Laser Pointer for Shoulder Fired Weapons

*An Evolving Capability for the User*

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M72 LAAW
66 mm
Shoulder Fired
Weapon Family

Disposable
Anti-Armor &
Anti-Structure
Weapons
Background

- Partnership formed with Crimson Trace Corp. (CTC) to develop a laser pointer system for use on M72 66 mm Family of Shoulder Fired Rockets
  - Based on CTC commercial laser technology
  - Range adjustable to match weapon (M72A7, M72A9)
  - Low cost, disposable
  - CTC investment in design and test hardware
  - Nammo Talley investment in integration and testing

- Prototype hardware built and demonstrated in 2010
  - QE adjustment capability
  - Establish located on launcher
  - Firing demonstration on Trainer Launcher
  - Draft performance spec and qualification plan
  - Refined size, launcher interface and human factors
Design Overview

Forward mounting
best ergonomic option
Requirements

• Sample Performance Specifications
  – Eye safe laser, Visible Red and Invisible IR options
  – Commercial technology, i.e. low cost
  – Selectable range settings
  – Powered by commonly available battery, replaceable
  – ±3 Mils system accuracy
  – Disposable but Laser Pointer reusability highly desired
  – Capable of surviving typical M72 environments
    • High and Low Temp Storage
    • Humidity
    • Temperature Shock
    • Vibration
    • Water Immersion
    • Salt Fog
    • Sand and Dust
    • 1.5M Drop
Design Overview – cont’d

- Laser Pointer
  - Source Controlled from CTC
  - Eye safe Class 3R Red and Class 1 IR laser options
  - Range adjustment 50-200M, 25M increments
  - Interchangeable to A7, A9 or other variants
  - Single AA battery, on/off button activation
  - Quick attach/detach to Range Plate
  - Intended to be disposable but proves to be reusable
  - Mostly injection molded glass reinforced urethane plastic
  - Aligned at factory (CTC)
  - Comes complete with sheath, battery, manual
  - Intended to be sold/shipped separate from Launcher
Design Overview

- System consists of Laser Pointer and Range Plate
Background – cont’d

• 2\textsuperscript{nd} iteration of prototype hardware demonstrated
  – Smaller unit
  – Refined human interfaces
  – Improved QE adjustment capability
  – Improved human interfaces
  – 2\textsuperscript{nd} demonstration firing with prototype hardware
  – Good results

• Development IRAD kicked off Q1 2011
  – Funding for completion of design and qualification
  – Includes non-recurring cost for manufacturing integration
  – High probability to be included in GOI contract

• CTC kicks off production tooling Q1 2011
Design Overview – cont’d

• Range Plate
  – Source Controlled from CTC
  – Contains cam for QE adjustment, unique to A7, A9, etc.
    • 50-200M, 25M increments
  – Keyed for mating with Laser Pointer
  – Mostly injection molded glass reinforced urethane plastic
  – Bonded to Launcher with screw and epoxy
  – Aligned during installation on Launcher (Nammo Talley)
    • Launcher mounted on mandrel with bore laser
    • Pivots on screw for QE adjustment
    • Set screws for AZ adjustment
Manufacturing Overview

- Range Plate Installation to Launcher
  - Launcher mounted on mandrel
  - Mandrel contains bore spotting laser to target on wall
  - Camera and monitor used to assist in alignment
  - “Master Laser” used to align Range Plate at 100M setting
    - Master is slightly modified version of production

- Process is conducive to retrofit of Launchers in field
Manufacturing Overview – cont’d
Engineering Test Data – cont’d

- Accuracy and Repeatability
Engineering Test Data – cont’d

- Environmental conditioning
  - High and Low Temp Storage, Temp Shock, Loose Cargo Vibration, Drop
  - Water Immersion, Humidity

- Conclusion
  - Launcher remains safe during after temp storage, temp shock, loose cargo vibration, drop
    - Laser will break away during cold drop, slight damage at hot
    - Laser continued to work
  - Humidity and water immersion acceptable for Launcher, slight corrosion on Laser battery but still functional
  - Laser drop caused slight sonic weld break and affected alignment
Engineering Test Data – cont’d

– Electrical
  • ESD and EMC
  • Battery life
  • Power operating range (temperature limits)
– Conclusion
  • Passed ESD and EMC
  • Battery life 14 hrs at ambient
  • Power drop off at ~135°F but reversible when cooled
    – Operating range of diode is 14 to 122°F
– Actions
  • Determine battery life at hot and cold
Engineering Test Data – cont’d

Laser Power \ Temperature Relationship

mW Laser 635nm

Temperature F

mW  2 per. Mov. Avg. (mW)
Engineering Test Data – cont’d

- Battery Life approximately 14 hours at ambient

**Battery Life Test**

- Battery: Duracell 1.5V Alkaline
- Laser: 5.6mm, 635nm, 3.5 mW power
- Temperature: 72°F

![Graph showing battery life test results]

**Power (mW)**

**Duration (Minutes)**
Qualification Testing

• Qualification plan included
  – System Safety
  – System Operation
  – Laser Pointer Operation
  – Laser Pointer Electrical
  – System Live Firing
  – System Durability

• Qualification Completed September 2011
  – Successfully met all criteria
Conclusion

• System entered serial production in March 2012