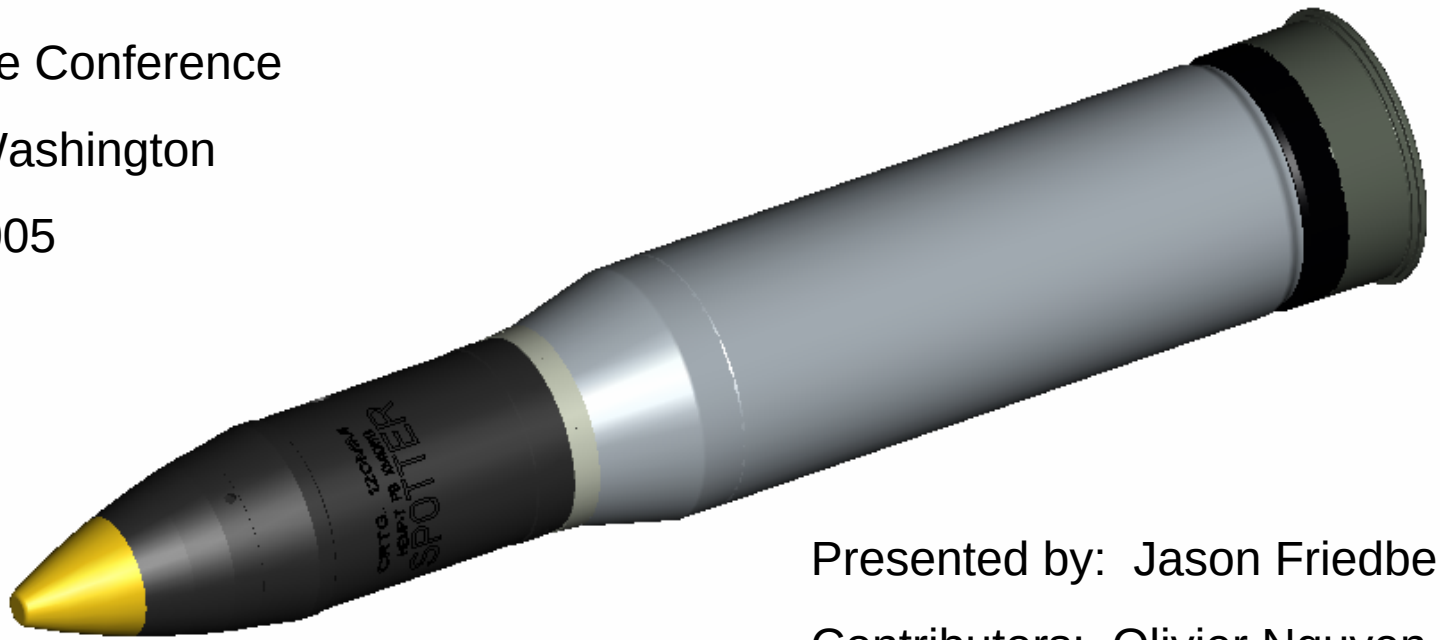
Multi-Mode Fuzing for XM1069/120MM LOS MP

NDIA Fuze Conference

Seattle, Washington

April 7, 2005



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Program Background

- 2 year ATO Program to demo an ARDEC designed multi-purpose projectile against:
  - Hard targets – bunkers, buildings, vehicles
  - Anti-Personnel
- ARDEC designed Multi-Mode Fuze
- Settable for
  - Impact
  - Impact w/delay
  - Airburst at set time

LINE OF SIGHT MULTI-PURPOSE PROJECTILE

PRESENT: 4 ROUNDS

2005

M830A1

M908

M393 A3

M1028 Canister

TARGET SET

FUTURE: 1 ROUND

2010

Combines capabilities of Canister, M830A1, M908 and HEP into one round.

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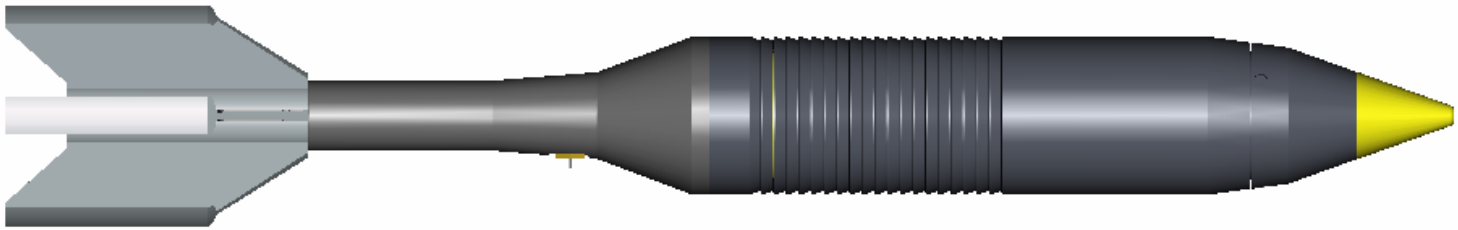
Projectile Designs

- Full Bore 120MM projectile
  - Acceleration = 40kG
  - Velocity = 1190 m/s
  - Spin = 18 rps
- Blast warhead
- Fragment system
- Base Mounted Fuze
- Folding fins

- Sub Caliber Sabot Round
  - Acceleration = 55kG
  - Velocity = 1495 m/s
  - Spin = 30 rps
- Blast warhead
- Fragment system
- Base Mounted Fuze
- Fixed fin

