GENERAL DYNAMICS
Ordnance and Tactical Systems

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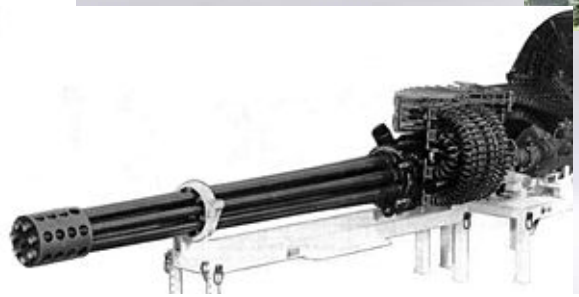
30x173mm High Explosive Incendiary Product Improvement

Approved For Public Release

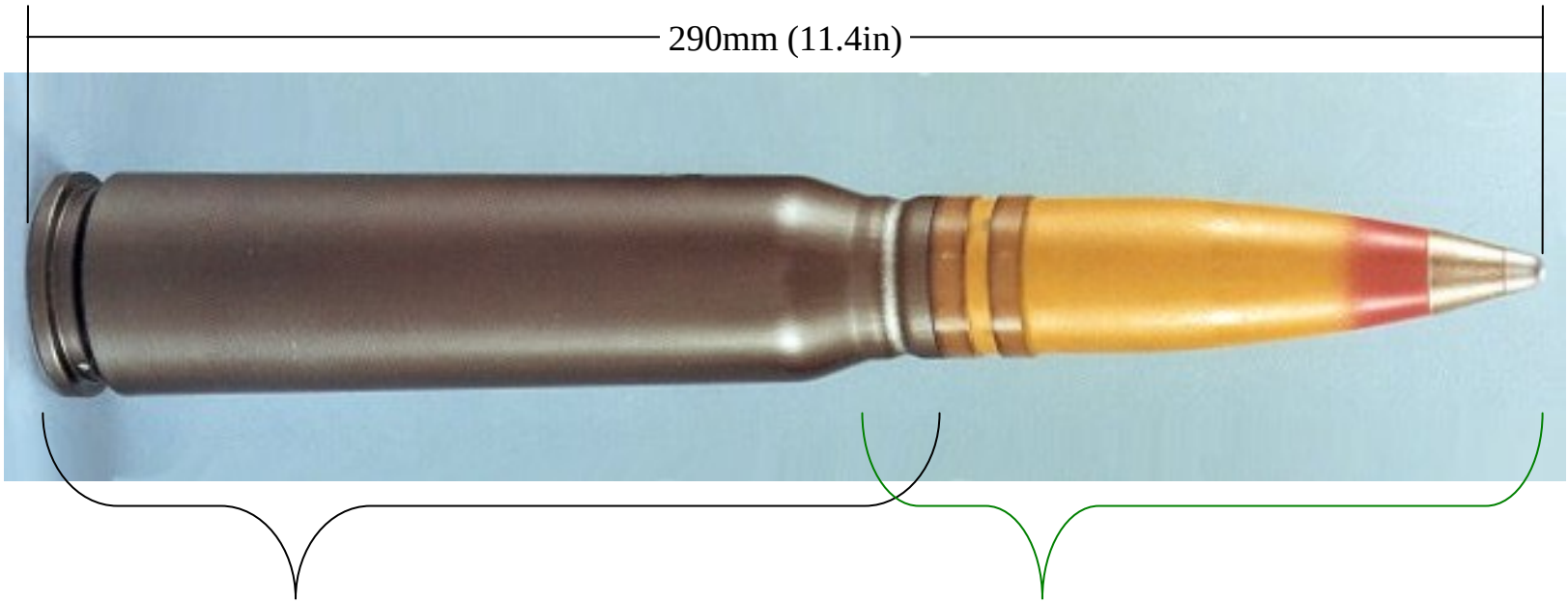
30x173mm PGU-13/B HEI Improvement



GAU-8 Avenger
- **7 Barrel Rotary Cannon**
- **30x173mm ammunition mix**
- **PGU-14/B Armor Piercing Incendiary (API)**
- **PGU-13/B High Explosive Incendiary (HEI)**
- **Light and Heavy Armored Ground Targets**

