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LW30 Spiral Development
Marking Round Technology Demonstration

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Executive Summary

- The basic technology to provide high impact signature rounds for improved night-time training was demonstrated using high speed digital photography in indoor range conditions
- Illumination of modified LW30 training rounds provides comparable signature to high explosive tactical rounds at a significant cost savings and increased safety
- This successful demonstration will be offered for incremental development projects aimed at increasing the effectiveness of existing LW30 systems

Objectives

- Existing System Review
- Design Basics
- Initial Testing
- Demonstration Testing
- Future Work

M230 Weapon System

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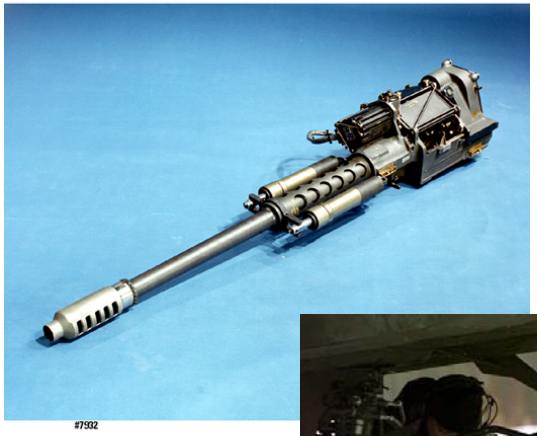

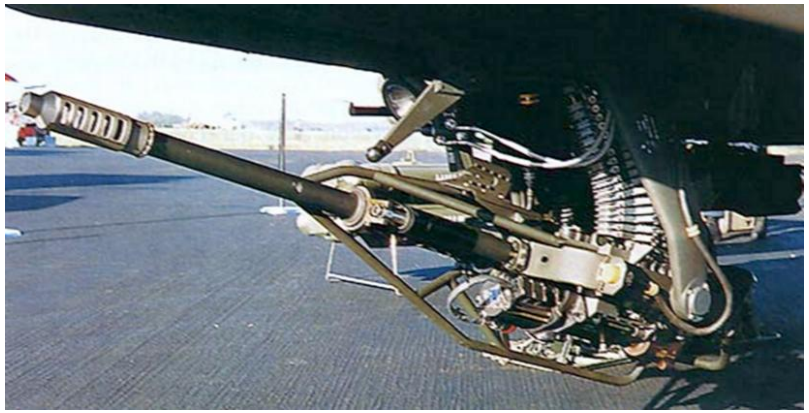

- **30mm M230 Chain Gun Automatic Cannon**
- **Caliber:** 30mm X 113mm - LW30 Linkless
- **Effective Range:** up to 4000 meters
- **Rate of Fire:** 635 ± 25 Shots per Minute
- **Platforms:**
  - AH-64 / AH64A Apache Attack Helicopters
  - MH-60 Variants – SOAR Blackhawks
- **Targets:**
  - Light Armored Vehicles
  - Deployed Infantry
  - Targets of Opportunity

LW30 Ammunition – 30mm X 113mm

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M788 TP

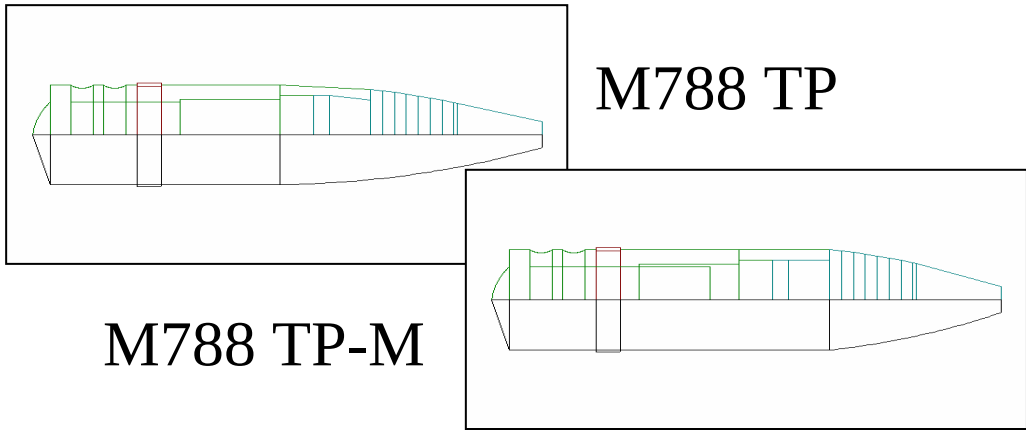
- Training Projectile matched to M789
- Basic ballistic match
- Only fielded training round for M230 systems