Projectile Designs



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Hard target penetration test

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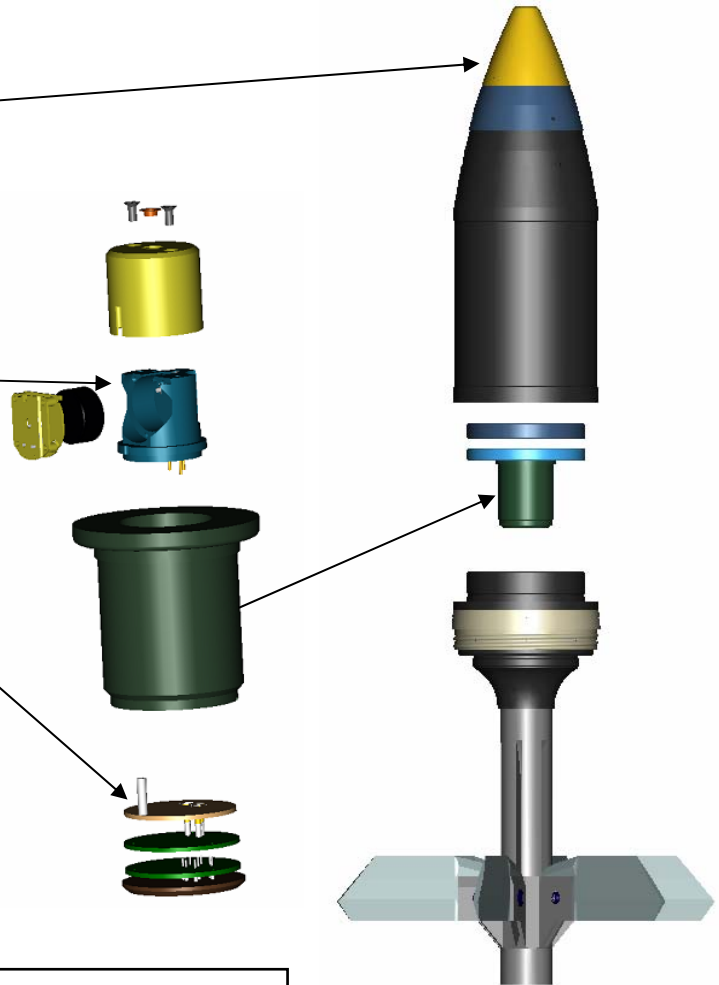
Fuze System Design

- Nose Mounted Impact Switch
- Base Mounted Fuze Module containing:
  - –Plug-in S&A
  - –Microcontroller Circuitry
- Modular design
  - –Fuze holder houses electronics and plug-in S&A



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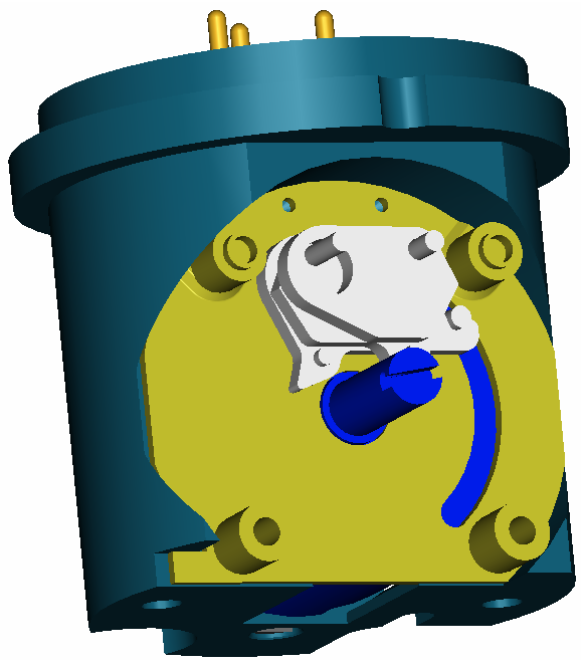
Fuze Mechanical Design

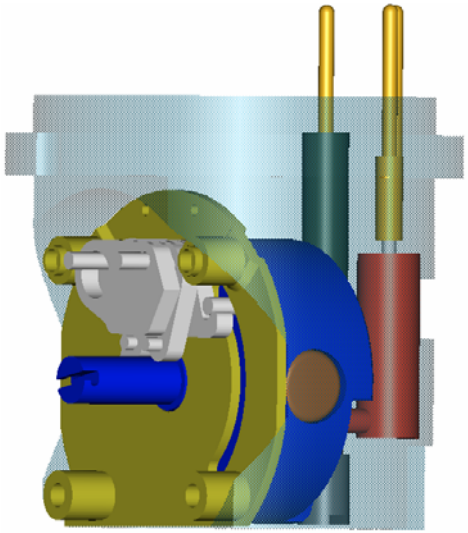
- Mechanical s&a based on M509
- Three leaf setback lock
- Irreversible commit to launch signal
  - Alternate environment - base pressure switch
- Piston actuator 2nd safe
  - Used for arming delay
- Explosive train redesigned to eliminate moving contacts
  - Fixed M100 detonator
  - Transfer to M61 detonator in rotor



