communications
KDI Precision Products, Inc.

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Electronic Safety and Arming Fuzes (ESAF) for Conventional Bomb Weapons

"Technology in Bomb Fuzing"

48th Annual NDIA Fuze Conference
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Presented by:
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KDI ESAD History

- 1991 - ATACMS ESAD - 1st Generation
  - First AFSRB Certified ESAD
  - High Voltage - 2500V
  - Standard EFI
  - Spark Gap
  - Military Components
  - Leaded Components
  - Microcontroller
  - Hermetic Package

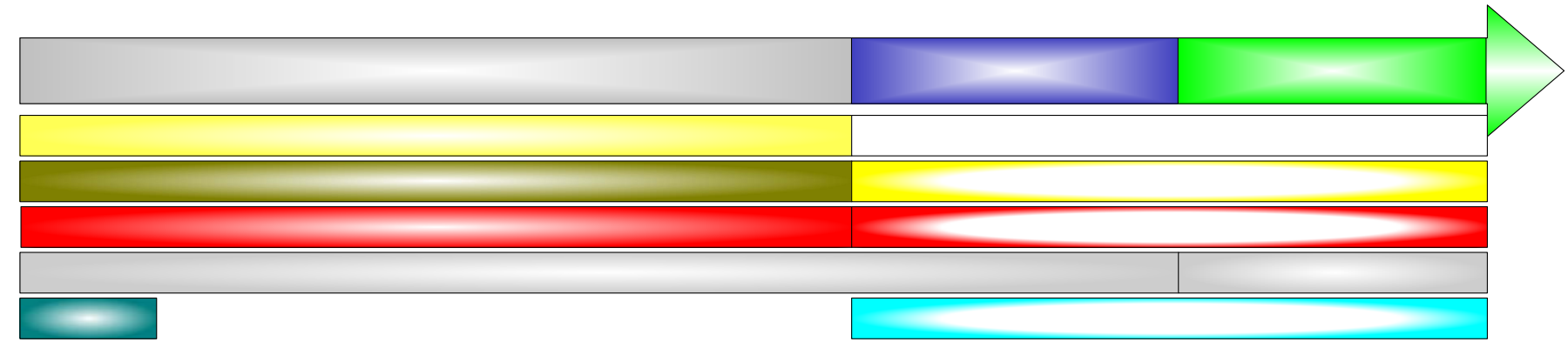
KDI ESAD History

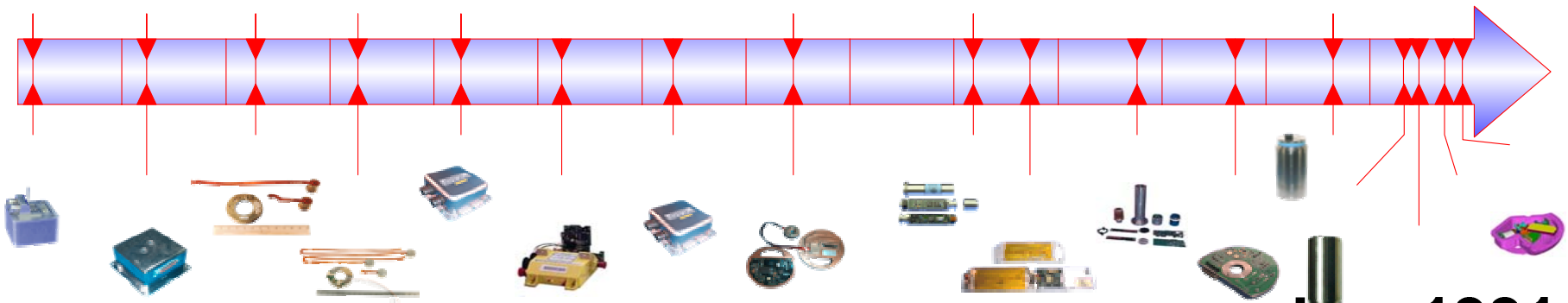
- 2000 - AIM-9X ESAD - 2nd Generation
  - Lower Voltage - 1500V
  - Spark Gap
  - LEEFI
  - COTS Components
  - Surface Mount
  - Antifuse FPGAs
  - Hermetic Package

