IED TM Lesson 1.1: Explosive Hazards

Overview

1.1.1 Revision of Explosive Hazards

1.1.2 IED Fundamentals

Terminal Learning Objectives

At the end of this module, the participants will be able to differentiate the various categories of explosives and describe their key features.

1.1.1 Revision of Explosive Hazards

Defining Explosives

What is an Explosive?

An explosive is a substance which when suitably initiated, exerts a sudden and intense pressure on its surroundings, by the rapid formation of large quantities of gas.

Defining Explosives

Classes of Explosives

Low Explosives – generally have a normal design mode to deflagrate

High Explosives – have a normal design mode to detonate

High Explosives Detonate

Detonation is a supersonic shockwave, induced by deflagration or shock, that passes through the explosive converting it mainly to gas, which is susceptible to failure, but which is virtually independent of surface area and pressure

- A High Explosive is one which detonates
- It is only capable of detonation if sufficient stimulus is applied
- Detonation is a much faster event than the deflagration (burning) of Low Explosives

Uses of High Explosives

Main Fillings - for landmines, artillery shells, mortars, bombs, hand grenades, mines, torpedoes, depth charges.

Civil Engineering & Demolition Stores - for quarrying, mining and Explosive Ordnance Disposal (EOD).

Bursting Charges - for carrier bombs, shells and missiles.

Categories of Explosive Hazards

- Explosive Remnants of War (ERW)
    - Unexploded Ordnance (UXO)
    - Abandoned Explosive Ordnance (AXO)
- Landmines
- Improvised Explosive Devices (IEDs)

Categories of Explosive Hazards

Explosive Remnants of War (ERW) refers to:

- Unexploded Ordnance (UXO).
- Abandoned Explosive Ordnance (AXO).

Categories of Explosive Hazards

Unexploded Ordnance (UXO):

UXOs are explosive munitions that have been fired, thrown, dropped or launched but have failed to detonate as intended.

Categories of Explosive Hazards

Abandoned Explosive Ordnance (AXO):

AXO is explosive ordnance that has not been used during armed conflict and has been left behind and is no longer under control of any particular Force (combatants) that left it behind.

Categories of Explosive Hazards

There are six main categories of LSA

1. Mines
2. Grenades
3. Projectiles
4. Mortars
5. Rockets and Missiles
6. Sub-munitions

Categories of Explosive Hazards: Sub Munitions

Function

Multiples dispersed through air dropped bombs or artillery.
Initiate on impact or armed to initiate on movement

Appearance

Small in size and of various shapes and colours.

UXO Threat

Up to 70% know to fail to immediately initiate on impact.
Remain armed and sensitive to initiation through movement

Categories of Explosive Hazards: Grenades

Function

Removal of safety pin and thrown.
Typically employ a time-delay mechanism.
Can be Blast, Chemical, Gas, Smoke, Noise.

Appearance

Hand grenades have a pineapple shape, cylindrical or round bodies about the size of an adult fist.

UXO Threat

Possibly prevented from initiation on landing after thrown. Disturbance leads to initiation.
IED Threat: Grenades can be used as IEDs

Categories of Explosive Hazards: Projectiles

Function

Fired from weapon. Initiate on impact or with delay fuze.

Appearance

Like large bullets but can be cylindrical or have fins. Certain grenades can be fired from rifles as projectiles

UXO Threat

Can fail to initiate on impact and subsequent movement can result in initiation.
Self destruct fuze can be present.
IED Threat: Artillery shells can be used as main charge

Categories of Explosive Hazards: Mortars

Function

Launched from tubes. They can initiate on impact or through time delay fuze.
Can be HE, Smoke, Illumination, Chemical.

Appearance

Various colours, diameters and lengths. Metal with a tapered shape. They have a cylindrical section with holes and fins on the bottom.

UXO Threat

Can fail to initiate on impact and subsequent movement can result in initiation.
IED Threat: Can be used as a main charge.

Categories of Explosive Hazards: Rockets and Missiles

Function

RPGs fired from shoulder launchers. Larger rockets fired from vehicle or ground based launcher.

Appearance

Rockets and missiles come in many shapes and sizes, from the relatively small air-to-ground, to very large artillery missiles.

UXO Threat

Can fail to initiate on impact and subsequent movement can result in initiation.

Categories of Explosive Hazards: Landmines

Landmines

A landmine is an explosive device designed to destroy or damage vehicles, or to wound, kill or otherwise restrict people's activities.

They are grouped into two broad categories:

a) Anti-Personnel (AP) mines.

b) Anti-Vehicle (AV) mines, also commonly referred to as Anti-Tank mines.

...Landmines

Anti-Personnel Landmines

...Landmines

Anti-Vehicle Landmines

Categories of Explosive Hazards: Improvised Explosive Devices (IEDs)

"A device placed or fabricated in an improvised manner incorporating ***destructive, lethal, noxious, pyrotechnic or incendiary chemicals*** *and designed to* ***destroy, incapacitate, harass or distract****. It may incorporate military stores, but is normally devised from non-military components"*

UNMAS Lexicon Definition

Categories of Explosive Hazards

Improvised Explosive Devices

Categories of Explosive Hazards

Improvised Explosive Devices

- Cheap
- Easy to make
- Specific to the attack
- Easy to hide
- Complex attack
- IED used as a precursor

Questions?