Safe & Arm Design

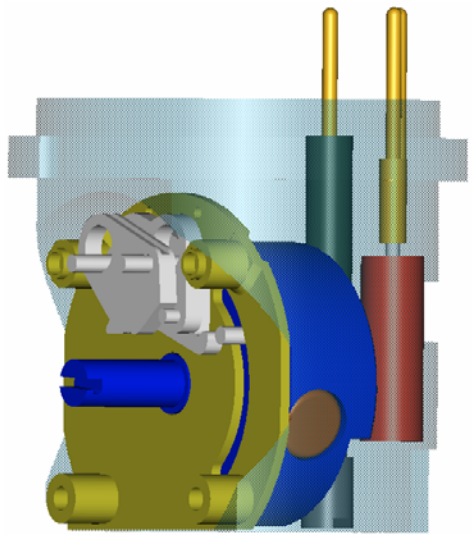
Full safe

- 3 leaf mechanism engaged
- PA in safe position



Post setback

- Leaf mechanism disengaged
- Rotor held by PA pin



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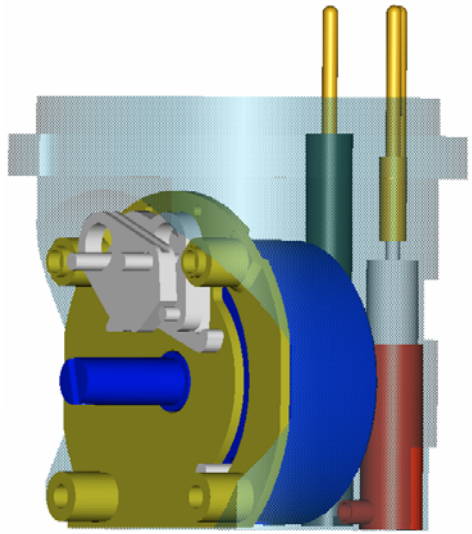
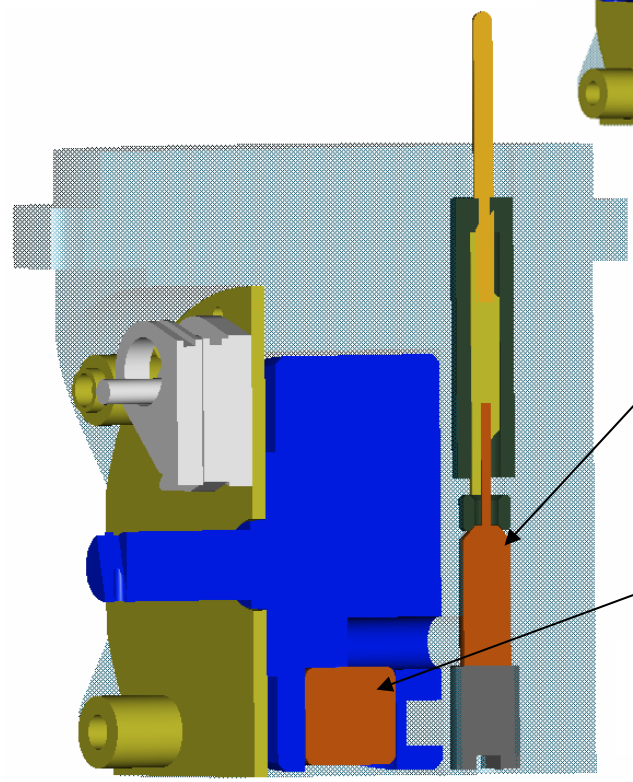
Safe & Arm Design

