KDI Precision Products, Inc.
An ISO 9001 Registered Company

Common Precision Munitions Safety & Arming Device

45th Annual Fuze Conference
"The Evolving Nature of Value Added Fuzing"

Presented By: Mr. Richard Dirks

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# Report Documentation Page

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<th>Dates Covered (from... to)</th>
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<td>NDIA (National Defense Industrial Association) 211 Wilson BLvd., Ste. 400 Arlington, VA 22201-3061</td>
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| Abstract | |
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| Subject Terms | |
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OUTLINE

• ERGM System Overview
• ERGM Payload Sequence
• XM982 System Overview
• XM982 Payload Sequence
• ERGM S&A Location
• XM982 S&A Location
• S&A Technical Requirements

• MIL-STD-1316D Compliance
• S&A Mechanical Design
• S&A Electrical Design
• S&A Integration
• S&A Event Sequence, Outputs, and Capabilities
• Program Test Results / Milestones
ERGM SUBMUNITION EXPEL & DISPENSE

- Fire Signal Sent
- Expel Charge Initiated
- Payload Exposed To Environment
- Dispense Charge Initiated
- Gas Bladder Expands
- 72 EX-1 Submunitions Dispensed
EXCALIBUR SUBMUNITION EXPEL & DISPENSE

- Fire Signal Sent
- Expel Charge Initiated
- Payload Exposed To Environment
- Dispense Charge Initiated
- Gas Bladder Expands

- 64 XM85/86 Submunitions Dispensed
ERGM EX87 S&A DEVICE AND LOCATION

Guidance & Navigation

Control Section

S&A

Electronics Module

Mechanical Module

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XM982 S&A DEVICE AND LOCATION

- Canard Control
- Guidance and S&A
- Slipping Obturator
- Folding Fins and Boat-tail
- Metal Bladder
- DPICM Dispenser
- Anti-jam
- GPS/IMU
- Navigation
- GPS Antennas
- Inductive Fuze Setter Interface
- Canard Control Guidance and S&A
- Modular Payloads
  - DPICMs
  - SADARMs
  - Unitary Penetrators
- GPS Antennas
- Inductive Fuze Setter Interface

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S&A REQUIREMENTS

• Projectile Application
  – All Arm - 1,250 G’s
  – No Arm - 300 G’s
• No Spin
• Interface With GN&C
• MIL-STD-1316D Compliant
• Seal Against “Expel” Pressure
• ERGM Unique
  – Support “Dispense” Forces
  – User Selectable Output

Autonomous “End Game” Operation
MIL-STD-1316D COMPLIANT

ERGM/XM982

- Two Independent Locks
- Enhanced Overhead Safety
- Set Back
- Anti-Malassembly Feature
- GN&C
- Launch Derived Rotor Drive Energy
- Sequence Dependent
- Selectable Output (ERGM Only)

Simplified Block Diagram

SAFE
- Set Back
- XM982 Canard Switch
- GN&C Coded Signal
- Fuze Setter
- Point X
- P.A

ARMED
- Fire Detonator
- DPICM Payload XM982 40 msec Pyro Delay
- DPICM Payload ERGM 40 msec Electronic Delay
- G₁, G₂, G₃, ALL

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S&A MECHANICAL DESIGN APPROACH

- Mechanical S&A Design Approach
  - Modified MK18 S&A
    - Higher G Loads
    - AFT Detonation Output
    - Switches Indicate Rotor Position
    - Integrated Electronics Control
  - Three (3) Leaf Set Back Mechanism

Leaf Lock  Rotor Drive Spring  First Rotor Lock (Safe)  Rotor Lock (Arm)
S&A ELECTRICAL DESIGN APPROACH

• S&A Electronics
  – RS232 Serial Communication Link
  – Codeword Controls Function

- Set Back Lock
- Second Safety & Arm Lock
- Second Rotor Lock W/PA
- Safety Button
- Piston Actuator

Rotor W/Switches & M84 Detonator

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ELECTRONICS PACKAGE

- Electronics Design
  - Flexible PWB
  - SMT
  - Glass Bead Fill
  - Mosfet Circuitry
    - Independent Timer (10 sec)
    - FPGA
  - Energy Storage
    - Autonomous Operation
    - Two Stage Timed Function
S&A OUTPUTS

- Energetic
  - M84 Electric Detonator Initiates
    Expel Charge
    • Solder Sealed Enclosure
    • Platinum Bridgewire

- ERGM Dispense Module
  - Initiate Cartridge Primers (44 magnum, 45-70, and 10 gauge)

- XM982 Dispense Module
  - Pyrotechnic Delay
S&A INTEGRATION

- Centrally Located
  - Seal Against Pressure
  - Support Structural Load
  - S&A weight Less Than 1 Lb. (Less Expel Liner)
  - Integral Cabling To GN&C

XM982 S&A

Expel Liner

ERGM EX 87 S&A

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S&A DESIGN SUMMARY

- Resulting Capabilities
  - Meets MIL-STD-1316D
  - Interactive W/ GN&C
  - Maximized Overhead Safety
    - Independent Timer
    - Arm Command issued Just Prior to Endgame
  - Variable Outputs ERGM Only
S&A PROGRAM MILESTONES

• ERGM EX 87 S&A
  – Piston Actuator Qualification - May & June '01
  – EX87 S&A Qualification - July thru September '01

• XM982 S&A
  – Completed Design Analysis Phase, Ready for Verification Testing
  – At present - On Hold