USAF A-10 THUNDERBOLT II

PGU-13/B High Explosive Incendiary (HEI) Cartridge

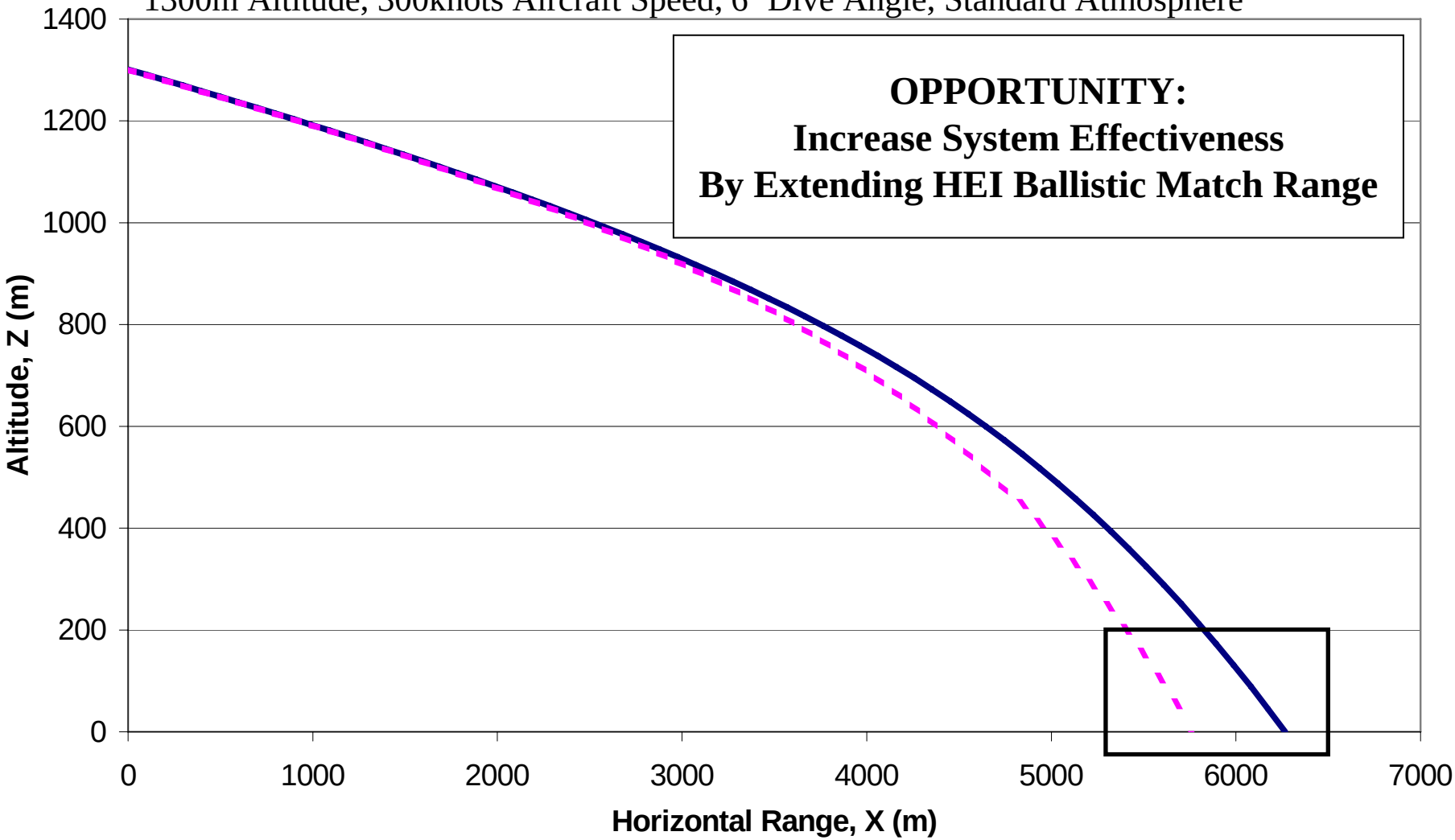


Propulsion System
- **Aluminum Cartridge Case**
- **Percussion Primer**
- **Flashtube**
- **Extruded Propellant**

