JUNGHANS 40mm MIRA/SPICA
Next Generation 40mm Infantry Grenade (IG) Fuzes

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Agenda

- Typical Problems with 40mm IG Fuzes
- JUNGHANS answers
  - MIRA/SPICA 40mm Fuze Family
  - MIRA/SPICA Main Objectives
- MIRA/SPICA specifications
- Technical state
- Way ahead
Typical problems with 40mm IG Fuzes

- Modularity & Versatility
- Self Destruct
- Temperature Range
- Integration
- Sensitivity
Typical problems with 40mm IG Fuzes

Safety
- Partial arming in environment
- Missing reliable self destruct
- (dangerous) duds
- jamming mechanical Self Destruct; stored energy!

Functional Reliability
- Problem with mechanical initiation on wide range of targets
- Lack in graze angle sensitivity

Terminal Effect
- Comparably low reaction speed (esp. relevant on Dual Purpose (DP) rounds)

Airburst
- Need for weapon integration
- High energy demand (problems in temp. range due to batteries)
- Impact of environment (heat, dust,...)

Cost vs. Function
- Missing optimization for mass production
- Low modularity
MIRA is (together with its Medium Velocity (MV) variant SPICA) a program initiated by JUNGHANS, established to develop a cost efficient, reliable and innovative Fuze Family with high modularity for 40mm IG ammunition.

The different Fuzes are:

- **Spin-decay Self Destruct MIRA SSD**: The base variant, featuring a low cost Fuze with a mechanical Self Destruct, optimized for extremely low probability of jamming.

- **Electronic Self Destruct MIRA ESD**: This Fuze features a superior electronic Self Destruct with a factory-settable delay of up to 33 seconds as well as an extremely fast and sensitive Point Detonating (PD) function. For this the Fuze has redundant electronic impact sensors.

- **Air Burst Function MIRA ABF**: This Fuze offers, additionally to the ESD, a programmable Airburst function, settable from 0,1s up to 20s in 1mS time increments. It has the completely new developed XMI (eXtended Magnetic Induction) programming technology implemented.
Use in 40mm Automatic Grenade Launcher

Use in 40mm Grenade Launcher
New 40mm IG Fuze Line

- Complete new Fuze line in final phase of qualification, all Fuzes for both High Velocity and Medium (120m/s) Velocity*

- Fuze types (modular)
  - SSD (Spin Decay mechanical Self Destruct)
    - Low price offer
    - High quality and reliability self destruct
  - ESD (Electronic Self Destruct)
    - Time based electronic self destruct (delay standard 20s, can be adjusted to customer demand)
    - Additional electronic impact sensing (multi-directional sensor) => dramatically increased angle sensitivity
  - ABF (programmable AirBurst Function)
    - 3rd Gen XMI (eXtended Magnetic Induction) programming
    - High weapon and Fire Control Unit (FCU) independence with low energy demand (no reserve battery needed)
      - High tactical versatility, non-intrusive for weapon system
      - Full temperature independence (full function across temperature range)

- Market availability 2017 (phased approach)

*Low Velocity (LV) modification available for ESD and ABF
MIRA/SPICA Main Objectives

High Reliability: Less than 1% possible duds
- Higher for ESD and ABF

Innovative Design: Optimised for high volume production
- Modularity

Robust Design: Survives highest environmental stress (vibration profiles)
- Lightweight moving parts

Low Cost
- Cast parts
- Easy assembly

Modularity and Scalability with electronic supplements:
- Electronic Self Destruct with maximum precision
- Electronic impact sensors in order to counter basic problems of mechanical Fuzes for 40mm IG (graze angle sensitivity)
- Programmable Airburst of the latest generation
MIRA SSD Specification

Compliance with all mandatory specifications

- Safety: 12m drop, jolt, jumble, detonator safety, progressive arming, muzzle safety distance, all armed distance
- Helicopter and Fixed Wing vibration, logistical vehicle vibration, 28 days temperature/humidity, temperature shock, salt spray, water tightness, 1.5m drop and loose cargo

No mal-assembly; impossible to assemble in armed position

Reliable PD system

- initiates on 2mm aluminium, 12.5mm cardboard, natural ground at 300m and 3mm steel at 60° NATO

Spin Decay System

- activates at a spin of 6,000 rpm nominal; therefore reaching all ranges up to 2.200m (and above) is assured
- optimized to prevent jamming on impact on problematic targets (like rocks) in specified angles

Complies with STANAG 4403, Fuze mass 63g

Functional temperature: -46°C to +71°C

Shelf Life: 10 years minimum

Less than 1% possible duds

PD function on specified targets: Better than 95%

PD and SD combined: Better than 99%

Modularity & Versatility
Self Destruct
MIRA ESD Specification

Same as MIRA SSD with the following additions:

- Highly precise electronic system for Self Destruct: Factory Setting for SD delay (20s); up to 33s ± 0.1s

Ultrafast Dual Mode Impact Sensor

- electronic PD Sensor for superior PD function in extreme graze angles
- Angle sensitivity up to 80° NATO (3mm and also thicker and harder steel)

The mechanical PD as in MIRA SSD is still implemented (mechanical PD Backup)

Energy provision is fully done with a Setback Generator (possible through energy efficient electronics)

- Wide temperature independence (-46°C - +71°C)

Modularity & Versatility

Sensitivity

Temperature Range
**MIRA ABF Specification**

**Same as MIRA SSD and ESD with the following additions:**

**Superior XMI Airburst programmability**
- Extended Magnetic Induction (out of barrel, weapon independent and virtually unjammable while non-reactive to environmental interference)
- No need for setter directional adjustment (benefit for remote weapon station)

**Time of Airburst programmable from 200ms up to 20s in increments of 1ms**

**Time precision ± 4ms or ± 0.25% of the set time (depending on which is the bigger value)**

**Programming with the XMI Setter, compatible with all major FCUs (and usable in a standalone setup for MV)**

**Full temperature range for Airburst (-46°C - +71°C)**

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**Modularity & Versatility**

**Sensitivity**

**Temperature Range**

**Integration**
40 mm SPICA

40mm SPICA is the MV variant of MIRA:

- Function in MV (120m/s)
- The entire base is identical, just some minimal diversion for single parts
  - Rotor Masses (all)
  - “Slug” in SD-Mechanism (SSD)
- The Setback Generator is identical
- The Fuze electronics are identical
- Therefore: Maximum modularity and highest transparency for the user
- An LV variant of ESD and ABF is available; Proof of Concept (live firings) conducted in late 2015 (USA)
Technical State of Project

- All 6 base designs have been developed in parallel
- End of development (currently beginning of qualification phase) in February 2017
- Company qualification will be passed by Q2 and Q4 of 2017
- MIRA/SPICA is fully available in qualified design Q4 2017
40mm Airburst from H&K GMG
Way Ahead

- Serialization Q2-4 2017
- Market availability Q4 2017
- Parallel:
  - Coordination of integration in FCUs
    - Different systems
    - First live demonstration of full integration in February 2017
- Programmers for development and demonstration are fully available
- Serial programmer for FCU available in Q2 2017

Future:
> Corrected Airburst
> 40 mm Prox
Thank you for your attention.

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