Modular Bomb Fuze

FBM 21

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Summary

- French Requirement

- Product Description
  - Characteristics
  - Performances

- Program status
French Joint Operational Requirement

Compliant with Joint French Forces* needs:
- **Single Multirole Fuze**: General Purpose, Proximity & Penetration
- Adaptable to all in-service / planned AUR
- Compliant with Insensitive Munitions (IM) Carrier requirements

Minimized Logistics
- No limitation of use (long captive carry, no maintenance, ext. service life …)

Growth Potential (P³I)
- Smart penetration features
- Adaptable to future armaments / Dialogue with A/C

Affordable

*Armee de l’Air (Air Force) Aeronavale (Navy)*
A Unique and Modular Design using Electronic Safety and Arming Technology

FBM 21
Fuze System Components

Arming Environments Sensor (AES)

FBM 21 Fuze

Electrical cable
Fuze layout

- Booster
- Slapper detonator
- Reinforced steel body
- Aft connector
- Coated electronics
- Front cover
- Front connector
- Setting buttons
- Thermal battery
- Closing screw

Weight: 2.1 kg / 4.6 lb
Fuze systems packaging

- Electric cable
- Documents
- Fuze
- Thermal insulating foam
- Closure ring
- Aluminium case
- Arming envir. sensor

Contribute to IM performances

Weight: 30 kg / 66 lb
For use on 3" fuze pocket bodies:
- General Purpose (Mk80 series, ...)
- Penetration bombs (BLU109, CBEMS*, ...)

(*) CBEMS: Corps de Bombe à Effets Multiples Sécurisé
(**) AASM: Armement Air-Sol Modulaire
Compatibility

- Accept external target detecting devices
  - Analog firing signal (ie: DSU 33 prox, ...)

- Digital firing signal (increased immunity, ...)

- Compatible with Insensitive Bomb Filling:
  - PBXN-109, ORA86B, ...
Compatibility with bomb bodies w/o plumbing

- Keep and Relocate the Arming Environment Sensor

Paveway II

Low Drag
Interface with peripheral equipment through front and/or rear fuze connectors

(*) Ground Testing Unit / Ground Setting Unit
Characteristics

- Full Autonomous fuze system:
  - AES senses the First and Second safety environment
  - Embedded energy (thermal battery): over 5 min of flight

- May take advantage of the Carrier capabilities:
  - First safety environment given by the carrier (Weapon or A/C)
  - External energy: unlimited flight duration
  - Receive Mission Data
  - Receive other commands (late arming, sterilization, ..)

- Flexible use:
  - Manual and/or electrical setting
  - Operated through front and/or rear connector
  - Supply energy to any peripheral (ie. Prox sensor)
Performances

- **Functional modes** (not limited to ...)
  - Instantaneous: accurate impact threshold (+/- 20 g) / superquick detonation (< 100 µs)
  - Penetration: post-impact delays from 1 to 250 ms (step 1 ms)
  - Proximity: prime a prox sensor - receive external firing order
  - External firing order only: sterilize impact sensor

- **Use conditions**:
  - Temperature: -54°C / + 71°C (-65°F / +160°F)
  - Release conditions:
    - up to 600 KCAS - 0.95 Mach / HALA* conditions
    - exceed 40,000 ft
  - Insensitive to free flight perturbated airflow / guidance maneuvers
  - Carriage: more than 200 hours
  - Service life: 20 years

(*) High Altitude, Low Airspeed
Mission data could be downloaded via a serial link:

- on ground
- from the cockpit
- during the free flight
Full functional test permitted

- anytime from factory to depot *

(*) only need to unscrew the booster and remove the detonator
Peculiar Safety Functions

- Accept late arm order: give safe over-flight
- Pre / post arming sterilization in case of System failure: reduce collateral damage risks
- Accept re-arming order
- Allow inert release even in case of accidental in-flight lanyard pull: prevent bird strike issue
- Automatic back to a Safe position in less than 5 seconds after a sterilization order, or after power supply withdraw
Electronic Safety and Arming Benefits

- Full electronic ESAF* using EFI** technology
  - Compactness / Shock resistance (No moving components)
  - Safer: 
    - No primary HE
    - Automatic return to a Safe position
  - Increased insensitivity & reliability in hostile environment 
    - Hard impact
    - Electromagnetic / Electrostatic / Lightning environments
    - Other IM performances (ie. Thermal)
- Greater flexibility of use via external programmation
- Allow full functional test up to detonator / booster
- STANAG 4187 ed 4 Safety Design Compliant

(*) ESAF : Electronic Safety & Arming Fuze
(**) EFI : Explosive Foil Initiator # slapper detonator
Dialogue with host equipment: adaptation to weapon specific protocols

BIT

Target penetration processing: void sensing, layer counting ...

Growth to MIL STD 1760 compatibility
Major Achievements To Date

- Ergonomics / Interface with all FR “in service” AUR
- IM filling initiation in all conditions
- 200 Hours Captive Carry Endurance*
- Electromagnetic environments:
  - HERO / EMI – EMC / ESD
- High altitude operating
- Operation under High G levels (gun / cannon):
  - 10 trials / 10 success in EMD phase

(*) to be extended next phase
Recoiless Gun Trials

Recoiless Gun

Test vehicle

Fuze
Recoiless Gun Trials

Recoiless Gun

Test vehicle

Fuze
Summary: Key Elements

- **Functional**
  - Evolutive multirole fuze
  - Ground and in-flight programming
  - Compatibility: High Altitude - Perturbated airflow

- **Safety**
  - Hardened to: High Gs / EM / Hostile acts and hazards (IM)
  - Sterilization command, late arming
  - Automatic back to Safe position

- **Logistics**
  - No maintenance
  - 20 years service life
  - Carriage endurance: more than 200 hours
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Program on track for......

In Service Date
Thanks for your attention.

Any questions?

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