KDI ESAD History

- 2002 - GMLRS ESAD - 3rd Generation
  - Low Voltage - 1250V
  - NMCT Switch
  - LEEFI
  - COTS Components
  - Surface Mount
  - Antifuse FPGAs
  - Hermetic Package

KDI ESAD History





Jun. 1991 -
1st Genera
2500

Electromechanical Fuzing

- Fuze Examples
  - FMU-139: General Purpose Bomb Fuze
  - FMU-152: Joint Programmable Fuze
  - FMU-156: JASSM Fuze
  - FMU-143: Hard Target Fuze

FMU-139 Fuze

FMU-152 JPF

Electromechanical Fuzing

- Power Sources
  - Turbine Alternator (FZU-55A/B, FZU-48)
  - Fuze Function Control Set (FFCS)
  - Turbojet Alternator
- Fire Inputs
  - External Proximity Sensor (DSU-33)
  - Internal Impact Switch
  - External Crush Switch

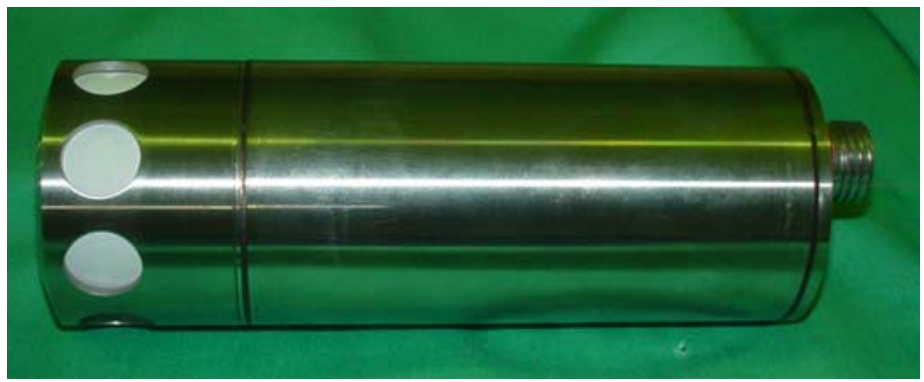
Electromechanical Bomb Fuzing

- Unique Components
  - Gag Rod
  - Piston Actuators
  - Detonator (MK 71)
  - Bellows Motor (MK 20)
  - Reserve Battery/Battery Primer (PA 536)

ESAF Development Programs at KDI

- New Systems Can Take Advantage of ESAF Technology
  - KDI Teamed w/Boeing SDB ESAF
- Current Systems Can be Upgraded to Incorporate ESAFs
  - Teamed w/Lockheed Martin JASSM
  - Teamed w/Boeing

JASSM ESAF
(SDB packaging
is similar)



ESAF Design Features

- Power Sources
  - Turbine Alternator
  - Fuze Function Control Set (FFCS)
  - Turbojet Alternator
- Fire Inputs
  - External Fuze Proximity Sensor
  - Internal Impact Sensor
  - External Impact Sensor

ESAF Design Features

- Based on 3rd Generation ESAF Design
- Some Components common with all other ESADs
- No Stored Energy for Arming