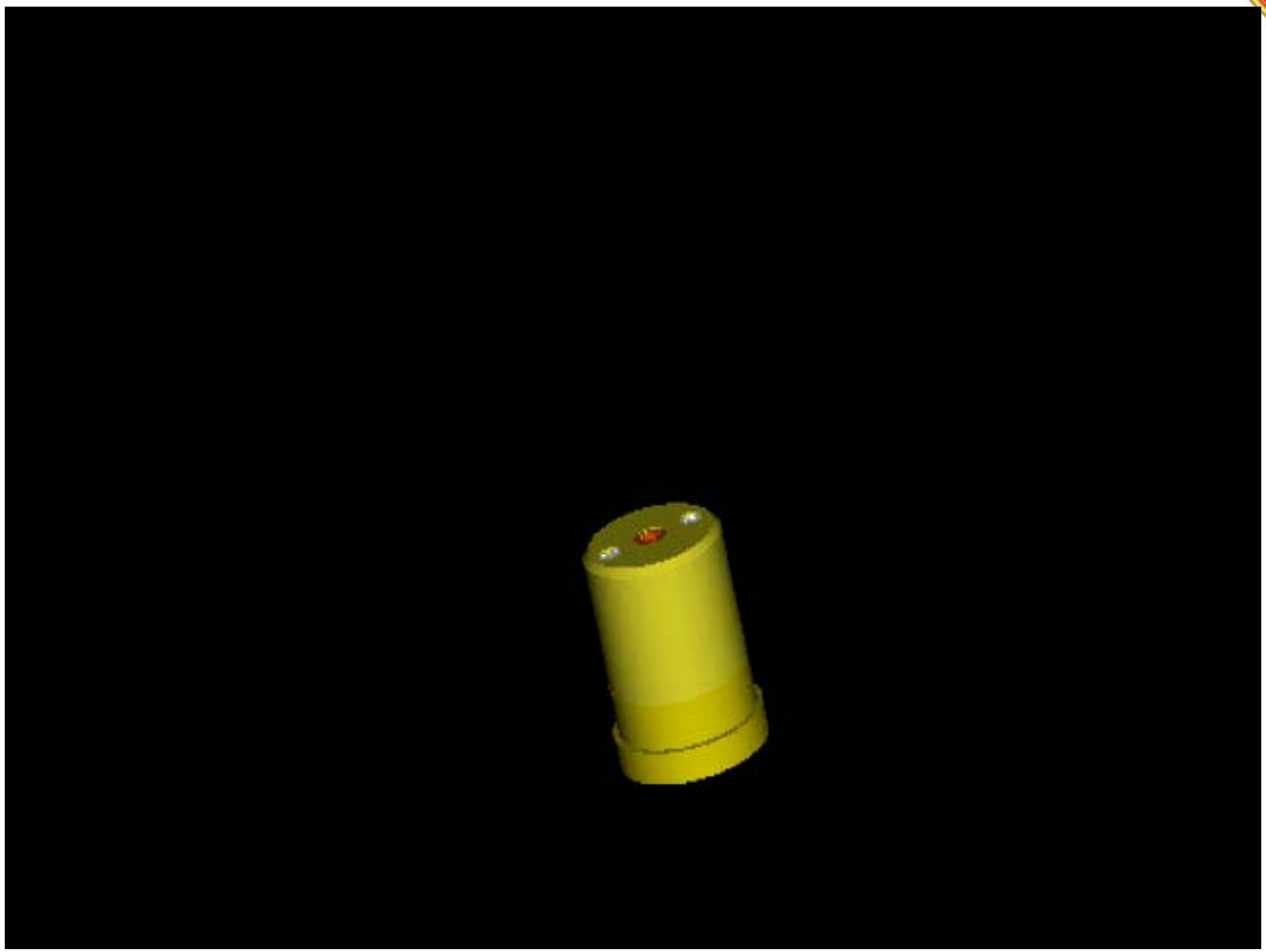
Armed

- PA has been fired
- Rotor moved into in-line position





Safe & Arm Design



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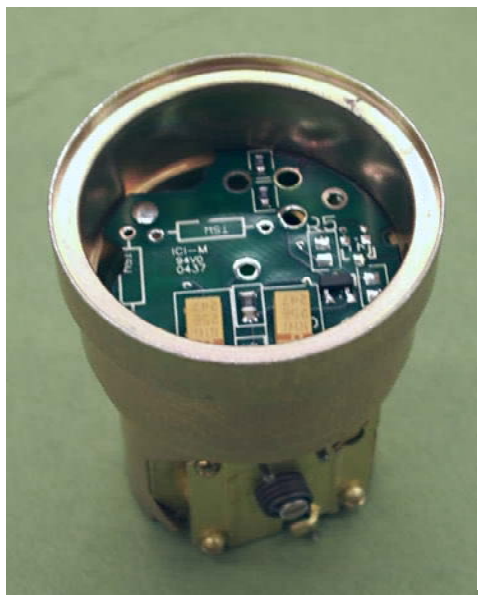
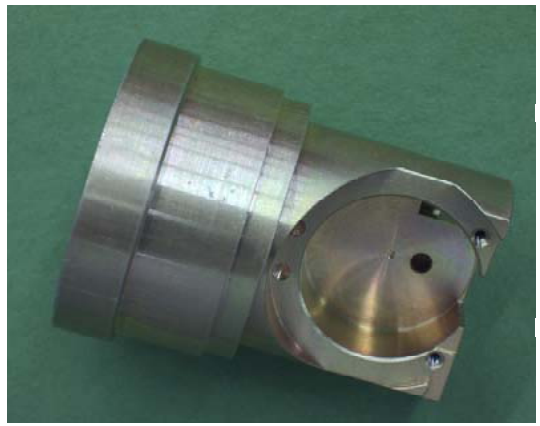
Photos of fuze hardware

- *Electronics designed and built at Picatinny Arsenal*

- *Mechanical parts manufactured by*

Action Manufacturing Company





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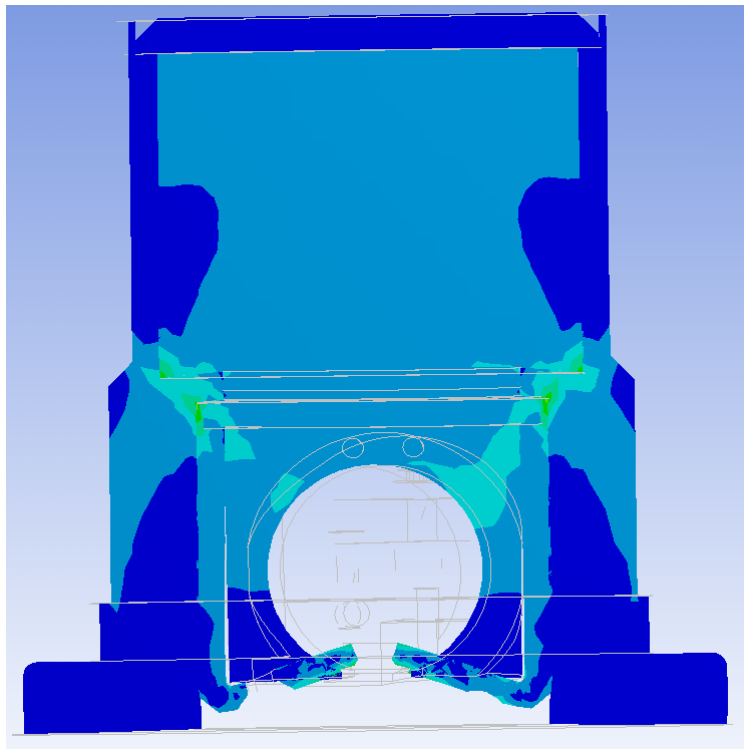
Structural Analysis

