SPACIDO 1D Course Correction Fuze
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Outline

- T2M fuzing activities overview
- Artillery main operational needs
- SPACIDO system
- SPACIDO fuze
- SPACIDO fuze main technical challenges
- Programme status
T2M Activities

Fuzes for Artillery and Mortar

Missile ESAD

Air Bomb Fuzes

Other fusing applications and High-G Embedded Electronics
Today artillery operational needs are:

- Efficiency improvement of artillery firings
- Collateral damages reduction
- Reduced time on firing position
- Reduced logistic burdens
- Compatibility with existing and future artillery system

To provide such a solution, T2M, Nexter Munitions and IN-SNEC are contracted by the French government to develop the 1D course correction system: SPACIDO

[Images of logos for T2M, Nexter Munitions, and DGA]
The SPACIDO System

- STANAG 4369 fuze setter
- SPACIDO Fuze
- Radar and transmitter
- Ballistic computer

• SPACIDO fuze and fuze setter:
• SPACIDO System:
• Radar:
**Range dispersion reduction by 1D course correction**
Operational sequence

1. Trajectory monitoring with muzzle velocity radar
2. Calculation and communication of the correction order to the fuze
3. Course correction by air brake deployment
4. Fuze terminal effect activation
0. Fuze programming and firing
Operational sequence
SPACIDO system main features

- Dramatic accuracy improvement by range dispersion reduction
- Number of rounds required for mission achievement divided by up to 4
- GPS independent
- Highly resistant to jamming
- Compatible with all setters compliant with STANAG 4369
- Modular system easily adaptable to all existing and future artillery systems
The ground station is composed of:

- A Doppler muzzle velocity radar to measure velocities up to 5 km
- A ballistic computer for course correction calculation
- A transmitter to send the correction order to the fuze
- A standard Fuze setter
2 fuze versions

- Fuze for HE rounds
  - 2 flight modes (ballistic and course-corrected)
  - Proximity Mode with programmable turn-on-time
  - Superquick point detonating mode
  - Impact delay mode
  - Time mode
  - IM compliant
  - STANAG 4369 et AOP22 compliant

- Fuze for cargo rounds
  - 2 flight modes (ballistic and course-corrected)
  - Time mode (in flight correction)
  - STANAG 4369 et AOP22 compliant
The SPACIDO Fuze integrates qualified sub-assemblies from the FRAPPE Fuze

- New generation HOB RF Sensor and signal processing
- Battery
- IM S&A Unit and explosive train

A low risk approach
SPACIDO Fuze architecture

- 200m IM S&A Unit
- IM Booster
- Programming and fuzing electronics
- Power supply and processing electronics
- RF receiver
- HOB RF-Sensor
- Programming Coil
- Battery
- Airbrake

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Main fuze technical challenges to solve

- Airbrake definition, ruggedization and performance validation
- Rear looking antenna integrated in the fuze
- Power consumption of electronics
- Integration of all functions in a standard artillery fuze volume
- Communication thru Base-Bleed
SPACIDO Airbrake - Definition and validation

- Wind tunnel tests scale 1/1
  - Rotation + aerodynamic pressure
  - Aerodynamic efficiency validation on all flight domain
  - Cinematic analysis of airbrake deployment
  - Simulation and visualization schlieren in wind tunnel

- Gun firings and efficiency validation
  - 39 caliber gun full charge
  - 52 caliber gun full charge to come
SPACIDO Fuze Antenna

- Rear looking antenna integrated in the fuze
  - Full 3D Electromagnetic simulation
  - Prototyping and experimental measurements
  - Hardening tests and dynamic tests validation

- Antenna radiation pattern compatible with all projectile velocities and angles
SPACIDO Fuze integration

- Integration of all functions in a standard fuze volume
  - HOB RF-Sensor,
  - Programming coil,
  - RF receiver,
  - Battery,
  - Signal processing and power supply,
  - Airbrake
  - Programming and fuzing electronics,
  - IM explosive train
  - IM S&A Unit

- All electronic functions are defined and meet objectives:
  - No specific component development
  - Power consumption and performances validated
  - Sizes compatible with volume requirements
Experimental system validations

- Successful full scale system firings in Base Bleed configuration
- Velocities measurement in multi-projectile configuration
Experimental system validations
SPACIDO Fuze technical challenges status

- Airbrake definition, ruggedization and performance validation
- Rear looking antenna integrated in the fuze
- Power consumption of electronics
- Integration of all functions in a standard artillery fuze volume
- Communication thru Base Bleed

- Main Fuze technical challenges are solved

The SPACIDO Fuze is mature
Interoperability  AOP 22 declaration

- The SPACIDO Fuze is STANAG 4369/AOP22 compliant
- A request for introduction of the SPACIDO Fuzes to the AOP22 ed2 has been made (XM7 and XM8)

  - ID code for SPACIDO Fuze for XM7 (HE Rounds) 1xxxxxxx
  - ID code for SPACIDO Fuze for XM8 (Cargo shell) 1xxxxxxx
  - Multiple Word Format (Two words)
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SPACIDO is a **state-of-the-art** and **mature** new generation cost-effective 1D artillery course correction solution that provides

- Increased effectiveness of all existing artillery rounds
- Full STANAG 4369 and AOP 22 compatibility
- Robust design with qualified components and fusing functions
- Flight proven solution
- Full compatibility with all artillery systems and munitions

**A solution to improve performances of munitions stockpile at low cost**

Thank you for your attention!