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Environmental Indicators of Explosive Hazards

Recognizing Dangerous Areas

Environmental Indicators
Warning Signs

Official Warning Signs

Unofficial (Improvised) Warning Signs

Environmental Indicators
Visible Mines, ERW and IEDs

- The edge of a buried mine, protruding metal and wooden stakes
- Abandoned and unexploded ordnance
- Pieces of wire or tape strewn about
- Tilt rods and fuses
- Discarded packaging, wrapping and military debris

Environmental Indicators
Signs of Fighting or Military Activity

- Trenches, Dykes, Bunkers Or Battle Positions
- Damaged, Abandoned Or Destroyed Civilian And Military Vehicles
- Discarded And Abandoned Weapons
- Military Checkpoints And Border Areas
- Around Military Buildings And Installations

Environmental Indicators
Signs of Fighting or Military Activity

- Bridges, Dams And Surrounding Areas
- Roads And Paths
- Airports And Railway Tracks
- Electrical Power And Water Supply
- Shaded Areas, Fruit Trees, Water Sources, Wells And River Banks, Cave Entrances
- Built-up Areas

Environmental Indicators
Signs in the Environment

- Changes in vegetation and soil
- Deserted villages and overgrown areas
- Abandoned and destroyed houses
- Logs or branches placed across a road.
- Explosion Craters and destroyed vehicles

Environmental Indicators
Signs in the Environment

- Patches Of Growth
- Unused Or Overgrown Paths, Roads Or Fields
- Animal Carcasses Or Skeletons
- Any Object That Appears "Out Of Place"

Environmental Indicators
Local Behaviour

- Forbidden Areas And Village Deminers
- Untypical Behaviour
- Scrap Metal Yards And Fishing

Questions?