- ANSYS FEA software
- 55000 G's
- Max Stress = 29000 psi
- Well below yield stress limits for material

Acceleration



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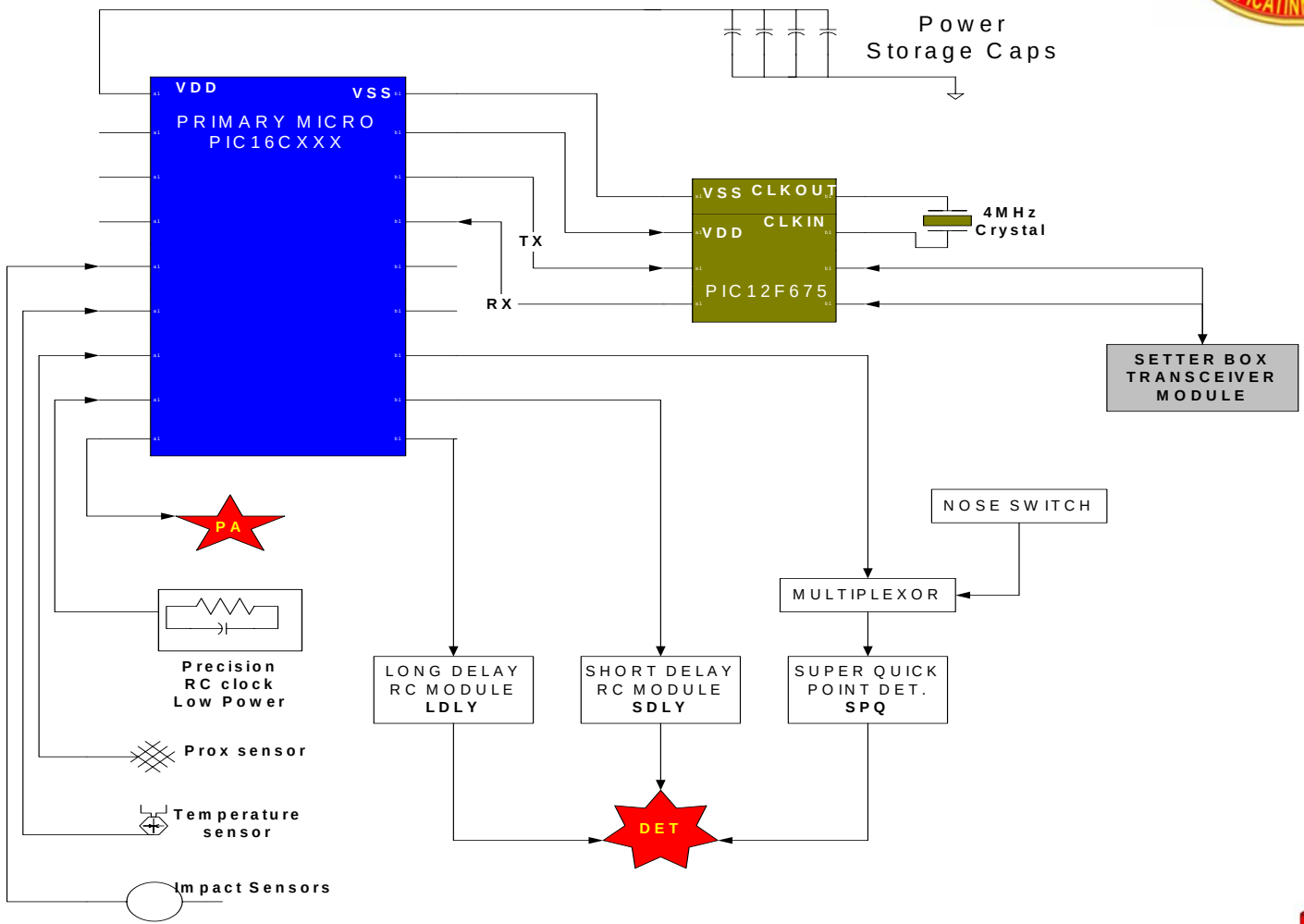
Fuze Electronic Design Features

- Storage capacitors in fuze charged during start of data transmission
  - Capable of powering circuit for 10 sec after gun launch
- Dual microcontroller design
  - High speed micro w/crystal oscillator handles data transmission (target info, airburst time) and calibrates time for low speed oscillator
  - Low power micro w/RC oscillator performs flight timing for airburst mode
- Data talkback used for diagnostic purposes
- Temperature sensor and proximity sensor added for future growth
- RS-232 interface
- Super quick response in point detonate mode.
- Precision of 1 meter or better in airburst mode.

