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

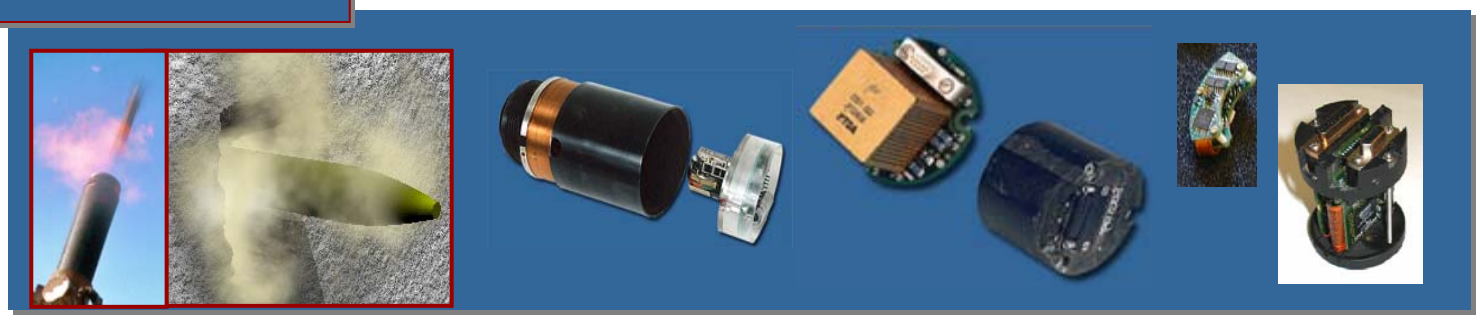
T2M Activities

Fuzes for Artillery and Mortar

Air Bomb Fuzes

Missile ESAD

Other fuzing applications
and
High-G Embedded Electronics



Artillery Operational needs

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

The SPACIDO System

STANAG 4369 fuze setter

SPACIDO Fuze

Radar and transmitter

In cooperation with

EN-SNEC

Ballistic computer

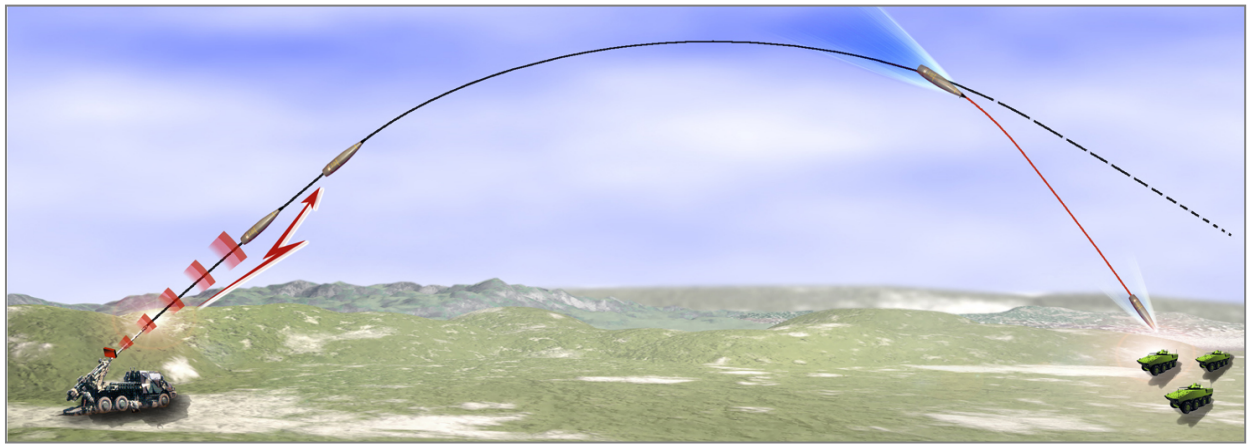
In cooperation with nexter MUNITIONS

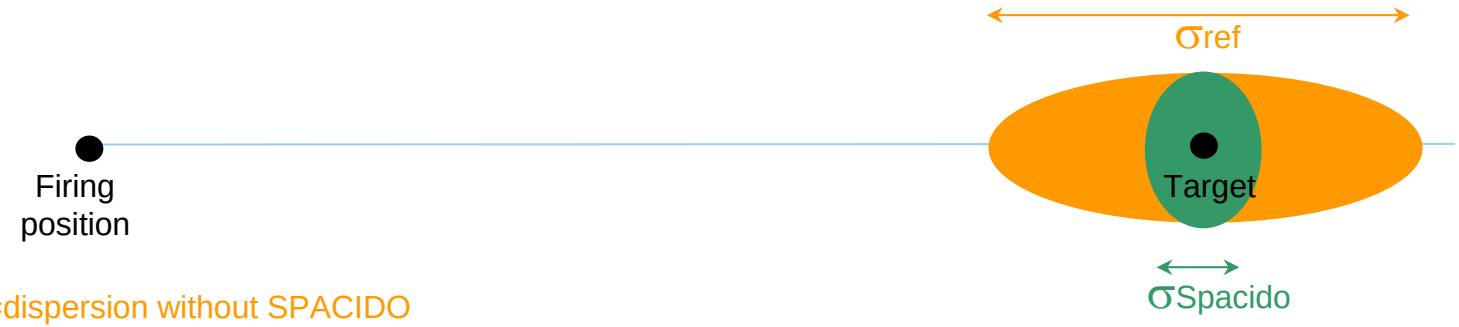
- **SPACIDO fuze and fuze setter:** T2M
- **SPACIDO System:** nexter MUNITIONS
- **Radar:** EN-SNEC

