Anti-Vehicle (Anti-tank) Mines

by

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Topics Covered

- Philosophy
- Engineering
- Impact on Non-Combatants
Mine Classifications

- Classified by target:
  - Anti-Vehicle
  - Anti-Helicopter
  - Anti-Personnel
Philosophy - AV/AT Mines

- Hit the weakest point
- Aim for Total Kill
  - Mobility Kill (Driver, Tracks or Engine)
  - Weapons Kill (Turret Crew, Optics or Gun)
  - Total Kill
Areas of Attack

- Off Route or Side
- Top

Track
Belly
Track

Full Width (FWAM)
ATTACK CONSIDERATIONS

Sub-Turret Attack
Types of AV/AT Mine

- Pattern
- Scatterable
- Side Attack or Off-Route
- Area Defence
Mine Components

- Warhead
- Fuze
- Sensor
- Power Source
- Safety and Arming Unit
Warhead Types

- Blast
- Shaped Charge (HEAT)
- Explosively Formed Projectile (EFP) (sometimes referred to as Self Forging Fragment (SFF))
Patterned Mines

- Normally blast mines.
- Laid in patterns to reinforce natural obstacles.
- Laid buried at fixed spacing.
Typical Blast Mines

- **M 21**
  - USA

- **PRB 3**
  - Belgium

- **Mark 7**
  - UK

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Scatterable Mines

- Laid remotely and quickly.
- Situation or target orientated.
- Can be used to disrupt known key locations.
- Surface laid.
- Small and light, therefore Belly Attack Mode.
- Need sophisticated fuzes.
Typical Scatterable Mine

- External casing
- Inner casing
- Lock-wiring
- Packing Piece
- Lugs
- Electronic Fuze
- Liner
- Moving Relay
- Primer
- Explosive Charge
Scatterable Mine Systems
Side Attack

- Designed to dominate an area of ground.
- Usually based on light anti-tank rockets.
- Sophisticated sensor package.
- Effective range of 100m.
Typical Side Attack Mine
Area Defence Weapons

- Cover both azimuth and area.
- Top attack munitions.
- Now in production.
- US Wide Area Munition “HORNET”.
Target Emissions

- Infra-red / Heat
- Magnetic field
- Sound/acoustic
- Seismic vibrations
- Ground pressure
Direct Fuses

- Pressure Activation - Springs
- Pressure Activation - 2 & 3 Impulse
- Pressure Activation - Hydraulic
- Trip Wires
- Break Wires
- Mechanical (Tilt Rod / Castor)
Pressure Fuses

- First generation.
- Double/Triple Impulse designed to defeat “Roller” counter-measures.
- Used in Blast AT Mines only.
- Track Attack Mode.
- Pressure required to activate is variable.
Tilt Fuses

- Belly Attack Mode
- Tilt
- Mast and Castor Wheel
Sensors

- Magnetic
- Acoustic
- Vibration / Seismic
- Infra-Red
- Milli-Metric Wave (mmW) Radar
- Scratch Wire
Battery design is the key.
Requires up to 12 years “shelf-life”.
Must generate sufficient power at the right time.
Must last for the “active” period.
Control of Minefields

- Your own minefield can become an obstacle to your own manoeuvre.
- International concern about collateral damage to non-combatants post-conflict.
- These have led to proposed technical solutions.
Control of Mines - Technical Solutions

- **Self Neutralisation (SN)**
  - For sophisticated and high value mines.
  - Allows recovery and re-use.
- **Self Destruct (SD)**
  - For those difficult to detect or clear.
- **Remote Control**
  - SN or SD can be achieved by time delay or remote control.
CONTROL OF MINES - TECHNICAL PROBLEMS

- SN and SD mechanisms add cost and complexity.
- Reduction of explosive content in same space.
- Reliable and secure communication link to the mine.
Future Developments

- **Sensor Technology:**
  - Detect targets at a distance
  - Distinguish between target types and non-targets.
  - Engage targets at greater distances, therefore less mines required.
  - Be selective about target attack.

- **Integrated logic circuits**
Impact on Non-combatants

- AV/AT Mines lethal to vehicles.
- AV/AT Mines lethal to farm equipment.
- AV/AT Mines deny access.
- In some theatres, AV/AT mines cause as many civilian casualties as AP mines.
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