Electronic Fuze System



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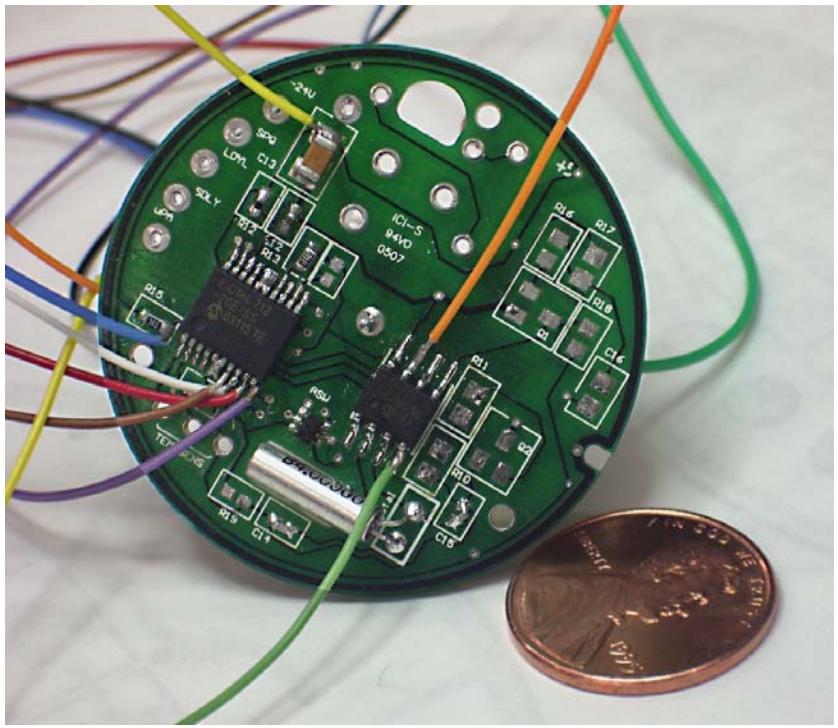
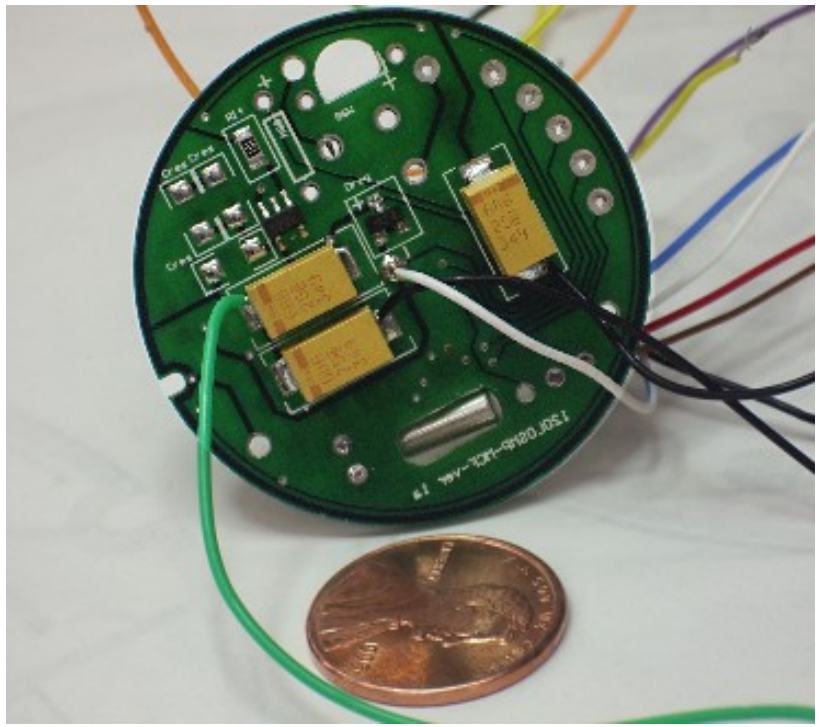
Photos of circuits





