



Product Improvement 40mm Ammunition NDIA



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OBJECTIVE

- Provide overview of the standard cartridges
- Provide Key Issues for each commodity
- Provide strategy for moving forward
- Provide future plans for improvements





General Trends in 40mm

Increased Demands

- Production numbers are increasing - Training demands are increasing
- Some items in production have not been procured recently
- Combat and training rounds are both in short supply
- Award of systems contract to AMTEC and DSE

Product Improvements

- Most rounds were designed in the late 1970's and 1980's
- Technology driven modeling and simulation enables better designs today
- Increased demands drive the need for improvements in produceability
- Cost savings are key based on large quantities produced
- Cost, Schedule, and Performance





40mm Ammunition Family

- **High Velocity (For MK19 Mod3 GMG/MK47)**

- **M430A1 High Explosive Dual Purpose (HEDP) - B542**
- **M1001 Canister Cartridge – BA11**
- **M918 Practice (“Flash-Bang”) - B584**
- **M385A1 Practice - B576**
- **Mk281 Training Cartridge -**



- **Low Velocity (FOR M203/M79/XM320)**

- **M433 High Explosive Dual Purpose (HEDP) - B546**
- **M781 Practice (“Orange Dye”) - B519**
- **M583A1 White Star Parachute (Illumination) - B535**
- **M661 Green Star Parachute (Illumination/Signal) - B504**
- **M585 White Star Cluster (Illumination/Signal) – B536**
- **XM992 IR illuminant – BA03**
- **XM1060 Thermobarric – BA19**



40mm Ammunition Family (cont.)

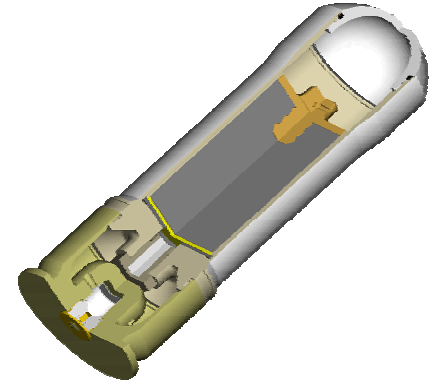
- **Less than Lethal Ammunition**
 - M1006 Sponge grenade – BA06
 - M1029 Crowd Dispersal Cartridge – BA13
 - XM1057 - TBD





STRATEGY FOR IMPROVEMENT

- **Establish Baseline Performance**
 - Warheads (M433, M430)
 - Interior and Exterior ballistics
 - Manufacturing and Environmental
- **Program Recommendations and Planning**
 - Engineering Study, Product Improvement
 - VECP, VEP, ECP
- **Other Avenues**
 - CRADA agreements with Systems Contractors
 - R & D programs
 - Foreign Comparison Testing





UNCLASSIFIED

ESIP: Cartridge, 40mm M433 High Explosive Dual Purpose (HEDP)

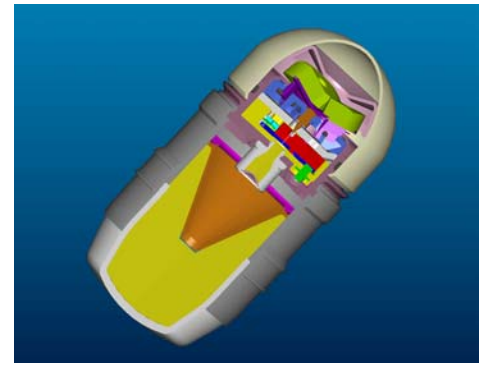
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System Description

MISSION: Provide anti-personnel and anti-armor (2.5" RHA @ 0 degrees) capabilities out to 400 meters maximum range.