nexter MUNITIONS

T2M

SPACIDO principle



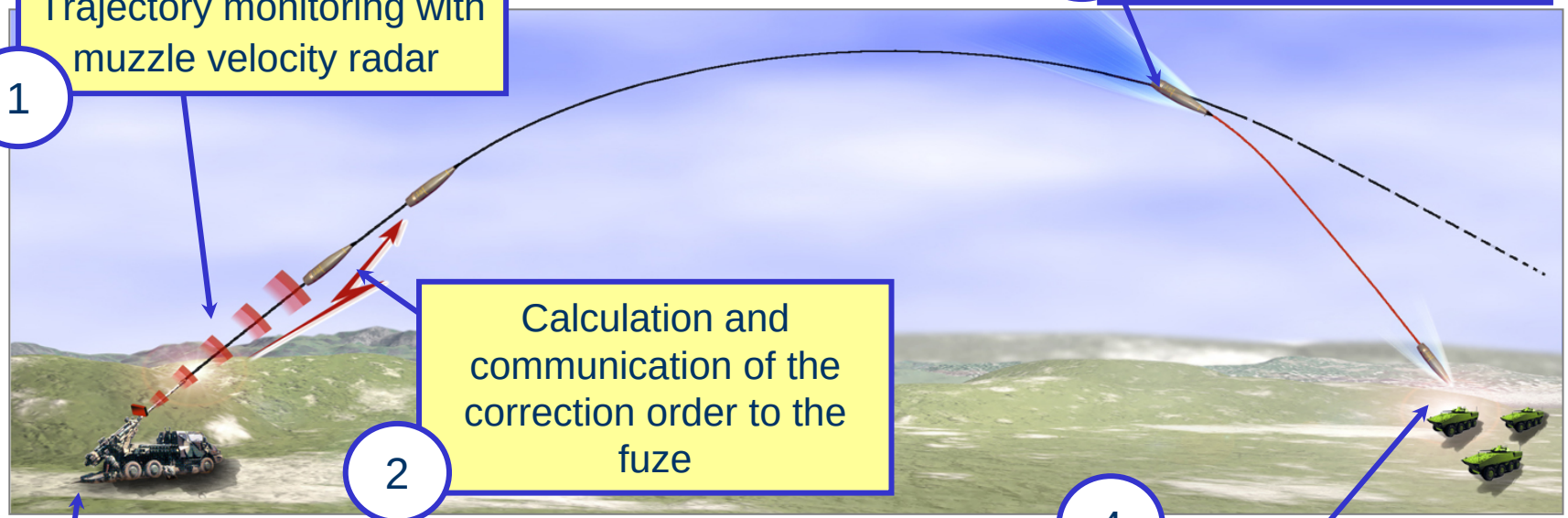


σref =dispersion without SPACIDO

σSpacido = dispersion with SPACIDO

- **Range dispersion reduction by 1D course correction**

Operational sequence



0 Fuze programming and firing

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

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