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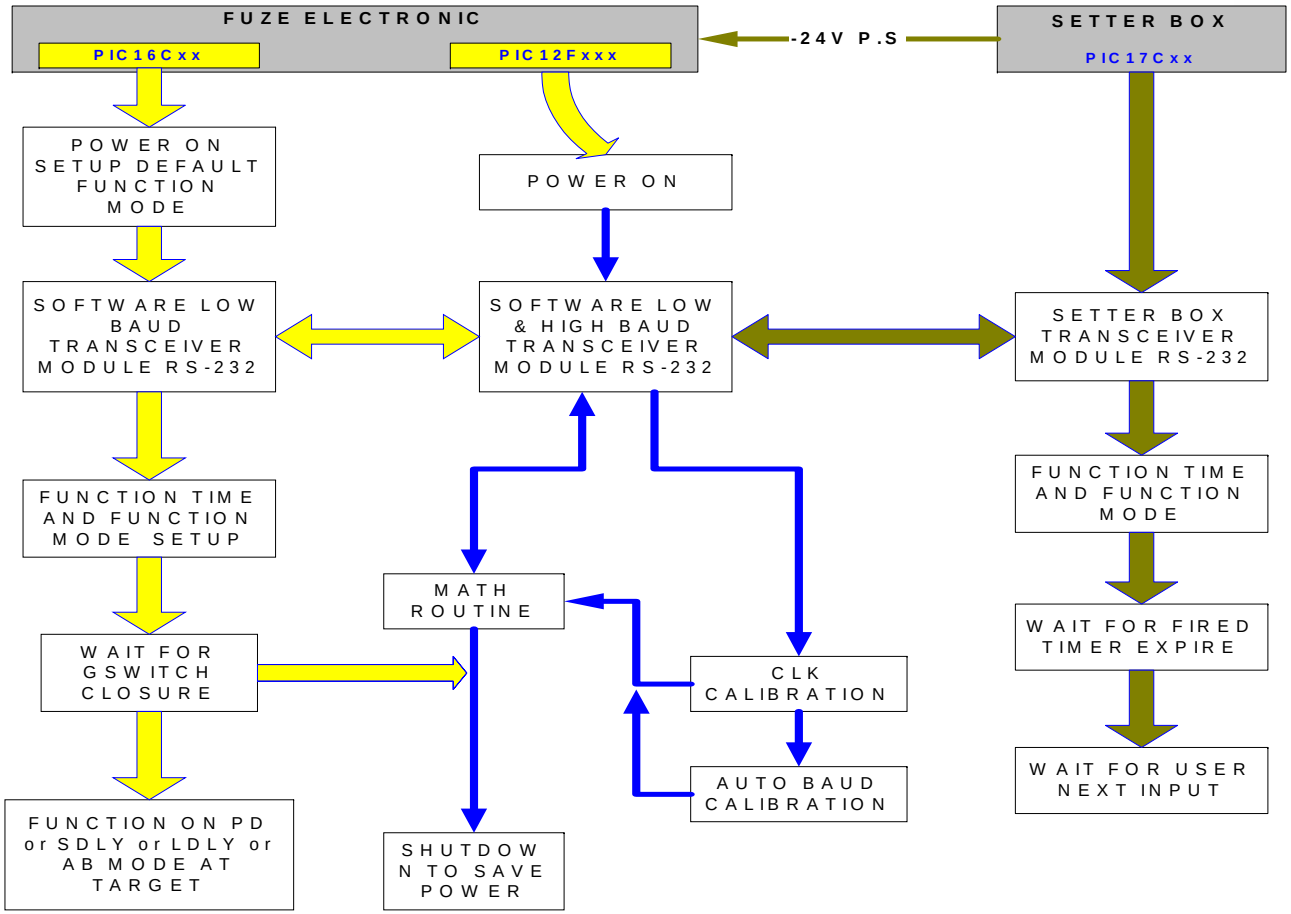
Fuze Software