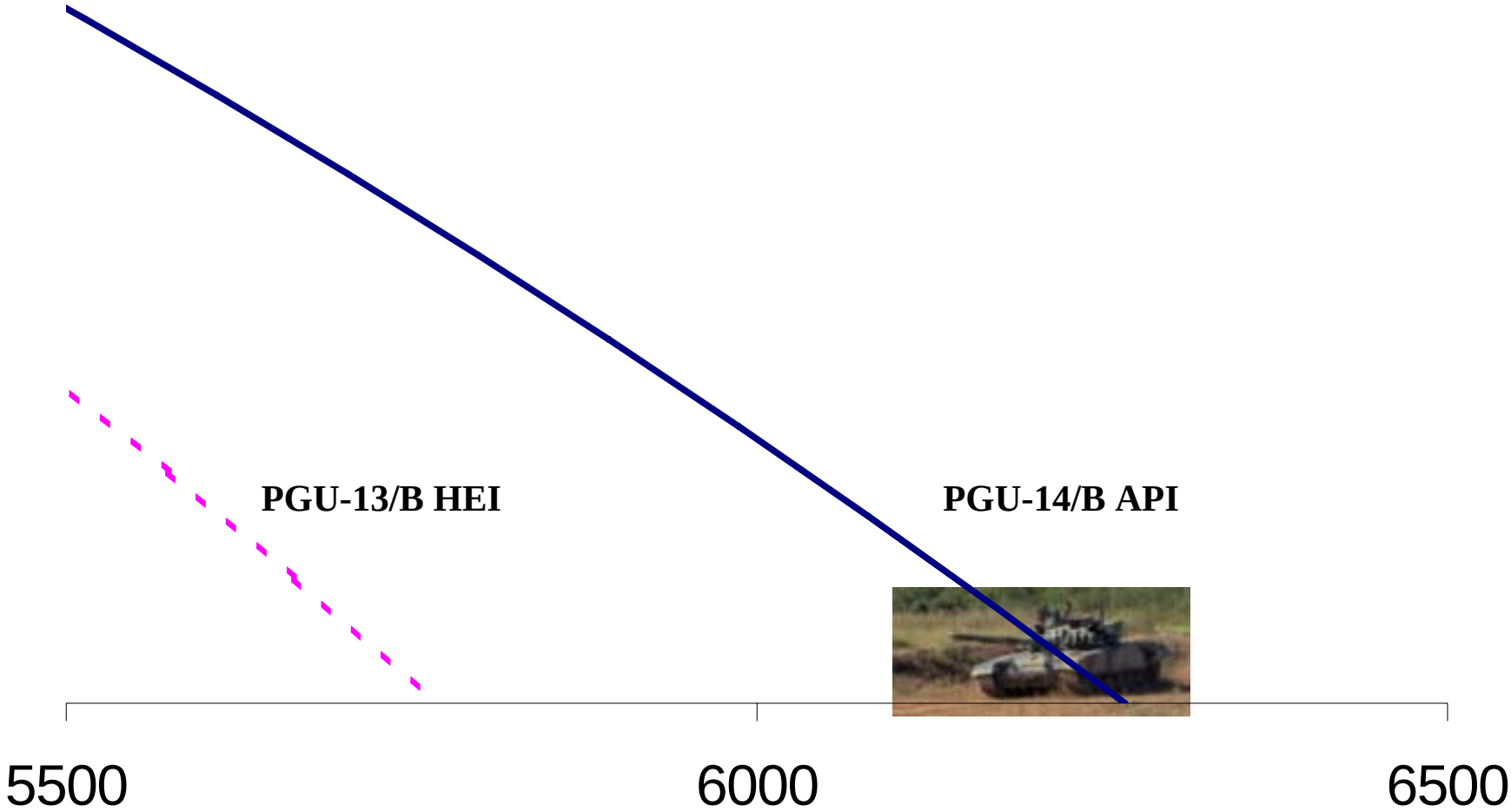
Projectile
- **Steel Body**
- **Dual Plastic Driving Bands**
- **High Explosive Fill**
- **M505 Point Detonating Fuze**