USE: Shoulder fired from the M203 GL (attached to the M16A2 rifle system). Used by Tri-Services

Visuals



Responsible PM: PM-MAS

Technical

CRITICAL REQUIREMENTS:

- Compatibility with the M203 Grenade Launcher
- Muzzle Velocity – 76 mps
- Range – 400 meters (maximum)
- Minimum Fuze Arming Distance – xx meters
- Maximum Anti-armor penetration – 2.5" RHA @ 0 degrees

HISTORICAL INFORMATION:

- TC-STD - 1968

Current Status

- Ballistic Match/ Baseline testing on-going.
- Warhead Improvement project on-going.
- PIP to improve aeroballistics and projectile body design based on ARL spark range data and modeling.
- PIP to improve warhead based on baseline data



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ESIP: Cartridge, 40mm M781 Practice

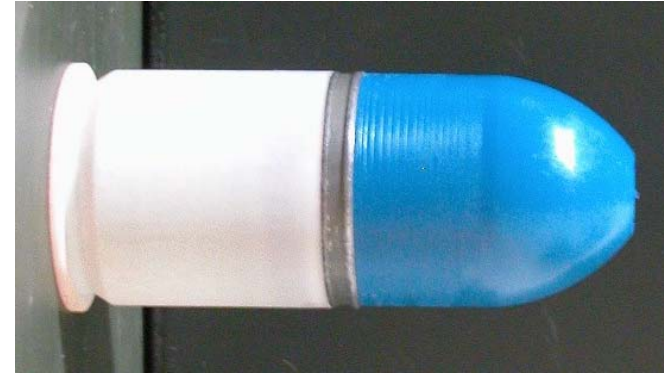
UNCLASSIFIED

System Description

MISSION: Provide an effective training simulator to the combat ammunition (M433) for use with the 40mm M203 GL (attached to the M16A2 rifle system).

USE: Shoulder fired from the M203 GL to provide visual signature upon impact. Used by Tri-Services

Visuals



Responsible PM: PM-MAS

Technical

CRITICAL REQUIREMENTS:

- Compatibility with the M203 Grenade Launcher
- Muzzle Velocity – 76 mps
- Maximum Range - 400 meters
- Visual signature upon impact

HISTORICAL INFORMATION:

- TC-STD - 1972

Current Status

- M781E1 Day/Night not funded
- Low Velocity Mann Barrel testing –on going (to record case mouth and mid-case pressures)
- Ballistic Match / Baseline Study - Ongoing
- Qualify Alternate Propellant - Ongoing
- Qualify Alternate Curing Agent - put on hold (possible alternate being tested also increased in price)
- PIP to reduce cost



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ESIP: Cartridge, 40mm M583A1 White Star Parachute

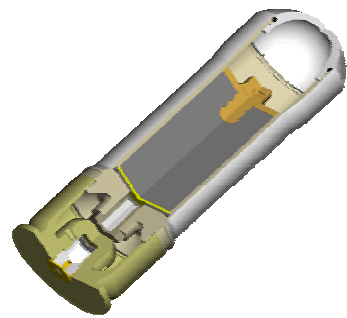
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System Description

MISSION: Provide an effective illumination and signaling cartridge for support of ground troops to be used in conjunction with the M203 grenade launcher (attached to the M16A2 rifle system)

USE: Shoulder fired from the M203 GL for illumination of target area or signaling. Used by Tri-Services

Visual



Responsible PM: PM-MAS

Technical

- CRITICAL REQUIREMENTS:**
- Compatibility with the M203 Grenade Launcher
 - Muzzle Velocity - 250 fps
 - Maximum Altitude - 700 feet at 90 degree weapon elevation
 - Minimum output - 70,000 candlepower
 - Minimum burn time - 35 seconds

- HISTORICAL INFORMATION:**
- TC-STD - 1972

Current Status

- 3 sources are now online for support of production (MEI, PSI, Valentec)
- PIP to reduce cost, increase burn time, improve cartridge case



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Cartridge, 40mm XM992 Infrared Illuminant – BA03

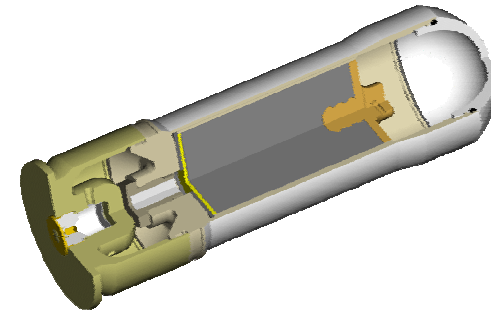
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System Description

