Future Fuzing: New Operational Needs and Fuze Technical Challenges

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53rd Annual Fuze Conference
May 19 - 21, 2009 – Lake Buena Vista, FL
"Next Generation Fuzing - Maximum Advantage for the Warfighter"
Company Presentation

- A global leader in the field of ammunition fuzes and S&A devices
- Full range of products
- Key competences in
  - Fuzing technologies
  - Micro-technologies
  - Ammunition electronics
Fuze Missions

● The Fuze provides most of the performance of the munitions, in terms of:
  ■ **Terminal Effect**: by optimizing the warhead initiation time/place/mode on target
  ■ **Safety and Reliability**: by providing maximim safety for the friendly troops while dealing with enhanced reliability requirements (no hazardous duds)
  ■ **Flexibility**: by enabling the user to always get the relevant product whatever the missions and the threats are, and reducing the logistic footprint

● New trends in modern warfare highlight new operational needs

New operational requirements for munitions

= Improvement of fuze functions and Development of new technologies for fuzes
Safety: Conventional requirements

- Storage, Transportation & Handling Safety
- Firing / Launching Safety
Safety: New operational requirements

Enhanced safety

Two Safety Criteria

Modern weapon severe environment

Overhead / overflight safety

Mission Abort

Self Re-safing

Safe / eco Dismantling

Self-Destruct

Reliability for UXO reduction
**Flexibility** : Conventional requirements

1 or 2 basic operating modes manually selected
Flexibility: New operational requirements

- Multi-mission
- Multi-function
- Fuze Setting
- All parameters
- Automatic
- Activity Control
- Mission Abort
- Target conf.
- Logistic Footprint Reduction
- Terminal Effect Control
Terminal Effect: Conventional requirements

Target "Detection"

Warhead operating
Terminal Effect: New operational requirements

- Cost Effectiveness
- Collateral Damage Reduction
- Logistic Footprint Reduction
- Precision Enhancement
- Effect Optimization / Target Detection
- "Smart Warhead"

May 2009
Common Needs

- The new needs and requirements applies to all arms:

  The fuzes dedicated to the various applications can share the same technologies and technical solutions.
Main Technical Challenges

New Operational Requirements

- Target Detection
- Environment sensor
- High-G Hardening
- Initiation Technologies
- Power Supply
- Fuze Data Link
- Electronic Design
- Micro-Technologies

Fuze technologies

Miniaturization
Sensors – Target detection

- More information on targets, for better accuracy and discrimination
  - Better discrimination in disturbed environment: clutter, jamming

- Compliant with fuze applications
  - Small, low energy: have to be integrated with other functions.
    More critical in small fuzes and smart fuzes
  - Low cost, G-hardened

- Advanced signal processing
Target Detection
Sensors – Environment Sensors

- Mechanical or electronic sensors
- Single safety event sensors
- or, accurate positioning sensors & multi-sensors, for trajectory control
- Low cost, small size, G-hardened
- Electronics safety architecture design
High-G Hardening

- Resistance to stress generated by modern weapon systems
- Hard target penetration and post-impact processing: Now often required, for all type of weapons and munitions
- Integration of more complex systems: Now necessary for smart fuzes. Use of devices not initially designed for munitions severe environments (navigation system, sensor, actuators)
High-G Hardening
Miniaturization

- General requirement, essential for designing new generation of fuzes
- Main stakes: Small caliber fuzes and Smart fuzes: Advanced multifunctions fuzes and 1D or 2D Course Correction fuzes
Fuze Integration Technologies

Course Correction Fuze
Fuze Data Link

- From simple fuze setting …
  … to the full control of fuze status during its active phase, up to the target
- More and more parameters to program in smart fuzes
- Safety and security management in all communication phases
- Wireless solutions, High rate
- Electronic safety design
Fuze Technology Developments - Trends

- Different categories
  - COTS component
    - Basic electronics
    - Processors
    - ... 
  - "Hardened" COTS component
    - Environment sensor
    - Specific components
    - ... 
  - Dedicated component based on commercial technology
    - MEMS sensor
    - Micro-technologies
    - Specific electronic components
    - ... 
  - Specific technology or component development
    - Specific energetics
    - Power supply
    - Target sensors
    - ... 

- ... and always: low cost / small size / low power

- The modern fuze is a mix and concentrate of technologies which have to live together in a very small volume and under severe conditions.

- Expected technological breakthroughs in the next future should provide a significant step forward to real fuze "intelligence"

- The various munitions, for all type of weapons, will share similar technology and component developments
Conclusion

- New generation and next generation fuzes will provide maximum advantage for the warfighter

- The fuze designer / producer has a key role in the future munitions performances

- Thanks to its technological leadership **JUNGHANS** is able to
  - Provide all warfighters with state-of-the-art, efficient and cost effective fuzing solutions
  - Take up technological challenges to provide them with next generation fuzes
Thank You

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