30x173mm PGU-13/B HEI Improvement

1300m Altitude, 300knots Aircraft Speed, 6º Dive Angle, Standard Atmosphere



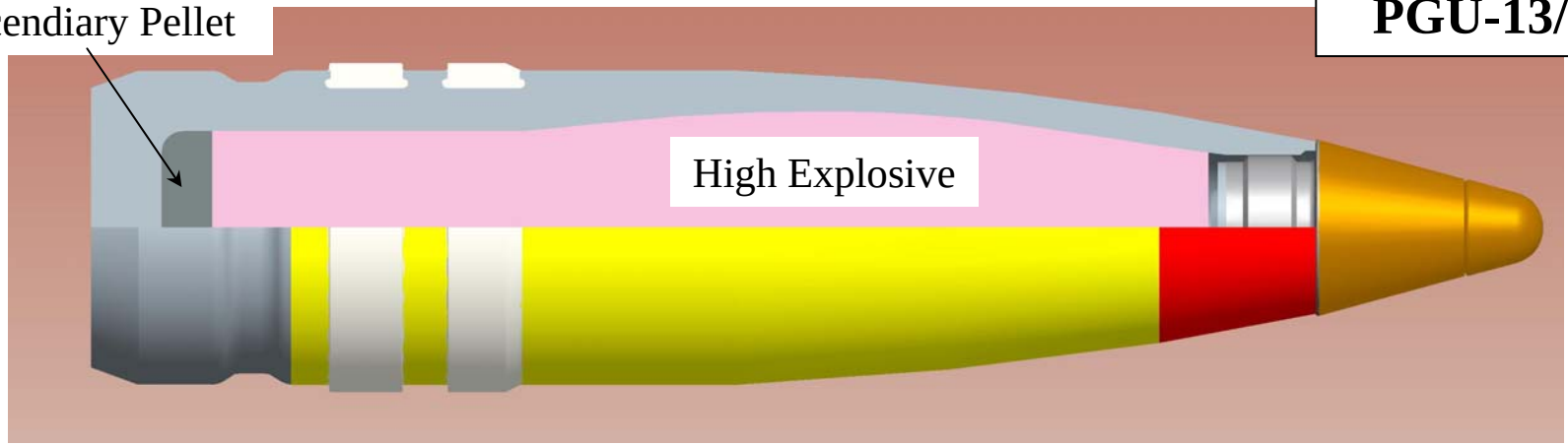
30x173mm PGU-13/B HEI Improvement



Fire Control Solution Puts PGU-14/B On Target, PGU-13/B Falls Short

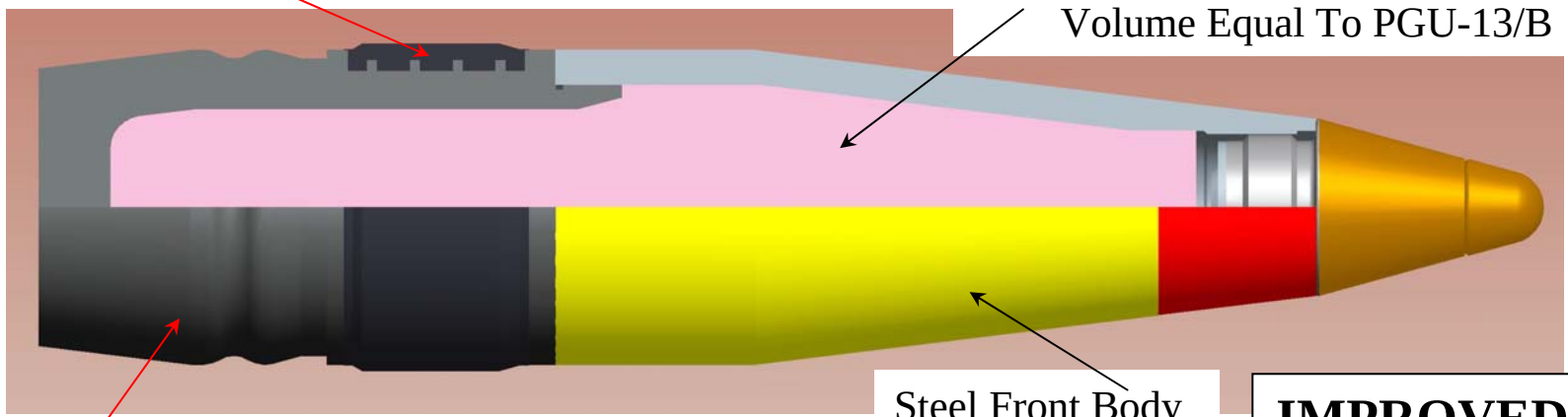
30x173mm PGU-13/B HEI Improvement

