Changing Safety Requirements

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Weapon Evolution

• Modern Warfare is Not the Same as With Earlier Times
• Unintentional or Collateral Damage is No Longer Acceptable
• Weapon Systems Are Becoming More
  – Sophisticated
  – Specialized
• Fuzing Systems Must Adapt to New Requirements
Fuzing Needs

• Fuzing Systems Must Provide
  – Flexibility
  – Analytical Capability
  – High Reliability

• Most of all, Fuzing Systems Must Provide the Necessary Safety
Fuzing Design

• As Fuze Requirements Increase, the Use of Electronic Sensing of Launch Environments Becomes Necessary
• Availability of Launch Environments are Reduced in Many Systems
• Programmability Requirements Increase
• Fuze/Weapon System Interfaces Become More Critical
• Fuze Requirements Become Considerably More Demanding
In-Line Fuzing

• ESADs are Becoming the Answer to Many New Fuzing System Needs
• ESAD Electronic Sensors Can Monitor Events and Environments
• ESAD Electronics Can Verify That Environment Measurements are Within “Normal” Limits
• ESADs Can:
  – Monitor Events and Verify Their Sequencing and Timing
  – Respond to System Control Inputs
  – Can Respond to System Programming
Fuzing Requirements

• Fuzing Performance Requirements Need to Be Simplified to Provide Only the Necessary Capability
• Fuze Requirements Need to be a Part of Early System Design and Not an After-Thought
• Fuze Safety Requirements Should Only Specify the Safety Level Not How to Achieve It
• Personal Likes and Dislikes Should Not Define Fuze Safety Requirements
Fuzing Requirements Cont’d

- All Safety Review Boards Should Work to the Same Requirements
- Changes to Safety Requirements During a Development, Should Not Be Imposed on “In Process” Developments
- Safety Requirements Should Be Enforced Uniformly
- Everyone Needs to Understand That Our Function is to Get Adequate Fuzes to the Weapon Systems That Support Our Troops
- All Involved Need to Understand the Cost and Schedule Constraints
Fuzing Issues

- Bomb Fuzes With Many Arm Times Selectable in Multiple Ways
- Penetrating Fuzes With Large Numbers of Delay and Target Sensing Options
- Bomb Fuzes With Delays Up To 24 Hours (Also Adds a Safety Compromise)
- Application of Jolt and Jumble Environments to ESADs
- Impact Detonation Delays of a Few Microseconds (Testing of Same)
- Fuze Safety That Requires Up to Four Independent Arm Delay Timers
  - Elaborate Interface Requirements (i.e. Firewire)
  - 30 Minute Energy Bleed Time
Fuzing Issues Cont’d

- Verification of Safe/Arm Status in Unpowered State
- BIT Requirements
- Satisfying of All Component Specifications
- FPGA/ASIC/Microprocessor Common Mode Failure Requirements
- Generalized Component Requirements (i.e. 400VAC Non Initiation of EFIs)
- Unnecessary EMI/ESD Requirements
- UXO Versus Non-Hazardous Duds
- Dual Reset for all Complex Logic Devices
We Need To Remember Our Mission!
Conclusion

• Our Mission is to Provide
  – Competent
  – Reliable
  – Affordable, and
  – Safe Weapons to Our Armed Forces Who Place Their Lives on the Line to Protect our Country and Our Freedoms