- 40mm Ctg fired from the M203 Grenade Launcher
- Similar in design to M583A1 White Star Parachute Ctg
- Provides IR illumination in the infrared passband
- Produces minimum visual signature outside of the infrared passband

The currently fielded 40mm star illuminant cartridge (M583A1) produces sufficient visible light that not only illuminates enemy targets, but may also illuminate friendly positions. The 40mm IR illuminant cartridge is similar in design and functional performance to the above except for the illuminant candle composition.

Visual



Responsible PM: PM-SW

Technical

- Weight: .49 lb.
- Total Length: 5.272"
- Projectile Length: 4.399"
- Candle Burn time: 30 secs min
- Muzzle Velocity: 76 m/s
- Average Altitude @ 90 degree QE: 600 feet
- I/R Passband: 600-900 nm
- Max visible candlepower output: <350
- NSN: 1310-01-422-2048 *
- Packout: M2A1 Metal cans (22 rounds)

* *Item yet to be procured*

Potential Future Improvements

- Reduce visible light output
- Increase burst height, thus improving useable IR visibility





XM992 IR Parachute





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ESIP: Cartridge, 40mm M661 Green Star Parachute

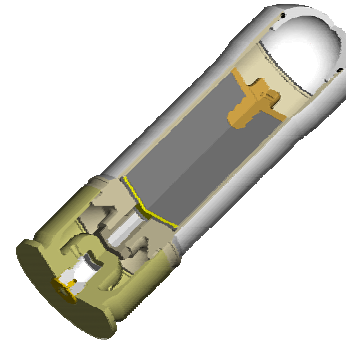
UNCLASSIFIED

System Description

MISSION: Provide an effective illumination and signaling cartridge for support of ground troops to be used in conjunction with the M203 grenade launcher (attached to the M16A2 rifle system)

USE: Shoulder fired from the M203 GL for illumination of target area or signaling. Used by Tri-Services

Visual



Responsible PM: PM-MAS

Technical

CRITICAL REQUIREMENTS:

- Compatibility with the M203 Grenade Launcher
- Muzzle Velocity - 250 fps
- Maximum Altitude - 700 feet at 90 degree weapon elevation
- Minimum output - 35,000 candlepower
- Minimum burn time - 35 seconds

HISTORICAL INFORMATION:

- TC-STD - 1972

Current Status

- Converting TDP to 3D





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ESIP: Cartridge, 40mm M585 White Star Cluster

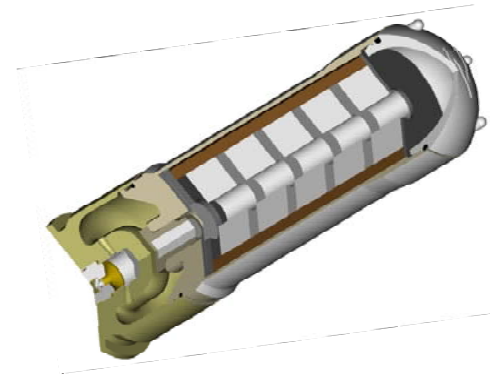
UNCLASSIFIED

System Description

MISSION: Provide an effective illumination and signaling cartridge for support of ground troops to be used in conjunction with the M203 grenade launcher (attached to the M16A2 rifle system)

USE: Shoulder fired from the M203 GL for illumination of target area or signaling. Used by Tri-Services

Funding



Responsible PM: PM-MAS

Technical

CRITICAL REQUIREMENTS:

- Compatibility with the M203 Grenade Launcher
- Muzzle Velocity - 250 fps
- Maximum Altitude - 700 feet at 90 degree weapon elevation
- Minimum output - 30,000 candlepower
- Minimum burn time - 5 seconds

HISTORICAL INFORMATION:

- TC-STD - 1972

Current Status

- Convert TDP to 3D





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ESIP: Cartridge, 40mm M430A1 High Explosive Dual Purpose (HEDP)

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System Description

MISSION: To defeat enemy personnel and lightly armored vehicles.