PGU-13/B



One-Piece Plastic Driving
Common Within Ammunition Family

Alternate Explosive Fill
Incorporates Incendiary Function
Volume Equal To PGU-13/B



IMPROVED HEI

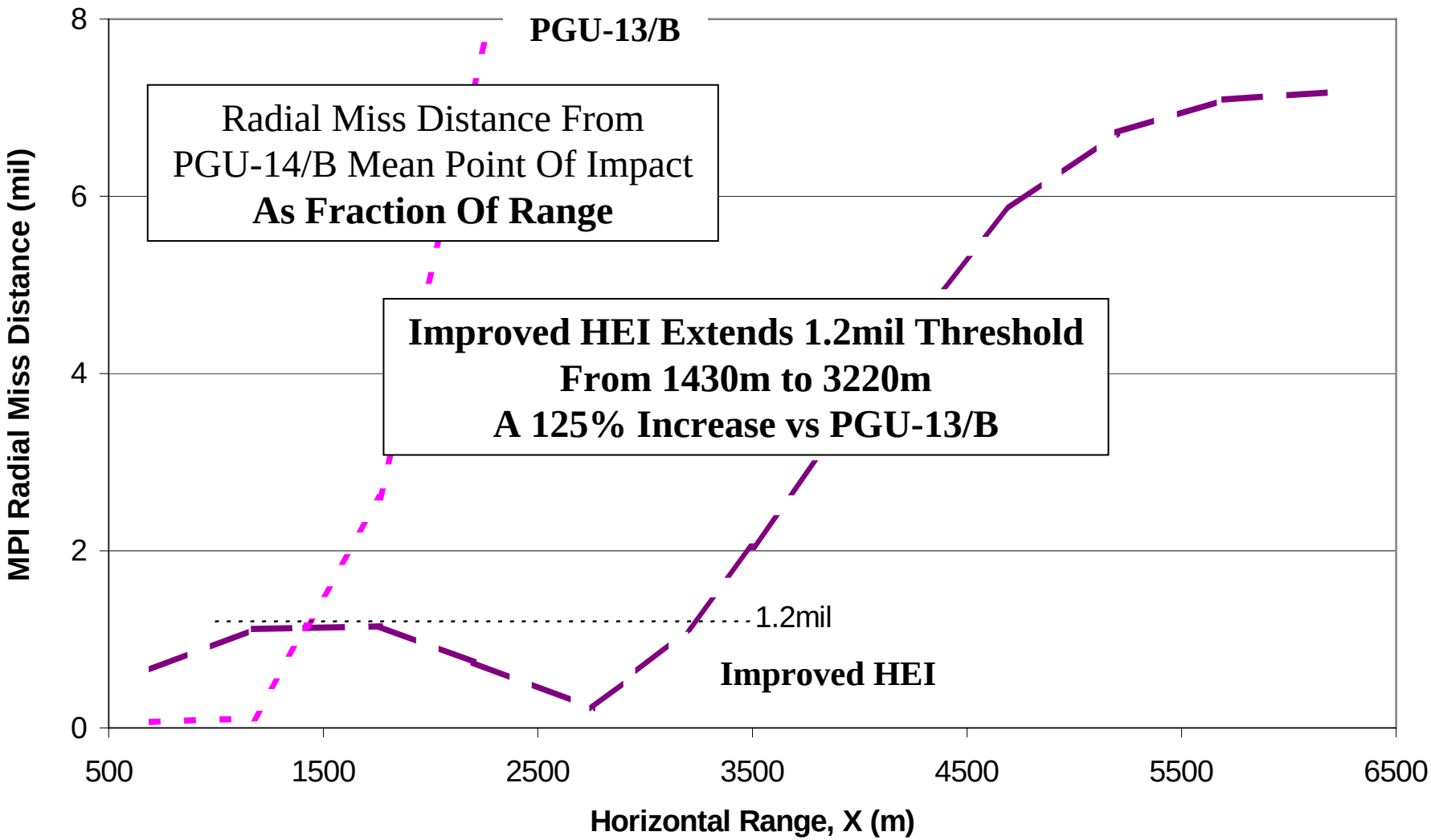
Aft Body Is Cobalt Free Tungsten Alloy With High Iron Concentration
Boattail Added For Reduced Drag, Same As PGU-14/B API