SPACIDO ground station

- **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

SPACIDO Fuze

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

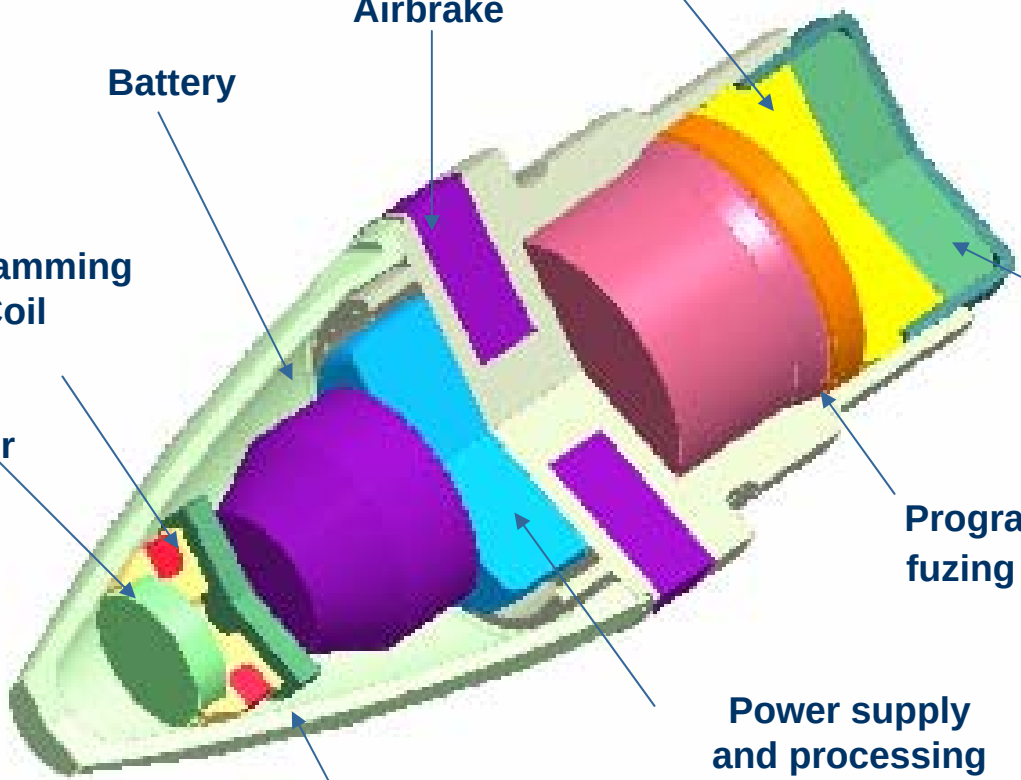
- **Fuze for cargo rounds**
  - 2 flight modes (ballistic and course-corrected)
  - Time mode (in flight correction)
  - STANAG 4369 et AOP22 compliant