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1.1.2 IED Fundamentals

Components of an IED

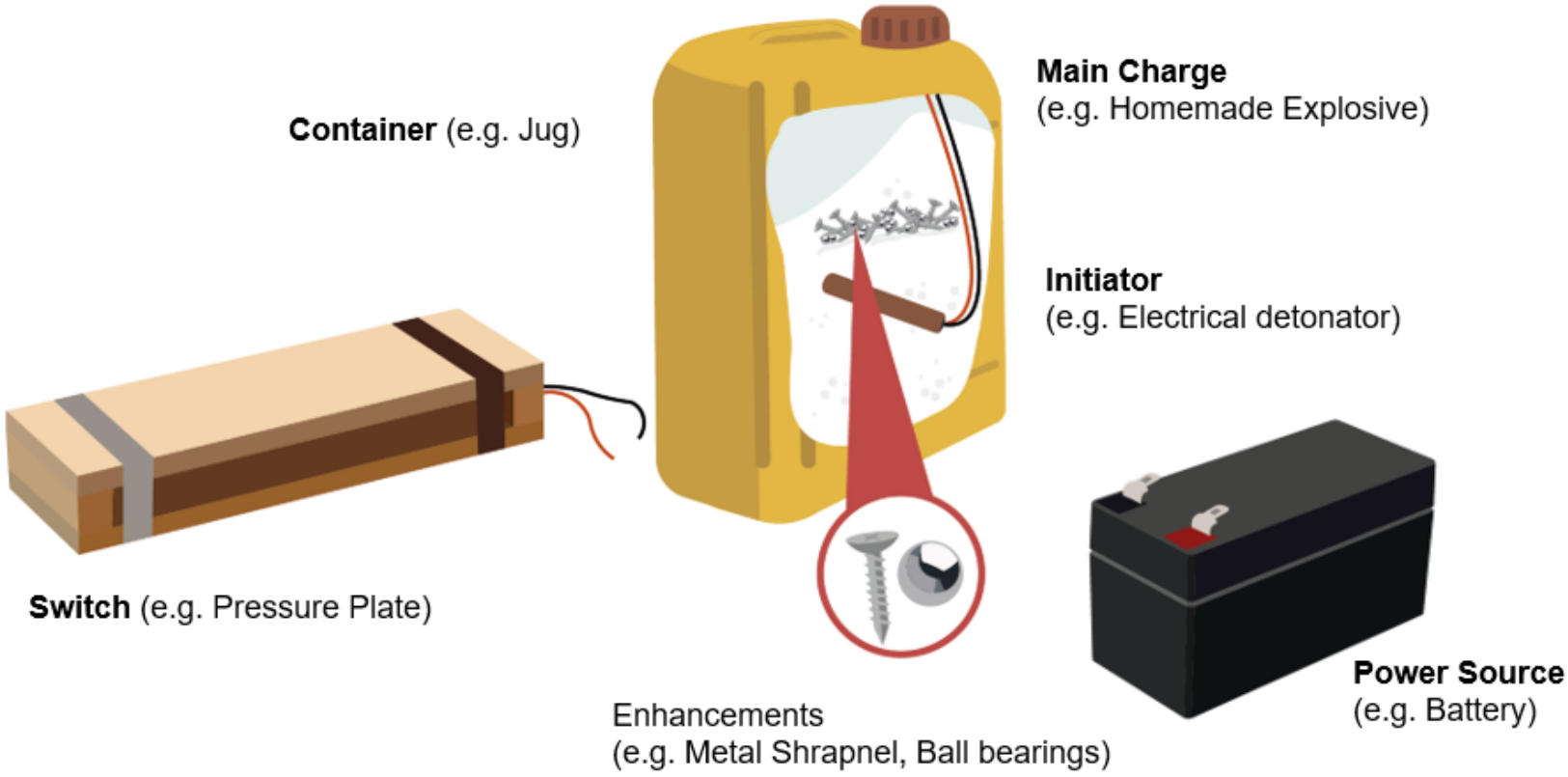


Figure 1-1: Components of an IED

UN IED Threat Mitigation Handbook 2024

Components of an IED

Components of an IED

Switches

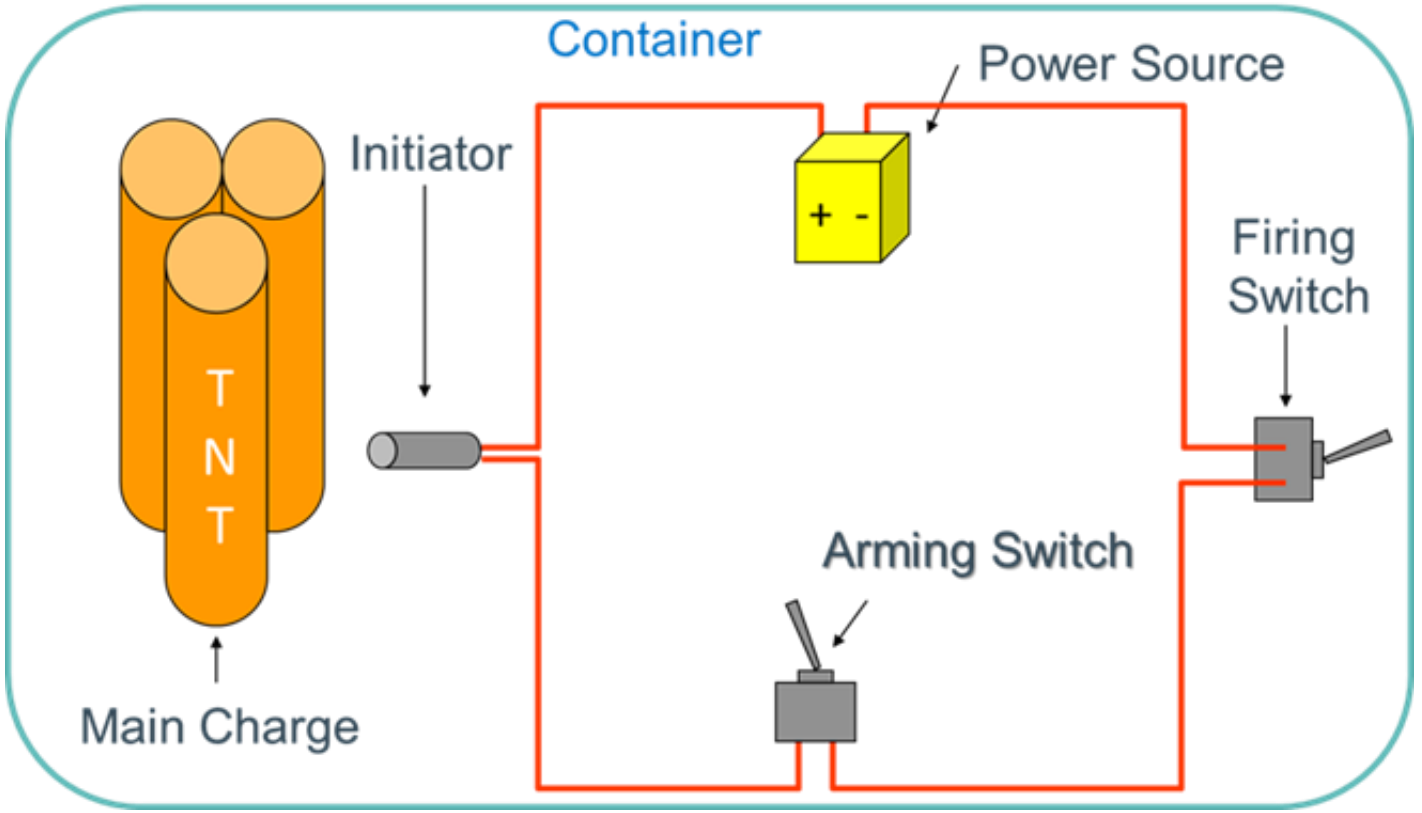
Initiator

Main charge

Power Source

Container

Enhancements

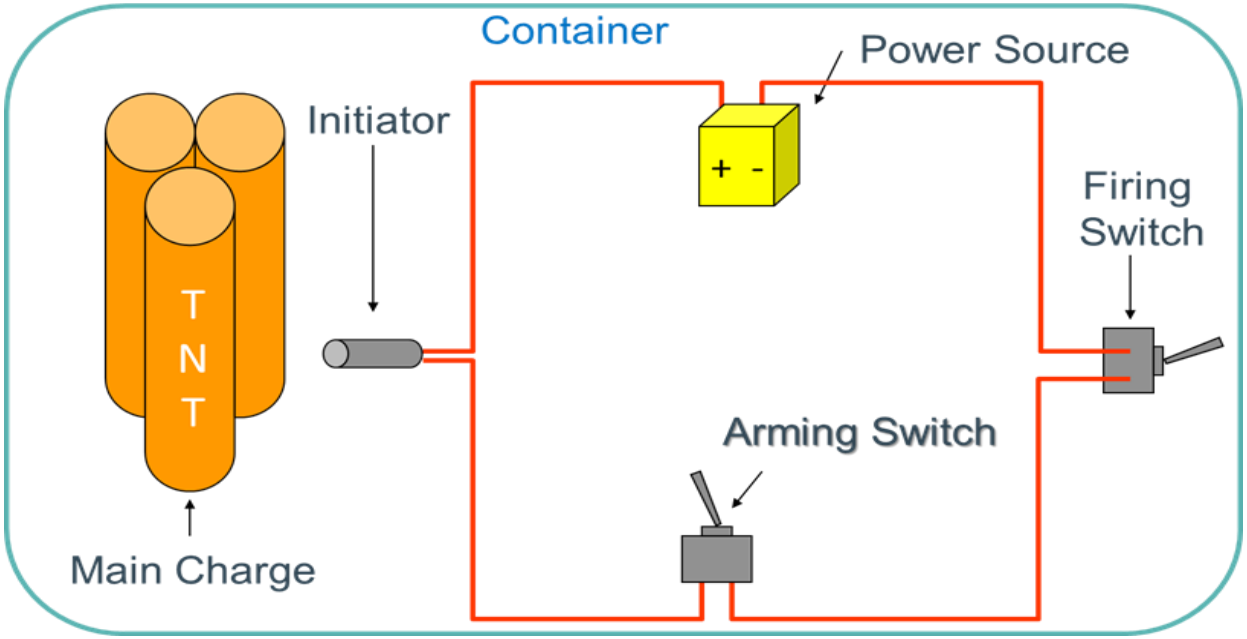


Components of an IED: Switches

The Switch is a device for making, breaking, or changing a connection in an IED.

- Arming switch – gives Bomb maker safety during; Fabrication, Transportation & Emplacement.