30x173mm PGU-13/B HEI Improvement

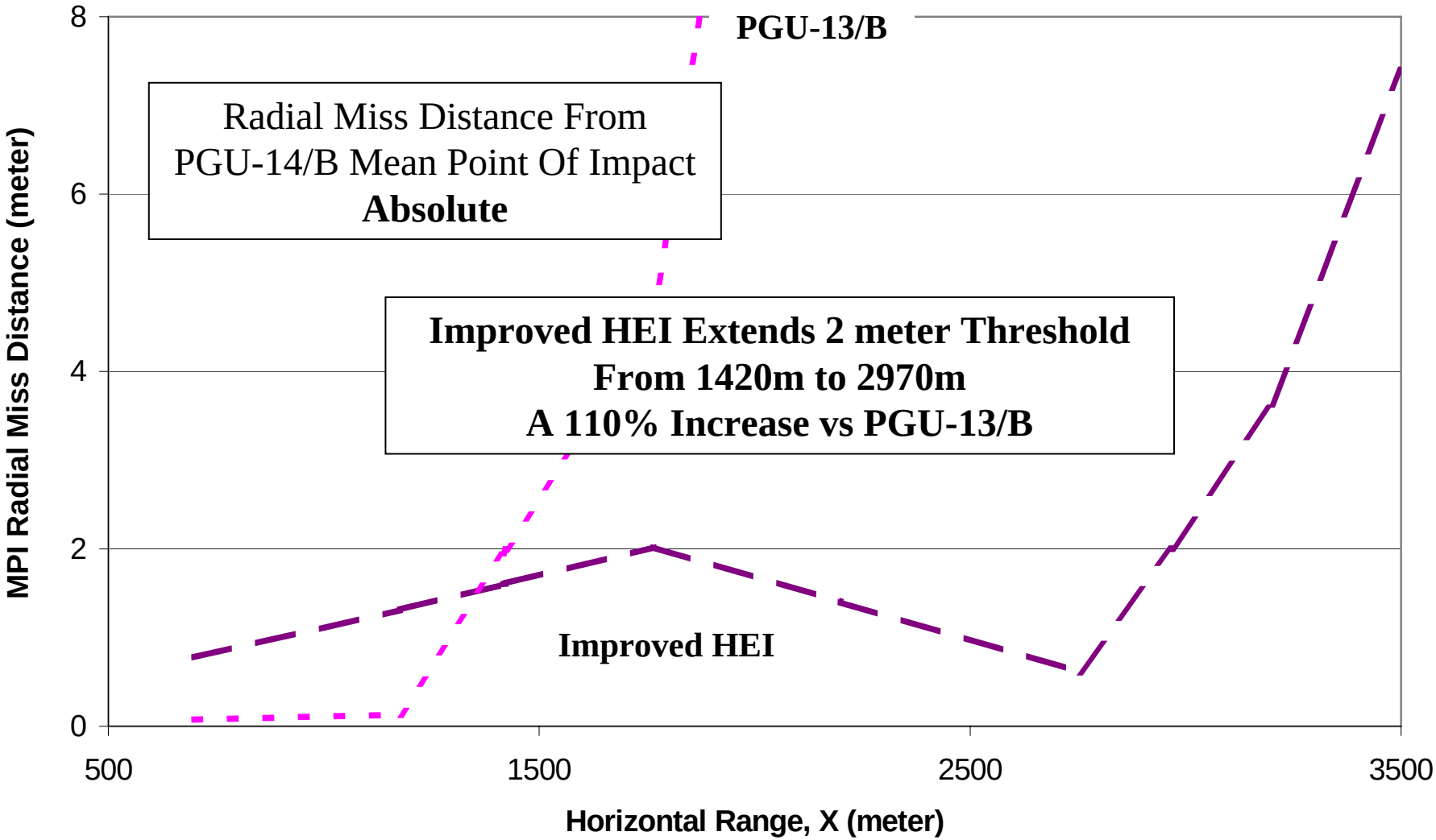
Projectile	Mass	Muzzle Velocity
PGU-14/B API	426 g	990 m/s
Improved HEI	419 g	1013 m/s
PGU-13/B HEI	367 g	1021 m/s