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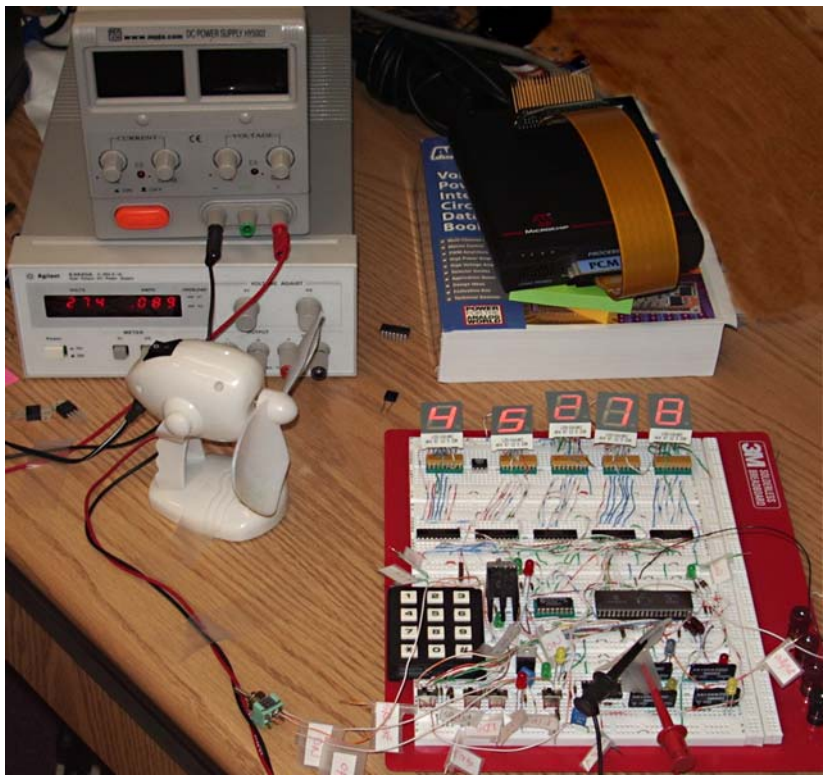
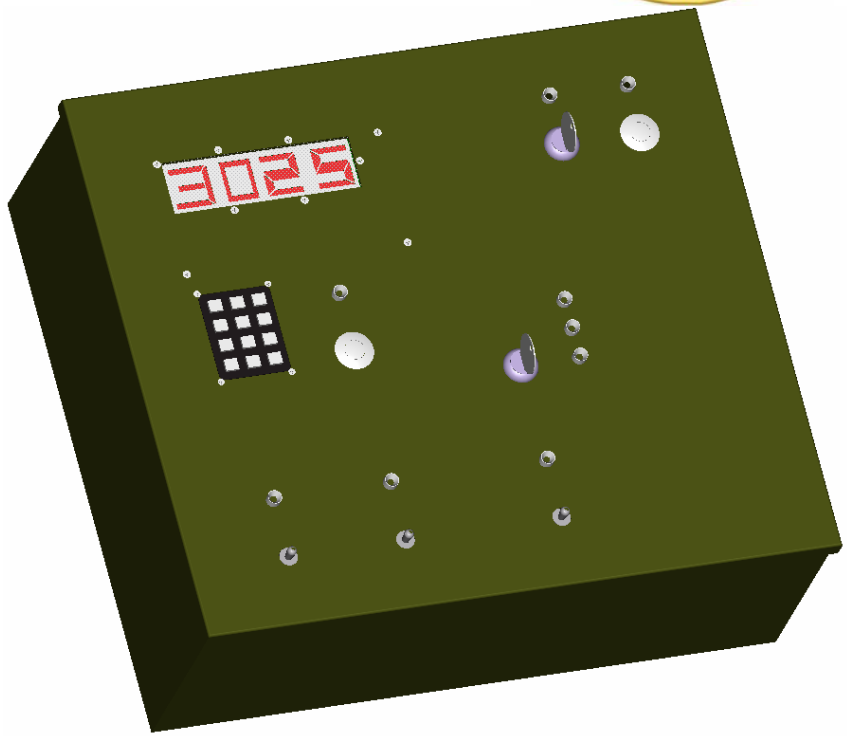
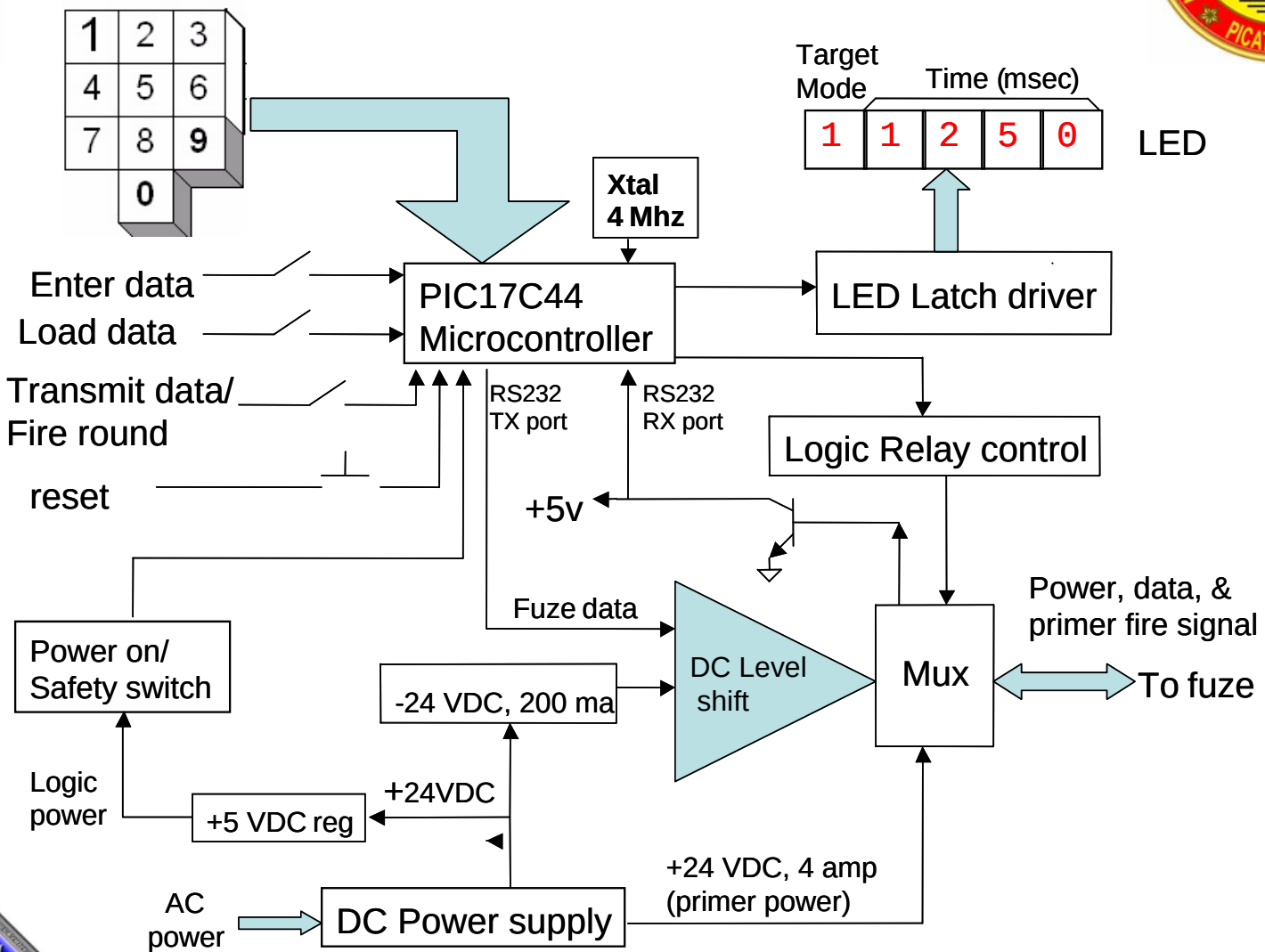
Fuze Setter Box





Breadboard

Setter Box Design



Fuze level tests

- Successful Safety tests
  - Transportation vibration
  - Jolt & Jumble
  - Out-of-line
- Progressive Arming
- Successful Air gun testing of mechanical and electronic components up to 60,000 Gs completed at Picatinny

Project Accomplishments

- Fuze design and lab tests successfully completed
- Projectile structural tests successfully completed
- Test projectiles built for initial fuze impact mode test
- Tests planned for 3-4th qtr FY05 to demo warhead effectiveness and fuze functioning