- Firing switch – initiates the firing sequence.

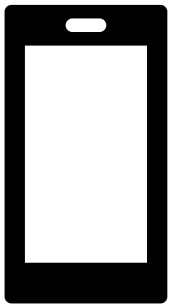
- **Firing Switch –** always present
- **Arming Switch –** may be present as a safety feature



Components of an IED: Switches

There are 3 types of Firing Switches:

- Time Operated
- Command Operated,
- Victim operated.



Components of an IED: Initiator

Any component that may be used to start a detonation or deflagration.

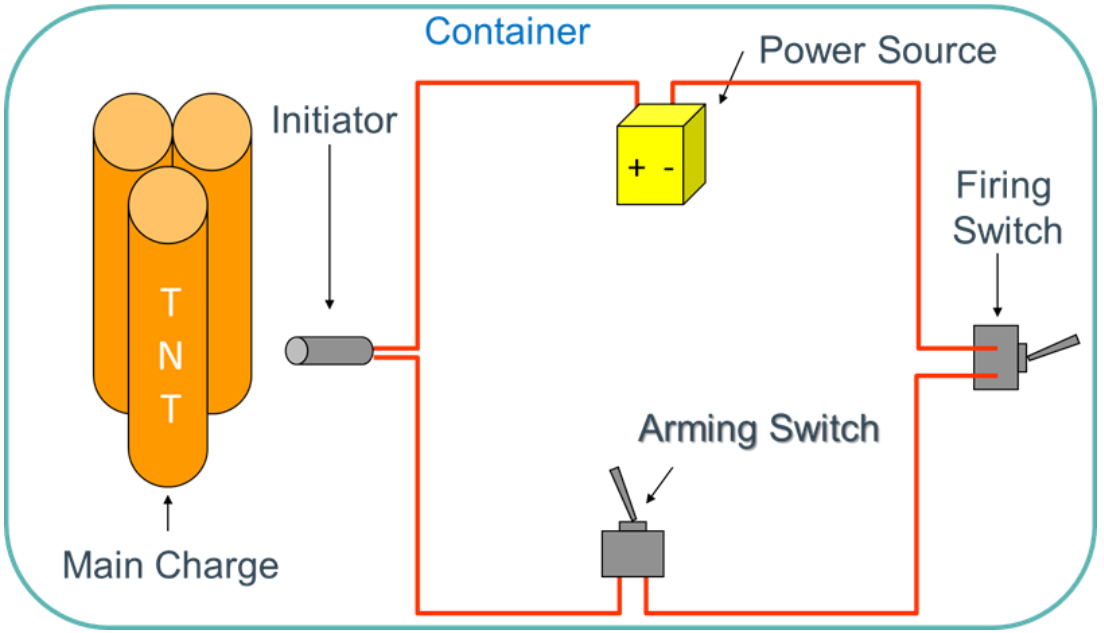
A small tube containing explosives which are sensitive to heat, shock, or friction.

Two types;

