Hard Target Fuzing Solutions

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52nd Annual Fuze Conference
May 13 – 15, 2008 - Sparks, NV
"Smart Fuzing – Adding Intelligence To Fuzing Solutions"
OUTLINE

- Company Presentation
- Smart Fuzing / Target Detection Issues
- Hard Target Fuzing Background
- Hard Target Fuzing Issues
- JUNGHANS T2M Solutions
- Products and Projects
• A global leader in the field of ammunition fuzes and S&A devices

• Full range of products

• Key competences in fuzing technologies, ammunition electronics and micro-technologies

• Located in:
  ▪ Seedorf (Germany)
  ▪ La-Ferté-Saint-Aubin (France)
Product Range and Competences

Artillery
- Mortar
- Air Bomb
- Missile SAD and ESAD

Infantry
- Grenade
- AT, A/G, G/G Rockets

Medium Caliber and Direct Fire

COMPETENCES
- AT, A/G, G/G Rockets
- EFI / ESAD Technology
- Micro-Technologies Miniaturized Systems
- Energetic Materials
- Mission Management
- Hard Target Smart Fuzing
- Safety Design
- Signal Processing
- Sensors
- Hardware Processing
- Micro-Technologies Miniaturized Systems
Smart Fuzing / Target Detection

- Objective: Optimize terminal effect on target whatever the operational configuration is
- Solutions: Use sensors and processing to initiate the munition warhead on target at the optimum time

**Proximity Fuzing**

**Post-Impact Fuzing**
Objective: Optimize terminal effect

**JUNGHANS provides effective solutions for both applications**

- **Proximity Fuzing**
  - May 15, 10:40 am presentation

- **Post-Impact Fuzing**
  - Today, May 14, 3:40pm presentation
Hard Target Fuze Background

- Better shock resistance
- More accurate
- More reliable
- More flexible
- More functions
Hard Target Fuze – Main Missions

1. Make the fuze survive to impact and penetration stress
   - Keep fuzing function able to process initiation after shock, even if the fuze is partly damaged

2. Initiate the warhead at the right time to optimize terminal effect
   - Detonate at a desired point inside buried or reinforced concrete targets
Objective n°1: High-g Impact resistance

- Primary issues:
  - Being able to determine and specify shock applied on fuze (axial, transverse)
  - Search for, or design, a test mean representative of actual stress
  - Being able to calibrate test means thanks to actual full-scale shock recording

- Fuze design basics
  - Split functions in 2 separate sub-assemblies:
    - A post-impact module specially designed and protected to withstand shocks
    - A module integrating other functions operating before impact
  - Iterative process: Modeling / Testing
  - Take special care of component and material selection: shock absorber and filtering solutions
  - Validate design thanks to special test means and actual firings
High-g Impact Resistance
JUNGHANS T2M Solutions

Testing / Modeling / Design process:
- Get the appropriate test means:
  - Collect actual data and replicate actual shock

High-g Test Means Video
High-g Impact Resistance  
JUNGHANS T2M Solutions

- **Design Solutions:**

  - **Use of ESAD technology to achieve S&A and firing functions:** Full electronic S&A device - "in-line" technology.

  - **Use of specific design + encapsulating and potting compounds + absorber materials**
Objective n°2: Optimize Post-Impact Operation

- Time delay
  
  - Preset time:
    - hand settable
  
  - Time value, programmable
    - by external fuze setter
    - or
    - by the weapon system
      - from the cockpit
      - during free flight
"Smart Fuzing": Impact Processing

- Embedded sensors + signal processing
- To detect and discriminate target characteristics
- To process exact position of the munition after target penetration

JUNGHANS T2M Background

- Void Sensing
- Layer Counting / Target Recognition
- Depth of Burial

- Simulation + validations on numerous actual firings
- Mature for implementation on current fuzes
Hard Target Fuzing Products and Projects

- FBM21 Multifunction Fuze
- AS30LS Missile S&A Device
- Impact Processing
FBM 21 Multifunction Bomb Fuze

- Single Multirole Fuze:
  - General Purpose, Proximity & Penetration

- For use with 3" fuze pockets:
  - General Purpose (Mk80 series, ...)
  - Penetration bombs (BLU109, CBEMS,...)
  - Compatible with guidance kits: Paveway II & III, Enhanced Pw II & III, AASM, JDAM

- Compliant with Insensitive Munitions (IM) requirements

- High altitude delivery

- Hardened to severe environments

- Full electronic design - ESAD / EFI technology
FBM 21 Multifunction Bomb Fuze

- Qualification tests completed in October 2007 including full-scale tests on reinforced concrete targets at various angles and various temperatures
  - Air gun tests
  - Sled tests
  - Flight trials: penetration bombs fitted with Paveway II kit

Qualified and ordered by the French Air Force and Navy
FBM 21 Multifunction Bomb Fuze

Flight Test Penetration Bomb with PWII
AS30LS Hard Target Missile ESAD

- Laser Guided Air-to-Surface Missile
  - Objective: High value / Hardened targets
  - Weight: 524 kg
  - Warhead weight: 240 kg
  - Flight speed: Mach 1.4

- New SAD designed for IM version, compatible with nuclear CDG aircraft carrier environments

- Safer and more reliable

- Stress on SAD > 80,000g
Impact Processing

- High-g recorder embedded in penetrators
- Penetration trials on multiple layer reinforced concrete targets
- DGA CEG (Centre d'Etudes de Gramat) facilities. CEG programme

Video from CEG
Smart Fuzing – Hard Target Fuzing

- JUNGHANS Hard Target Fuzing technology

  Makes fuzes "smarter"

  - More accurate bursting point in target
  - More reliable and resistant to very high penetration shocks
  - More flexible to use

  For better

  Strike efficiency
  Operational flexibility

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