonstrated
Safety Tests	Passed Mil-Std-331 D1 Out-of-Line Safety Test @ Ambient and Cold Test at Hot to be conducted	Passed Mil-Std-331 D1 Out-of-Line Safety Test @ Ambient and Cold Test at Hot to be conducted
No-Arm (3 meters against .040" Al)	Passed	Passed

Testing against all key baseline performance requirements demonstrates enhanced lethality, safety and graze sensitivity.

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GD Mechanical Fuze Growth in other Calibers

- Integrated mechanical fuze into the 30mm x 173 HEI projectile.
- Design is a ballistic match to PGU-14 API round.
- Mechanical fuze increases capabilities from the baseline design, which utilizes the M505 fuze.
 - Increased Graze Sensitivity
 - Improved Safety
- Ballistic match comparison test fired at Yuma. Results verified ballistic match.
- Function test successful at Marion Test Facility.



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Summary: GD-OTS 20mm Fuzed Cartridge Alternative



- Meets weight and envelope requirements for 20mm PGU ammunition while using many common components
- Fuze design compliant with Mil-Std-1316
- Point detonate configuration demonstrated
- Delay function, meeting 20mm PGU-28A/B specification, demonstrated
- Ballistic match to PGU-28A/B
- Meets performance requirements established at program start
- Fuze design can be integrated into all applications ranging from 20mm to 30mm.

Ready for combat today!

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Questions?

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