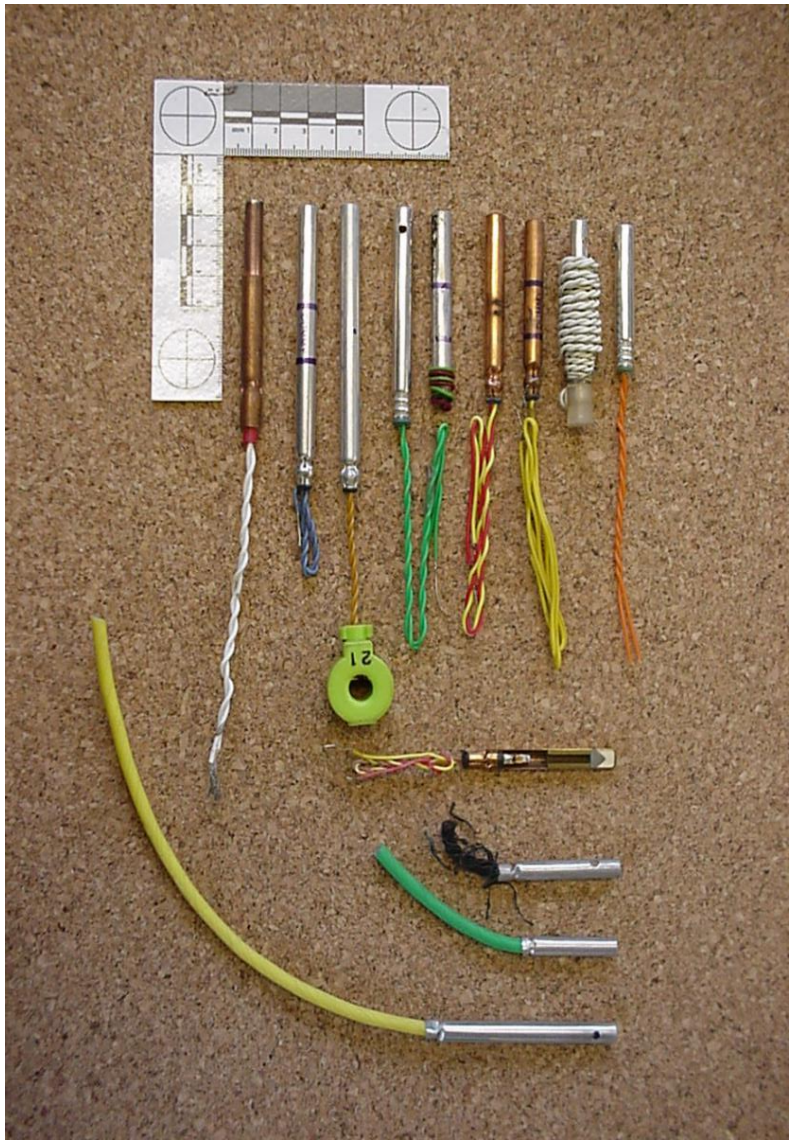
- Electric
- Non Electric

These can be:

- Military
- Commercial
- Home Made

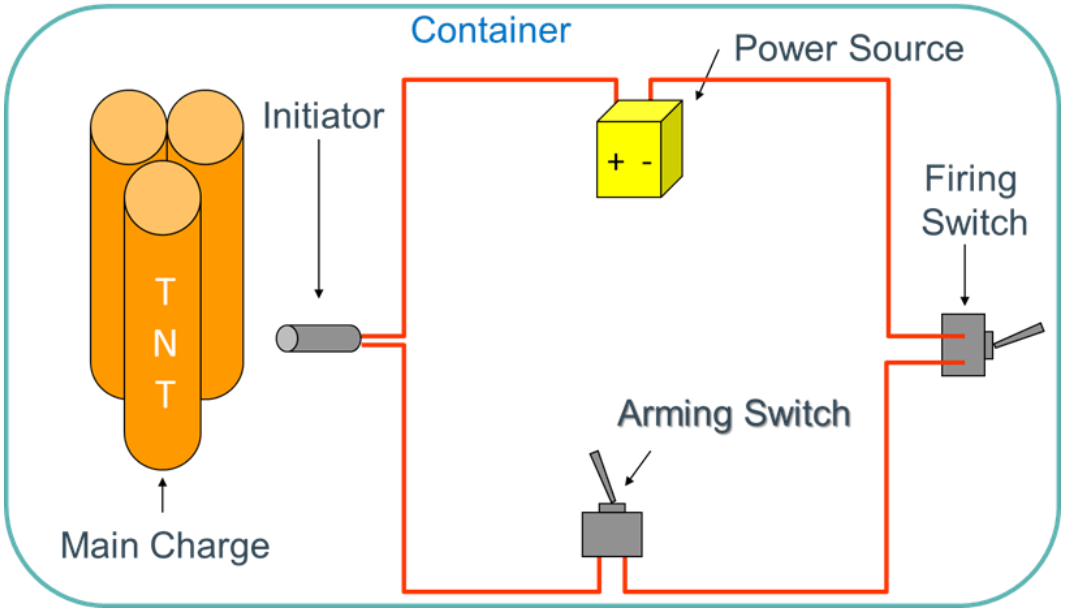


Components of an IED: Initiator



Components of an IED: Main Charge

The bulk explosive component of an IED capable of providing an explosion by its own energy when initiated



Components of an IED: Main Charge

Military

Components of an IED: Main Charge

Commercial

Components of an IED: Main Charge

Home made

Potassium Chlorate

Ammonium Nitrate Aluminum (ANAL)

Calcium Ammonium Nitrate

Components of an IED: Power Source

A device that stores or releases electrical or mechanical energy. Used to provide power to the electrical initiator.

In most cases, the power source is usually a battery.

Common battery types include:

- 12V car batteries
- 12V Motorcycle batteries
- 9V and 6V dry cells.
- Multiple AA or D cells

12V Motorcycle Battery

6V Motorcycle Battery

9V Battery used in PBIEDs

Components of an IED: Power Source

The key elements that determine the type of battery are:

- Availability
- Method of delivery
- Lead time for emplacement
- The number of initiators in the device.

12V Motorcycle Battery

6V Motorcycle Battery

9V Battery used in PBIEDs

Components of an IED: Power Source

Components of an IED: Container

- An IED Container is any item with a void within it, into which the other components of an IED are placed.
- IED containers can simply contain components of an IED or can also act to **conceal** the components and / or **confine** the explosive material of the IED which can produce direction effects.
- The container can serve both as a container and potentially an enhancement.