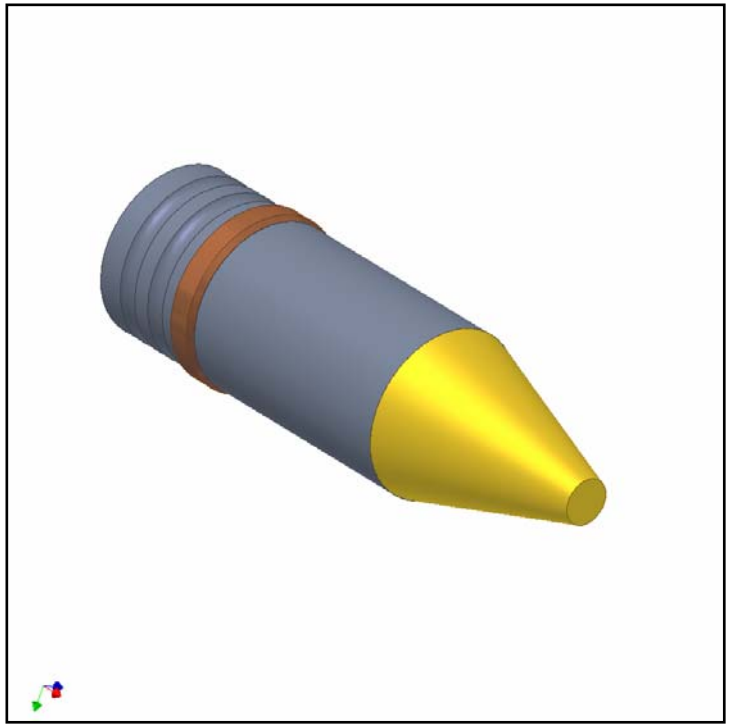
M789 HEDP

- High Explosive Dual Purpose
- Combined fragmentation and shaped-charge effects
- Only fielded tactical round for M230 systems

Marking Round Basics

- M788 TP-M
- Modified M788 training round
  - Minor metal parts modifications to facilitate access to the internal cavity
  - Incorporation of low-power energetic materials to provide marking illumination
  - Fuzeless design
  - Aerostable over short ranges <250m





Marking Compounds

- Technology Demonstrators were loaded with 1 of 2 possible marking compounds

  - **<u>Compound A</u>**

    – Fast burning with moderate sensitivity and moderate illumination

  - **<u>Compound B</u>**

    – Slow burning with low sensitivity and intense illumination

Marking compounds selected based upon burn rate, sensitivity, and illumination effect

Initial Testing - Metal Parts Reliability

- Initial testing was done on M788 TP-M without energetic materials on-board to test changes in metal parts
- High-Speed Shadowgraph Testing showed no nose-separation or buckling based body failures

