49th Annual Fuze Conference

JUNGHANS Feinwerktechnik
Presentation for the NDIA’s 49th Annual Fuze Conference 2005 (Seattle, WA)

Presented by Jochen Wagner & Martin Leonhardt
JUNGHANS - History

1861 - Founded by Erhard Junghans

1905 - Start of fuze production

1957 - Takeover by Diehl

Diehl-Group

Family owned since 1902
Sales: 1.6 billion €, Employees: 10,600
JUNGHANS - Product Range

Mechanical and Electronic Fuzes for:

- Mortar ammunition
- Rockets
- Tank ammunition
- Anti-tank ammunition
- Artillery ammunition
- Medium calibre ammunition
- Submunition
- ...and Safety and Arming devices
Fuze for the new programmable Cartridge

120mm x 570 HE

(Point Detonating / Airburst / Self Destruct)
Applications

• 120mm smoothbore Tank Gun
Cartridge
Requirements (1)

Functional Modes

• Programming
  – Impact Super Quick
  – Impact with Time Delay
  – Time (Airburst)

• Back-Up
  – Self Destruction

• Basic Function (without Programming)
  – Impact Super Quick
  – Self Destruction (optional)
Requirements (2)

• Design and Safety Requirements in accordance with STANAG 4187 and MIL-STD 1316

• Environmental Tests in accordance with MIL-STD 331 and MIL-STD 810

• Muzzle Safety Distance $\geq 20m$

• Arming Distance $\leq 80m$

• Reliability Rate over all Modes $\geq 98$

• IM in accordance with STANAG 4439
Requirements (3)

• Following requirements are generally fulfilled:
  – STANAG 2895
  – STANAG 4235
  – STANAG 4239
  – MIL-STD 1385
  – VG 95211
  – VG 95287
Firing Trails

• Flight Phase of the Projectile

Many thanks to Rheinmetall for the videos
Firing Trails

• PD Function
Firing Trails

- Airburst
Firing Trails

• Target Arena after the Airburst
Main Components

Firing Train
- Booster
- Relay charge
- Detonator

Electronics
- Programming- / firing electronics
- Set back generator
- Connector
- Impact sensor (covered)

SAD
Rotor
Solution (1)

• First Safety Criterion
  – Safety element: Set back system
  – Arming criteria: Acceleration

• Second Safety Criterion
  – Safety element: Piston actuator in combination with time and firing circuit and a gas pressure switch at the tail unit
  – Arming criteria: Gas pressure
First Safety Device

Set back pins

Rotor
Second Safety Device

![Diagram of Second Safety Device with labeled parts: Rotor and Piston actuator]
Solution (2)

• Safety Distance
  – Ignition pulse for the piston actuator after muzzle safety distance

• Programming
  – Digital programming
  – Talk back after programming
  – Continuous programming up date

• Power Supply
  – For programming from the control unit via wiring
  – For the basic function from the set back generator of the fuze
Solution (3)

• **Impact Sensor**
  - Shock wave sensor (Piezo)
  - Inertial switch (G- switch)

• **Connector**
  - Gas pressure switch connection
  - Fire control unit connection
- Cartridge loaded in the barrel

  - Power supply for programming mode
  - Programming

- Firing / travelling through the barrel

  - Gas pressure switch closed
  - Power from set back generator
    (for time and firing circuits)
  - Capacitors charged
  - Electronic works
    (start of the time and SD mode)
  - Start timer of the piston actuator
    (muzzle safety distance)
  - Set back system releases rotor

- After nozzle

  - Rotor turns until piston actuator detents
  - Muzzle safety distance (time) is over
  - Ignition of the piston actuator
  - Rotor turns in- line
  - Start delay time for firing circuit charging
  - Firing circuit is charged
  - Impact sensors are released

- Fuze is now armed
Functional Description (1)

- Unarmed Position

- Limit stop for the piston actuator: To secure the rotor in unarmed position
- Hole for the pin of the piston actuator: For releasing the rotor
- Hole for the pin of the piston actuator: To secure the rotor in unarmed position
Functional Description (2)

• 1st Step of the Arming Process

Limit stop for the piston actuator (Rotor turns about 18°), pin stops further arming
Functional Description (3)

- 2nd Step of the Arming Process

Pin of the piston actuator fired into the hole. Rotor turns in-line.
Functional Description (4)

- Malfunction: Piston Actuator fired in Safe Position

Pin of the piston actuator fired into the short hole. Rotor fixed in unarmed position.
Schedule

• Development
  – Company qualification until the end of 2005

• Qualification
  – Qualification by the BWB in 2006

• Mass Production
  – EMD in 2006 / 2007
  – Start mass production end of 2007 / beginning of 2008
Firing Trails

- Airburst
Points of Contact

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Thank you for your kind attention!