Components of an IED: Container

- **Plastic Containers** – 5 litre Milk Container & Yellow Oil Drums
- **Small Metal Boxes** - UVIED
- **Military Ordnance (MILORD)**
- **Vehicles (VBIED)**
- **Machined containers** for directional effects
  - Directional Fragmentation Charges (DFC)
  - Improvised Claymores (IC)
  - Platter charges
  - Explosive Formed Projectile (EFP)
- **Vests** – used by PBIED

Components of an IED: Enhancements

- An optional, deliberately added components (as opposed to secondary hazard) which modifies the effect of an IED. The IED would be effective, yet produce a different measurable result if enhancements are not added
- Enhancements are also considered a characteristic of a container
- Indicators/Observables - The following indicators could be evidence of efforts to enhance IEDs:-
  - **Fragmentation** such as ball bearings, nuts, bolts, washers, nails, bullets, shell casings, scrap metal, rocks, glass, etc.
  - **Gas cylinders & containers** – Compressed Propane, Oxygen, Acetylene and other gases, intended to increase blast, thermal and / or fragmentation effects.
  - **Liquid Gasoline, diesel and paraffin** in plastic or metal containers could be present as an attempt to give the IED a greater blast and/or thermal effect.
  - **Charge Effect**

Ball bearings

Ball bearing mixed with explosive

Components of an IED: Enhancements

Explosive Effects

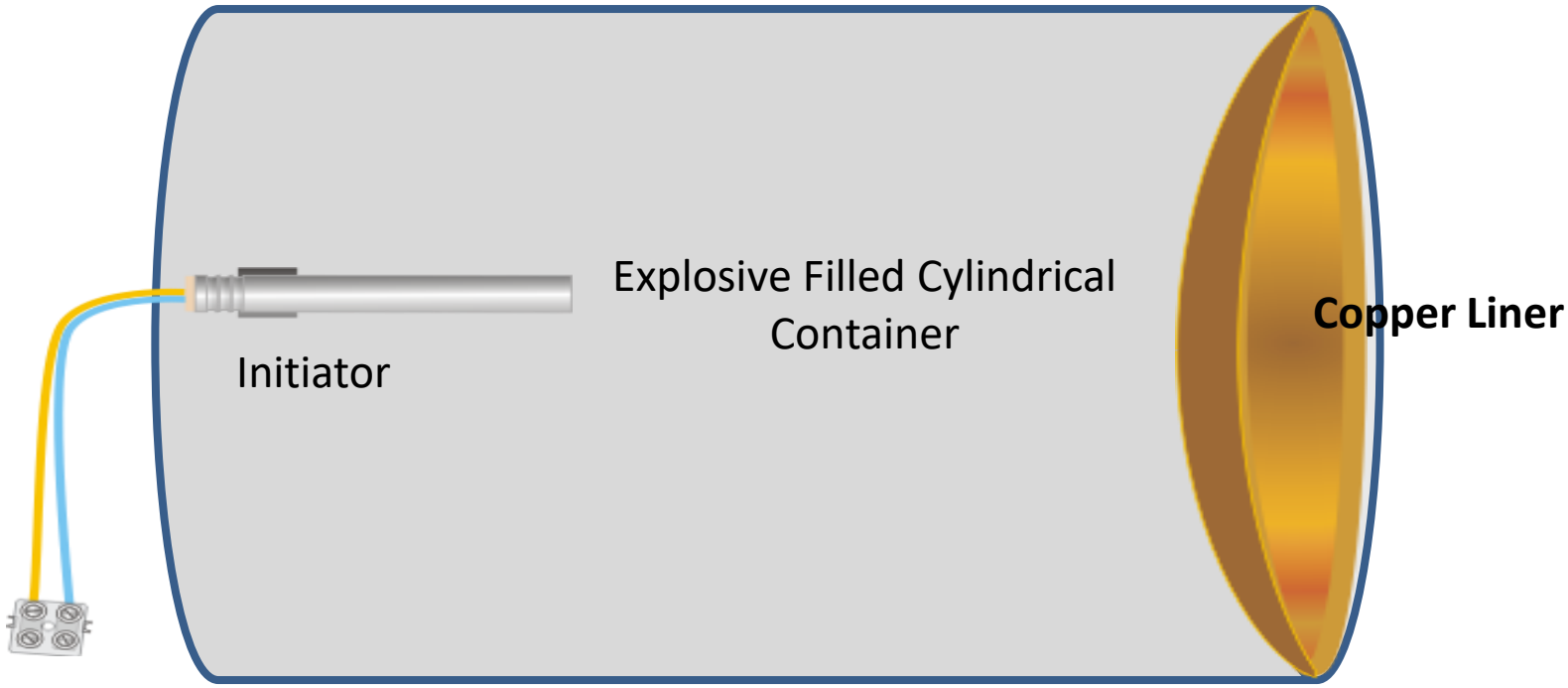
1. Blast
2. Fragmentation
   - Omni-directional
   - DFC
3. Anti-Armour
   - EFP