USE: Fired from the Mk19 Mod3 GMG. Used by Tri-Services

Visual



Responsible PM: PM-MAS

Technical

- CRITICAL REQUIREMENTS:**
- Muzzle Velocity - 240 mps
 - Range – 1200m Effective, 2200m Maximum
 - Minimum Fuze Arming Distance – 18 meters
 - Maximum Anti-armor penetration – 3” RHA @ 0 degrees

- HISTORICAL INFORMATION:**
- TC-STD – A in Sept 92

Issues

- Baseline performance at ARL and Warheads
- PIP based on outcome of the Aeroballistics and warhead baseline



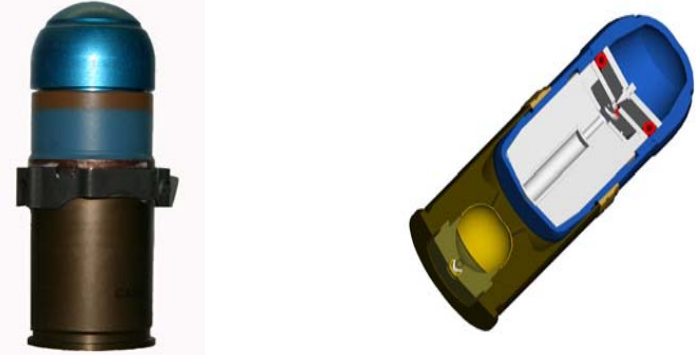


System Description

MISSION: Provide an effective training simulator to the combat ammunition (M430A1) for use with the 40mm MK19 Mod 3 GMG by producing an audio and visual signature upon impact.

USE: Fired from the Mk19 Mod3 GMG. Used by Army and Navy

Visuals



Responsible PM: PM-MAS

Technical

CRITICAL REQUIREMENTS:

- Compatibility with the MK19 Mod 3 Grenade Machine Gun
- Muzzle Velocity - 240 mps
- Action Time - < 4 ms
- Range – 1200m Effective, 2200m Maximum
- Minimum Fuze Arming Distance – 18 meters
- Visual and Audio signature at effective range

HISTORICAL INFORMATION:

- TC-STD – A in December 1985

Issues

- Baseline test at ARL
- PIP to match aerobalistically to M430
- PIP to reduce cost
- PIP for Single Chamber Cartridge Case





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ESIP: Cartridge, 40mm M385A1 Practice

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System Description

MISSION: Provide an effective/safe means for proof Testing the MK19 Mod 3 Grenade Machine Gun

USE: Fired from the MK19 Mod 3 GMG. Limited use for training on “clean ranges” (no impact signature – solid aluminum projectile.)

Programmatic



Responsible PM: PM-MAS

Technical

CRITICAL REQUIREMENTS:

- Muzzle Velocity - 240 mps
- Range – 2200 m Maximum

HISTORICAL INFORMATION:

- TC-STD – A in June 64

Issues

- M918/M385A1 mixed belt testing.
- PIP to make injection molded body one piece. Reduce cost





System Description

MISSION: Anti-Personnel and Capable of penetrating PASGT vests

USE: Fired from the Mk19 Mod3 GMG.

Visuals



Responsible PM: PM-SW

Technical

- Weight:
 - Projectile 245 g
 - Cartridge 333 g
- Total Cartridge Length: 112 mm
- Muzzle Velocity: ~240 m/s
- Action Time <4 ms
- Peak Chamber Pressure 95 MPa
- NSN: 1310-01-464-4117
- Packout: PA120 Metal can (32 rounds)
- 107 Flechettes

HISTORICAL INFORMATION:

TC-STD – A in April 01

Issues

- Make a true performance Spec.
- Baseline Flechette performance





RDE Command



40MM GRENADES