SPACIDO Fuze background

- 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

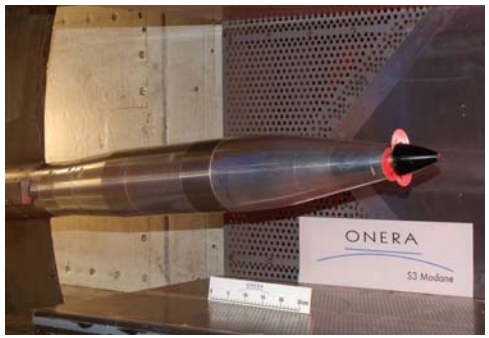
A low risk approach

SPACIDO Fuze architecture



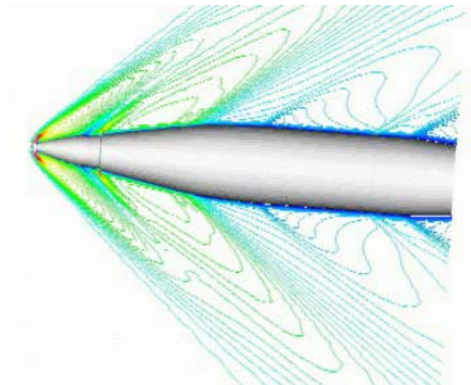
SPACIDO Fuze main technical challenges

- 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

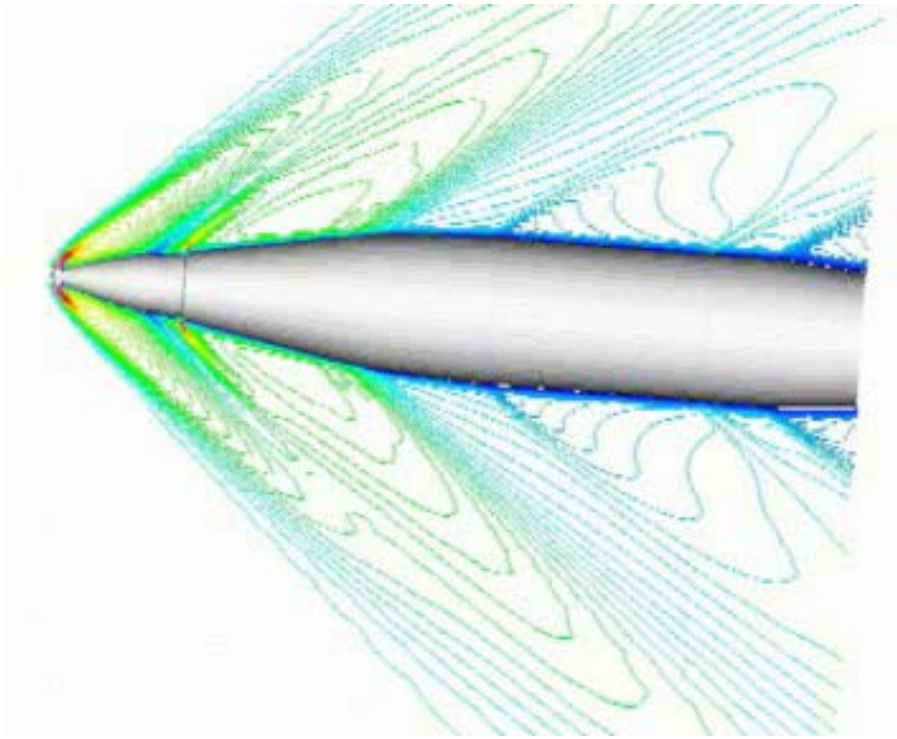


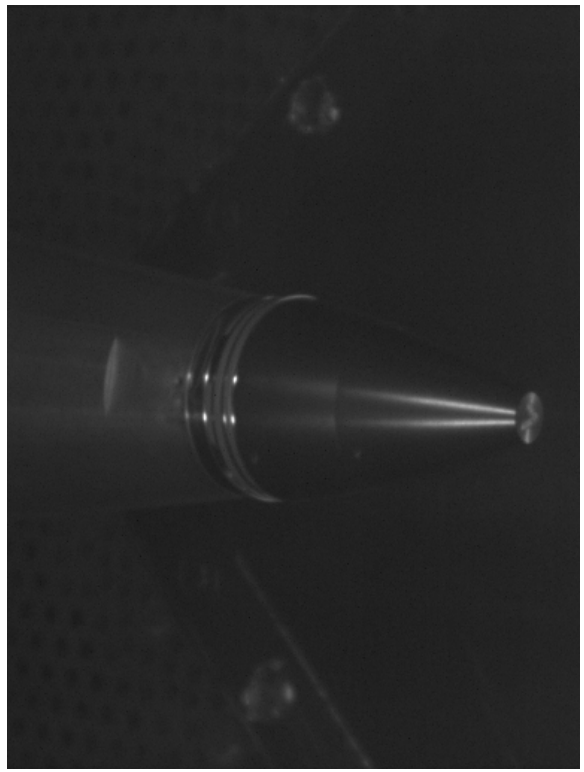
SPACIDO Airbrake- Definition and validation