Components of an IED: Enhancements

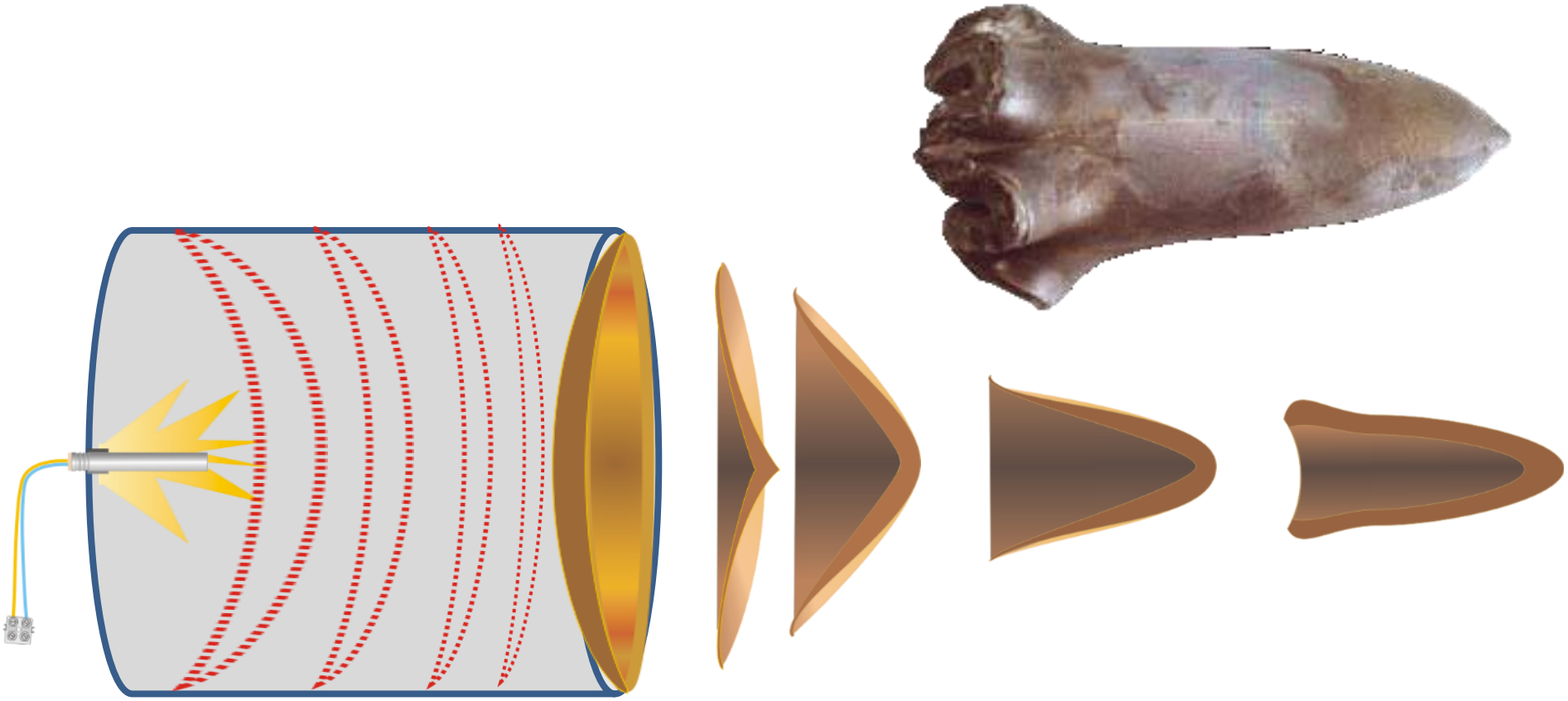
Explosively Formed Penetrator, Self Forging Fragment

The EFP can defeat the new generation armoured vehicles.

Components of an IED: Main Charge



Components of an IED: Enhancements



Questions?

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IED Initiation Systems (Type of Switches)

IED Initiation Systems: Command

This category of IED comprises command switches. This is a type of switch that is activated by the attacker in which s/he controls the device and function it at an opportune moment.

