MK 432 MOD 0 ET Fuze

47th Annual Fuze Conference

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MK 432 MOD 0 ET FUZE
OUTLINE

• Objectives
• Program Plan
• Weapon System
• Design
• Technical Experiences
• Summary
• Conclusion
MK 432 MOD 0 ET FUZE
OBJECTIVES

• Develop, qualify, and produce an electronic time fuze for use with the MK 45 5” gun weapon system for use on cargo projectiles.

• Maximize commonality with the Army’s M762A1 fuze.
MK 432 MOD 0 ET FUZE PROGRAM PLAN

- Customer: Naval Surface Warfare Center, Dahlgren
- Program manager: PM4 NSWC, Crane
- Strategy: Modify M762E1 Materiel Change Program (MCP) contract with L3-BT Fuze Products to incorporate MK 432 MOD 0 effort
- Phase 1: Design Qualification
- Phase 2: Production
MK 432 MOD 0 ET FUZE
PROGRAM PLAN

• IPT: Used existing TACOM-ARDEC M762E1 MCP IPT with addition of Navy personnel
MK 432 MOD 0 ET FUZE
5” GUN
MK 432 MOD 0 ET FUZE
5” GUN
M762A1 & EX 432 MOD 0

ELECTRONIC TIME FUZE

- 155mm and 105mm projectiles
- Auto settable and hand settable
- Time mode and impact mode settings

- Based on M762A1 platform
- 5” projectiles
- Auto settable
- Time mode settings.
MK 432 MOD 0 ET FUZE
DESIGN CHANGES

- Eliminate Point Detonation (PD) capability
- Eliminate handset mechanism
- Activate battery on launch
- Change the setting precision - .1 s to .01 s
- Modify inductive setting capability
MK432/M762A1 CUTAWAYS

MK 432 FUZE

- Coil
- PD Contacts
- LCD window (not shown)
- Push button (to set fuze)
- Power supply
- Housing
- S&A
- Lead

M762A1 FUZE
MK 432 MOD 0 ET FUZE
Activate Battery on Launch

• Different mission – a set fuze may not be fired
• Dual independent battery activation schemes
  – Mechanical – Set back drops an actuating rod to release a firing pin into the battery primer.
  – Electrical – Upon spin switch closure the battery primer is activated electrically
MK 432 MOD 0 ET FUZE
Fuze Power: pre-battery activation

- Power provided by the inductive set carrier
- Power stored on capacitors before launch.
- Power saving sleep mode.
  - Carrier removal induces “sleep”
  - Launch “wakes up” fuze
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Precision Change

• From 0.1 to 0.01 seconds
• Needed for High Speed Maneuvering Surface Targets
• Replaced the 163.84 kHz crystal with a 204.8 kHz crystal
• Modified the ASIC
MK 432 MOD 0 ET FUZE
Modify Inductive Set

- Location of fuze and coil
- Different message format

MK 45 GUN
w/ MK 34 SETTER

M1155
(PIAFS)
MK 432 MOD 0 ET FUZE
Modify Inductive Set

- Moved the fuze coil closer to the nose
- Added a ferrite core within the fuze coil
- Modified the ASIC
MK 432 MOD 0 ET FUZE
M762A1 PARTS COMP.

Black:
M762A1/
MK 432
MOD 0
Common parts

Red:
MK 432
unique parts
MK 432 MOD 0 ET FUZE
TECHNICAL EXPERIENCES

• Crystals and Fuze wake-up
• Inductive Setter
MK 432 MOD 0 ET FUZE
FUZE OPERATION

• Dual crystals
  – While in flight the frequencies of two crystals are compared.
  – Countdown stops if frequencies differ
  – Circuitry determines a “free run frequency” when a crystal is not oscillating

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Free run frequency 1
Crystal frequency
Free run frequency 2
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Time
• Fuze wake-up
  – During ASIC evaluation a delay was noticed when the chip exited from sleep mode into active mode.
  – Caused by transition from free run frequency to crystal frequency
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FUZE WAKE-UP

- Fuze wake-up
  - There is a tolerance associated with the free run frequency based on resistance in circuit.
  - By moving resistors from inside the ASIC to the PWB, the tolerances were brought in.
  - This made the wake-up time consistent

Free run frequency 1
Crystal frequency
Free run frequency 2
Wake-up range
Time
MK 432 MOD 0 ET FUZE
INDUCTIVE SETTER

• MK 34 inductive setter
  – When a fuze is under the setter coil, the setter is constantly sending set information.
  – During testing it was noticed that a fuze would stop talking back after being under the coil for several minutes and be declared a dud by the gun control panel.
–Investigation revealed that within the gun mount, where rounds and fuzes are in close proximity, multiple fuzes were talking to the setter.
–As a fix, a voltage divider was placed on the input of the chip that allows talkback.
MK 432 MOD 0 ET FUZE

SUMMARY

- May 2000: Program Started
- June 2002: Design Qualification Phase
  - Environmental (Trans, Thermal, E3, Drop, Leak)
  - Ballistic
- November 2002: LAT
  - Ballistic
  - Tear-down
- November 2002: 14,212 MK 432 MOD 0 fuzes delivered to the Navy
MK 432 MOD 0 ET FUZE

CONCLUSION

• Quick fuze development program
• Successful cooperative effort between Army and Navy

MK 432 MOD 0

M762A1