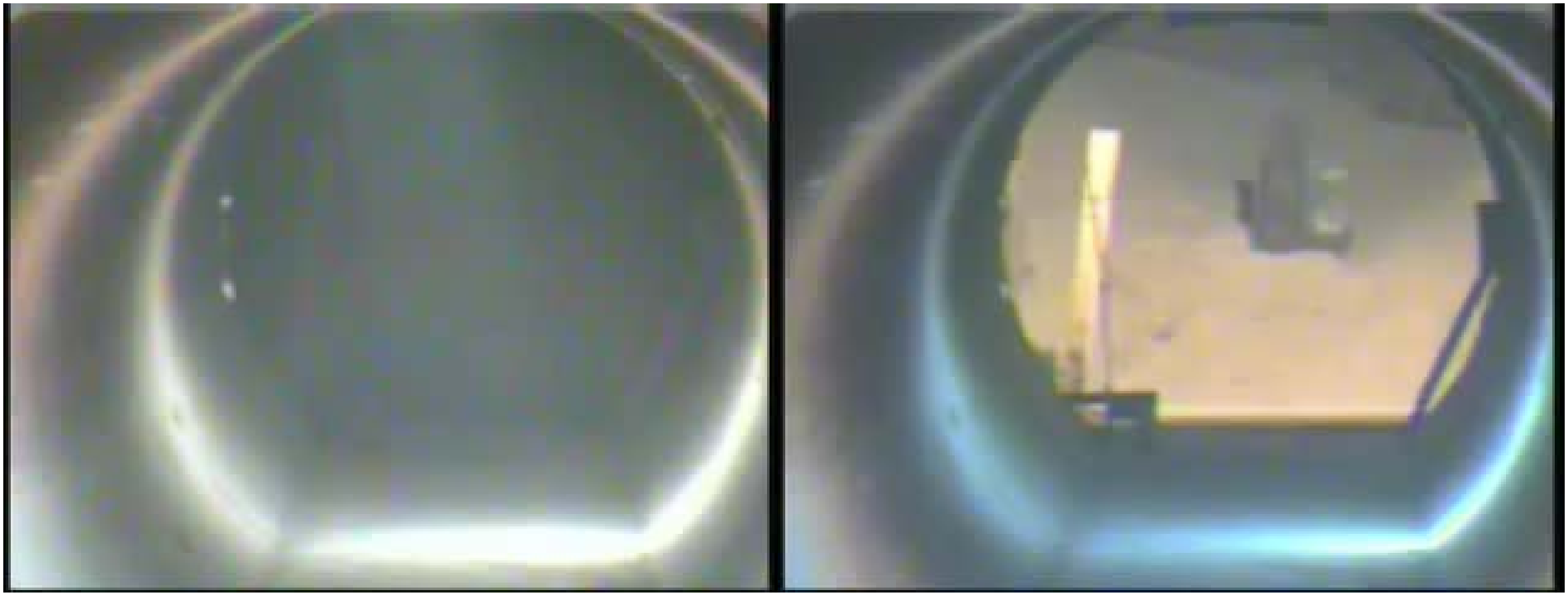
Initial Testing - CE/CP testing

- Increased projectile weight alters pressure/velocity profile
- The intent of the technology demonstration was not to provide ballistic match but provide a safe demonstration platform
- Firing test at various charge weights were conducted to address concerns about pressure margin and acceptable velocity performance
- Analysis showed safe operating pressures at production powder load with acceptable muzzle velocities

Charge Establishment Testing	Muzzle Velocity	Chamber Pressure	Action Time
80% Charge Weight	681	222	3.27
90% Charge Weight	740	277	3.04
100% Charge Weight	782	303	2.65
Production Target	800	335 (Max)	4.00 (Max)
	m/s	MPa	ms

Marker Performance Testing

- Shots made against ¼ steel targets in sand
- Baseline Training rounds showed no appreciable impact signature from 200 meters
- TP-M rounds showed similar impact signature to HEDP at 200 meters under full light and unlit conditions



Future Work

- Bullet will be redesigned to provide stable flight at longer distances
- Increased energetic payload for more intense illumination
- Implement safer energetics like Reactive Materials to work toward IM solutions
- Design for production Initiatives, use DFSS to help the path to production

Technical demonstration successful and shows significant promise