- No Moving Components

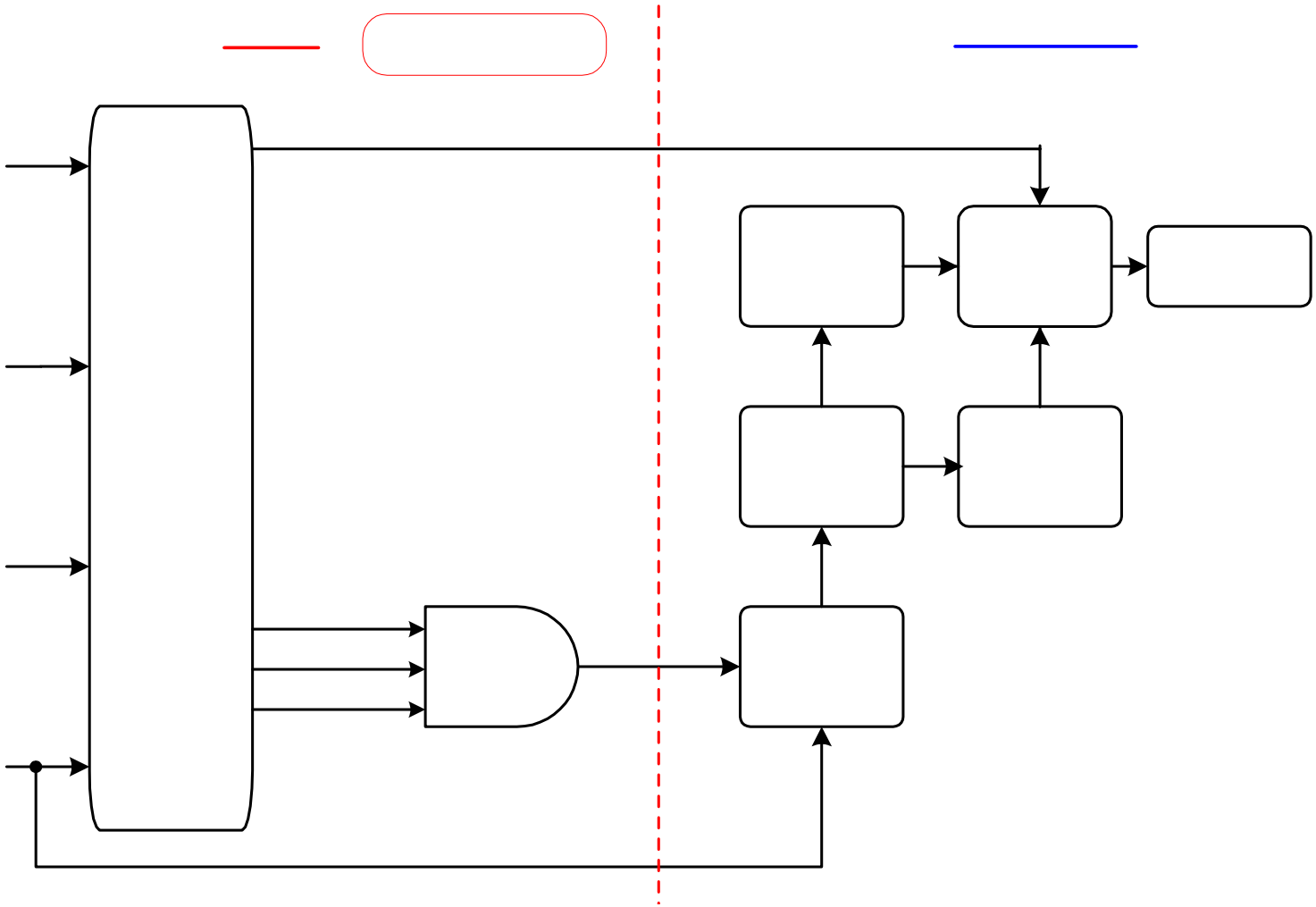
ESAF Design Features

- Common Features
  - All Electronic
  - Form Factor - Standard 3 Inch Fuze Well
  - Stainless Steel Housing - Hermetically Sealed
  - COTS Components
  - Surface Mount Components
  - Withstand Target Penetration
  - Programmability
    - Serial Command and Status Messages
    - Selector Switches
  - In-Line Explosive Train
  - Environmentally Derived Arming Environments

ESAF Design Features

- Safety Requirements
  - MIL-STD-1316E Safety Compliant
  - NNMSB and/or WSESRB Approval
  - LEEFI Complies with MIL-DTL-23659
  - Two Independent Safety Environments
  - No Stored Energy - Environmentally Derived Arming Power