Improved HEI Is Predicted To Meet Pressure And Action Time Requirements Using The Same Propulsion System As PGU-14/B

30x173mm PGU-13/B HEI Improvement



30x173mm PGU-13/B HEI Improvement



IMPROVED HEI STATUS:

- **Key innovation is the use of non-standard tungsten alloy aft body material** that adds a degree-of-freedom for projectile design. This eliminates sleeved designs that are susceptible to setback induced motion with associated potential for in-bore detonation.
- **Ammunition ICD requirements are met** and the ammunition family **common propulsion system can be utilized**.
- Bourrelet length is reduced 6% versus PGU-13/B (tends to increase dispersion) but aerodynamic jump factor is also reduced 19% (tends to decrease dispersion). Net effect is predicted 14% reduction in dispersion due to balloting. **No net increase in dispersion versus PGU-13/B is expected.**
- **The projectile is gyroscopically and dynamically stable**, predicted maximum yaw limit cycle is 1 degree.
- **Ballistic match is greatly improved (smaller miss distance)** past 1400m with only a small penalty below 1400m. Bi-conic ogive is believed to provide lower drag than modeled in this example. Margin could be used to reduce pressure (through reduced muzzle velocity) or to further extend ballistic match range.

IMPROVED HEI STATUS:

- **Concept shown preserves blast and fire start lethality while eliminating separate incendiary pellet**.

POTENTIAL CONCERNS:

- Predicted aft body stresses are higher than the expected strength of the cobalt free tungsten alloys being considered. Future optimization studies will likely reduce explosive volume to allow sidewall thickness increase for reduced stress. Ballistic match will be preserved.
- Net effect on lethality for reduced explosive payload will need to be evaluated; increased density of the aft body fragments should improve penetration.
- Direct contact of tungsten alloy with the bore is not now done for any product known to GD-OTS. Potential for increased barrel wear exists. The high iron concentration of the aft body should mitigate this risk and coatings are available to further reduce it.

NEXT STEPS:

- Verify capability to fabricate aft bodies over the potential range of densities.
- Characterize aft body material strength and finalize sidewall thickness.
- Evaluate methods for joining aft and front bodies.
- Evaluate metal parts security and total drag by ballistic test.

General Dynamics 30x173mm Improved HEI Provides A High Degree Of Compliance With Technical Requirements And Is Ready For Prototyping