Air Bursting Munition for 40mm x 53 Automatic Grenade Launchers

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Air Bursting System Upgrade
For All 40 mm Automatic Grenade Launchers

ONE ABM-SYSTEM for all 40mm x 53 Weapon with minimal modifications!
ABM Upgrade for AGL Systems
Programming Concept

Vital Features:
• Gun unload safety
• No burst rate limitation
• System works also w/o external Power (Aiming & Impact Function of ABM)
Weapon and Fire Control System Designs

**CONVENTIONAL**

**SUPER LIGHT WEIGHT AGL**

Ammo Programmer

SLWAGL of ST Kinetics
ABM Family of Oerlikon Contraves

35mm x 228
Ahead
NATO Qual.

30mm x 173

40mm x 53
selected by Sweden for evaluation

Other studies on following calibers:
25mm x 137
27mm x 145
up to 140 mm
35mm Ahead Performances

Aircraft

Missiles

Soft Targets

Tanks
One ABM Fuze System (Ahead) - Two Different Warhead Systems

Programmable Base Fuze

Ejection Charge

Subprojectile Warhead (KETF: Kinetic Energy Time Fuze)

Booster

Blast Fragmentation Warhead (HETF: High Explosive Time Fuze)

30mm x 173
(35mm x 228)

40mm x 53
AGL Air Bursting Munition: One Fuze for All Types

TPTF
Flash & Bang

HETF
High Explosive

NLTF
Non Lethal

ILTF
Illumination

In Development
In Development
Future Type?
Future Type?

ONE Fuze for all types of 40mm x 53 Air Bursting Munition
40mm x 53 Automatic Grenade Launchers: Air Bursting Munition HTE309

- Generator
- Explosive Chain
- Tungsten Balls
- Explosive
- Body
- S&A
- ETM
Air Bursting Munition for AGL: Low Risk Concept

Components from OCP ABM-Family
- Electronic Timer Module
- Setback Generator
- Squib

Components from CAI 40mm Munition
- Safe and Arm System
- Cartridge Case
- Propellant
Air Bursting Munition Concept
Electronic Timer Module ETM

Parameters & Features

- Operating range 40 m to 1600 m
- Self-Destruction (SD) 1600 m
- Programming of impact function On / Off
- Impact function & SD On if not programmed
- Sensitivity of impact sensor 2 mm Alum. Alloy
- Data transmission check if negative -> SD is On
- Absolutely ECM safe
- Without external energy the fuze still works on impact, even at graze angles
Air Bursting Munition Concept
Safe and Arm System

**SAFETIES**

- Setback pin
- Centrifugal pin
- Setback generator
- Detonator Safety
- Mechanical muzzle safety $\geq 18\text{m}$
- Mechanical arming $\leq 40\text{m}$
- Electronic muzzle safety $\sim 40\text{m}$
40mm x 53 Air Bursting Munition for AGL

Summary of Main Features

Electronic Base Fuze: Ahead technology
Programmable at Muzzle: Fuze time / impact sensor
Arming Time: Mechanically & electronically driven
Safe and Arm: Mechanically driven (Stanag)
Propulsion System: Accurate / low muzzle velocity variation
Exterior Ballistics: Compatible with standard ballistics
Point Detonating: Piezo impact sensor / graze angle capability
Impact Sensor:
  - Automatically On w/o fuze programming
  - Switched Off function programmable
Warhead: HE pre-fragmentation / large footprint / high lethality (forward and lateral fragment release)
Self-Destruct Function: Automatically On when no fuze programming
40mm x 53 ABM HTE309: Fuze Operation Modes

"String of Pearls"

Air Burst w/PD Function Off

Air Burst against Openings

Point Detonating PD Function On

Self Destruct
Air Bursting Munition Analysis
Effectiveness Pattern: Nose vs Base Fuze

Nose Fuze:
\[ V_{\text{frags}} = V_{\text{grenade}} - V_{\text{explosive}} \]

Base Fuze:
\[ V_{\text{frags}} = V_{\text{grenade}} + V_{\text{explosive}} \]
40mm x 53 ABM HTE309: Pre-Fragmented High Explosive Warhead

- Fragments
- # of W-Balls
- Ball Mass 0.25g each
- Payload Mass Max. 100 g

X-Ray Flash Picture of Detonating Warhead
Air Bursting Munition Analysis
“Behind Wall” Lethal Area

FIRING DIRECTION

NOSE FUZE

BASE FUZE

Lethal Area

Lethal Area
Air Bursting Munition Analysis
Max. Allowable Error in the Open - Nose Fuze

Max. Error Allowed $\Delta$
Air Bursting Munition Analysis
Max. Allowable Error in the Open - Base Fuze

Max. Error Allowed $\Delta$
Air Bursting Munition Analysis
Max. Allowable Error Against Openings - N.F.
Air Bursting Munition Analysis
Max. Allowable Error Against Openings - B.F.
Terminal Ballistics of ABM for AGL: Base Fuze vs Nose Fuze Concept

With Base Fuze:

- Lethal area much larger: Better hit probability.
- Addition of velocity vectors: Higher fragment velocity; i.e. lethality.
- Detonation wave acting directly on target: Better performance on impact.
- Larger “Behind Wall” lethal area
- Few low energetic frags flying backwards: Higher safety at short range.
40mm x 53 ABM HTE309:
Warhead Function
40mm x 53 ABM HTE309: Firing Tests

Slow Motion Videos
of single shot
and burst firings
up to 570 Rd/min
40mm x 53 Air Bursting Munition System for AGL: Program Mile Stones

- Start R&D (ABMS)  Early 1998
- Start Partnership OCP - ST Kinetics  Sept. 2000
- Contract Signed with FMV-Sweden  Dec. 2000
- Prototype Delivery FMV-Sweden  May 2002
- Product Qualification completed  Mid 2003
- Start Serial Production  Early 2004