- 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



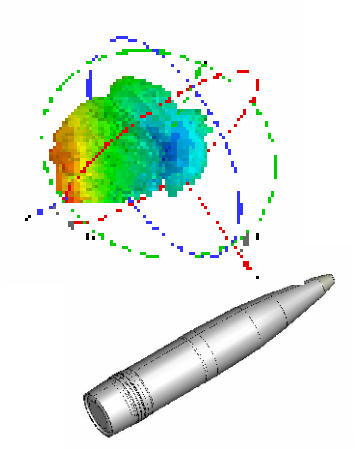
SPACIDO Airbrake- Wind tunnel tests



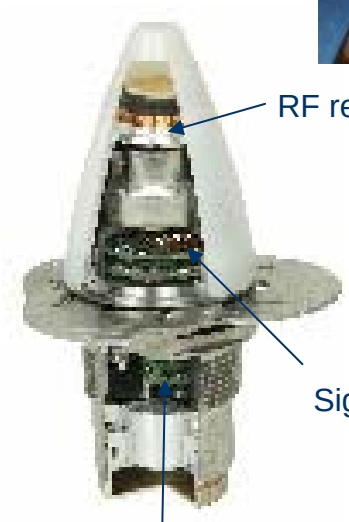


SPACIDO Fuze Antenna

- 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



RF receiver and antenna

Signal processing and power supply

Programming and fuzing electronic

- 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

- Successfull 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

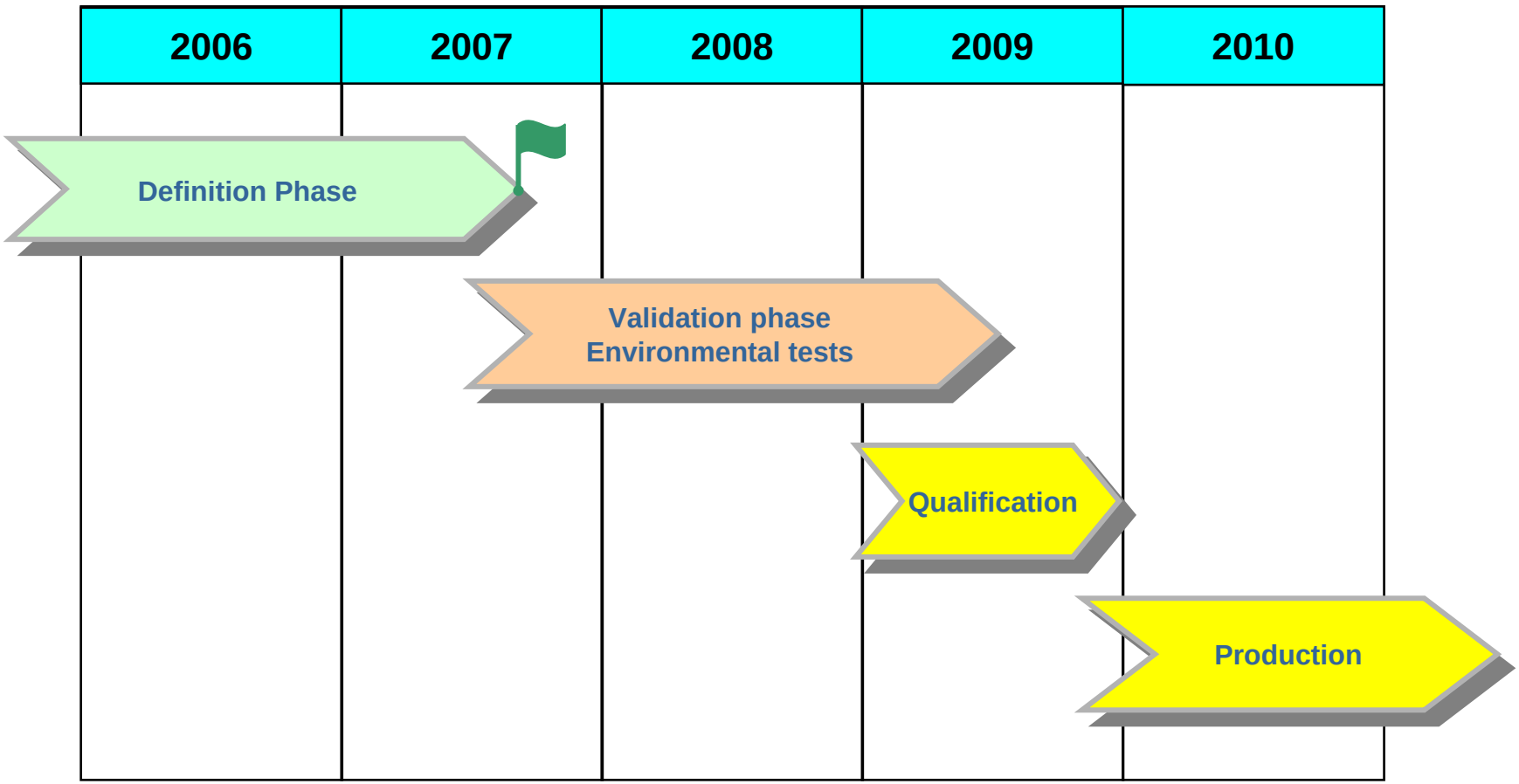
The SPACIDO Fuze is mature

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)

Programme STATUS



Conclusion

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 fuzing 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!