ESAF Block Diagram



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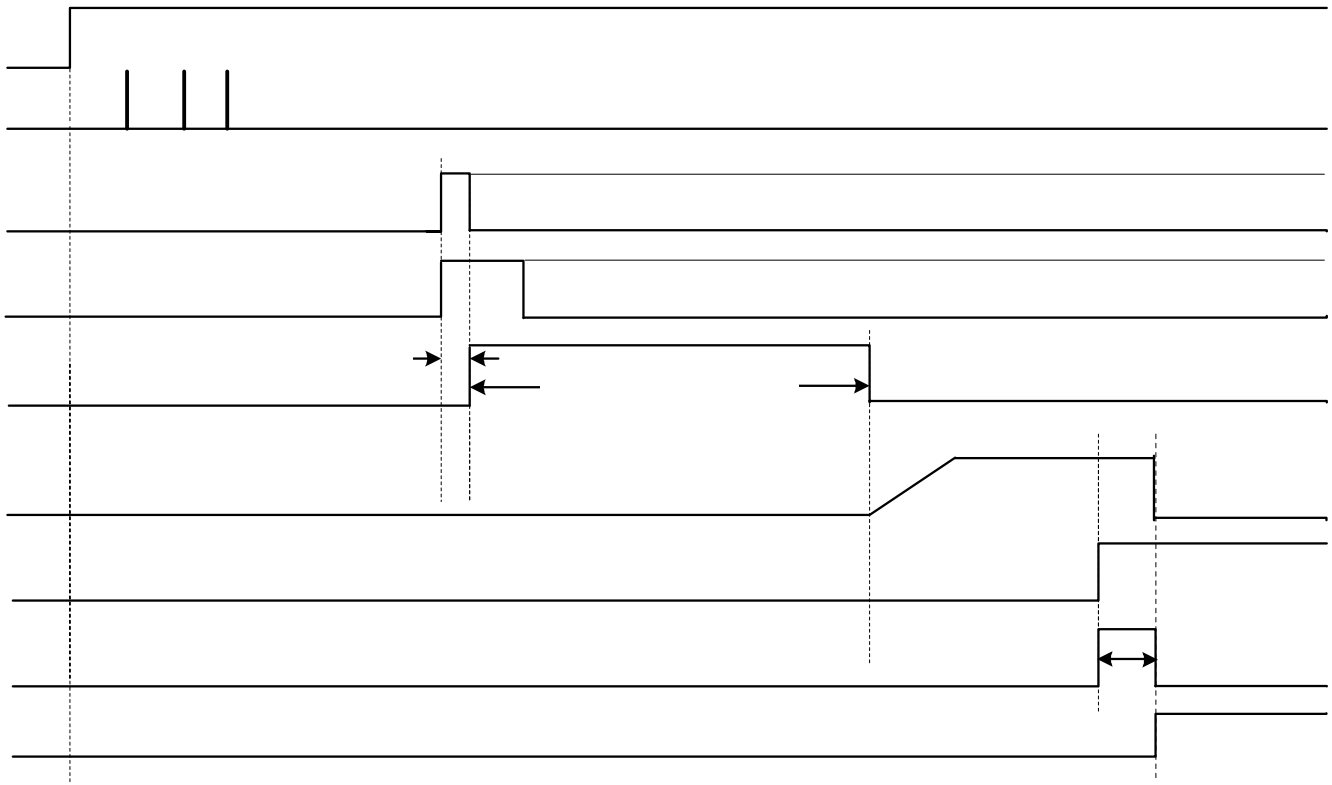
ESAF Timing Diagram



ESAF Advantages

- Increased Reliability
  - No Moving Parts
  - Increased Usable Life - Hermetically Sealed ($1X10^{-6}$ cc/sec Helium)
  - Only One (1) One-Shot Device, LEEFI
- Lower Overall Cost
  - Short Development Times
  - Common ESAF Parts
  - Low Unit Cost

ESAF Advantages

- Increased Flexibility
  - Adaptable to Varying System Requirements
  - Improved Programmability / Communication with System/Aircraft Features Can be Added
  - Variable Environment Sensing
  - Multiple Explosive Outputs
- Increased Safety
  - MIL-STD-1316E Compliant

Conclusion

- Electromechanical Bomb Fuzes Exist and are Performing in the Field but…
- Electronic Bomb Fuzes are Being Developed as a Lower Cost and Enhanced Performance Improvement /Upgrade to Existing and New Systems

- "Technology in Bomb Fuzing"