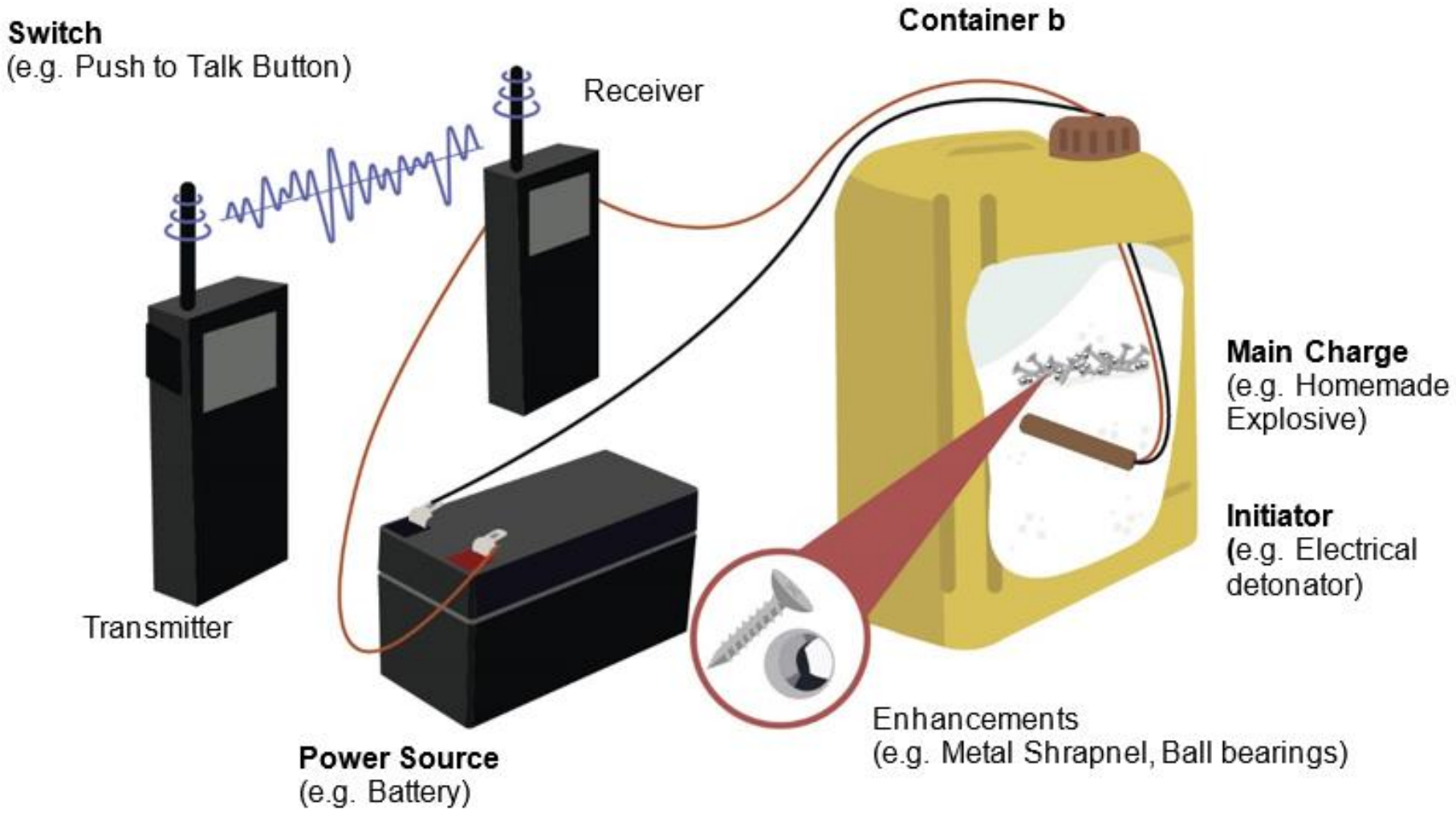
Command IEDs operate in two modes

- Physical link
- Non-physical link

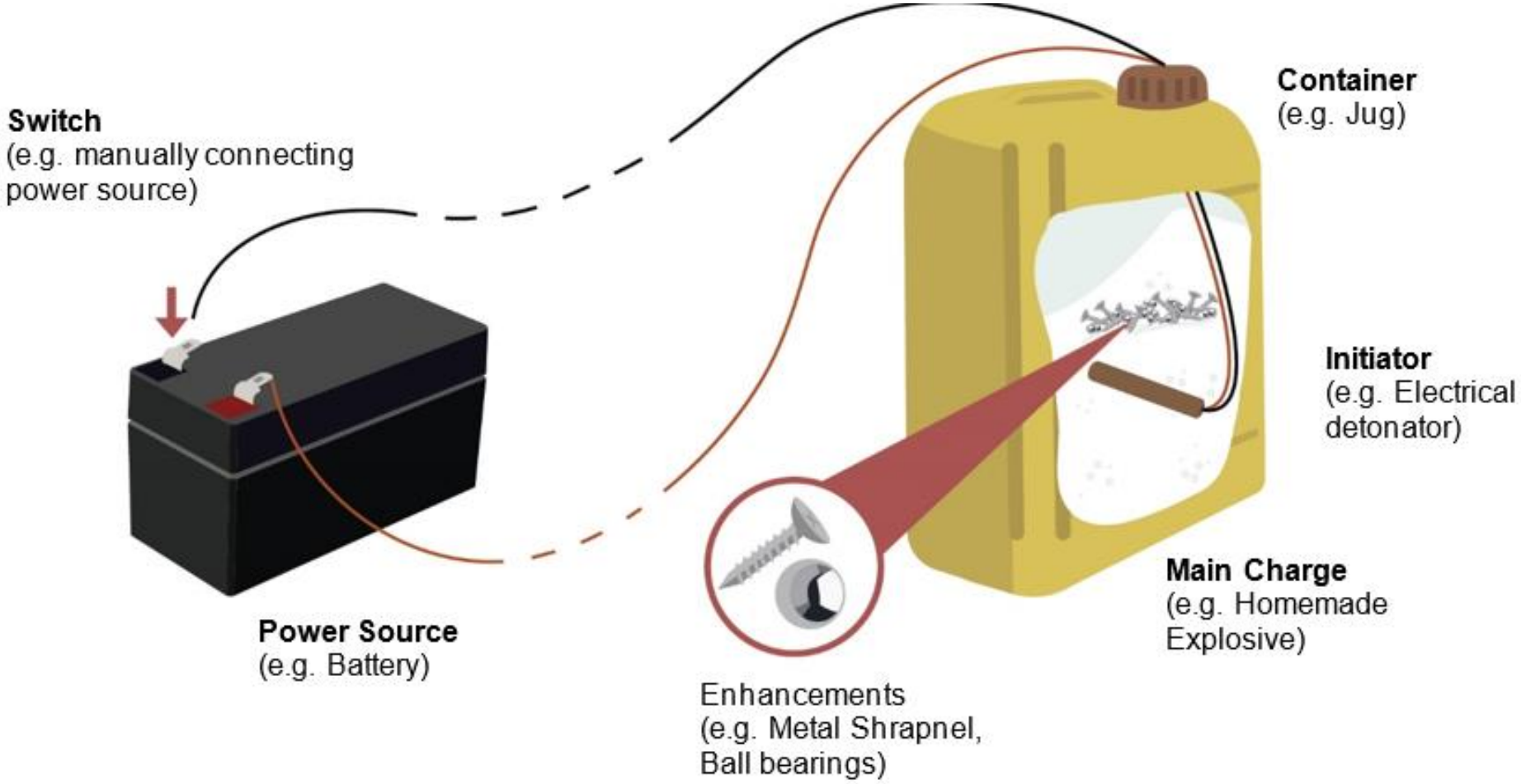
IED Initiation Systems: Command

- Used to attack specific targets.
- Used against slow moving and static targets but which are in a predictable location at a somewhat predictable time
- Required the attacker to identify a firing point and a contact point.
- Includes suicide IEDs

IED Initiation Systems: Command Remote Controlled IED (RCIED)



IED Initiation Systems: Command Command Wire IED (CWIED)



IED Initiation Systems: Command Suicide

Usually refers to an individual wearing explosives and detonating them in order to kill others including themselves.

The bomber will conceal explosives on and around their person, commonly using a vest and will use a timer or some other trigger to detonate the explosives.

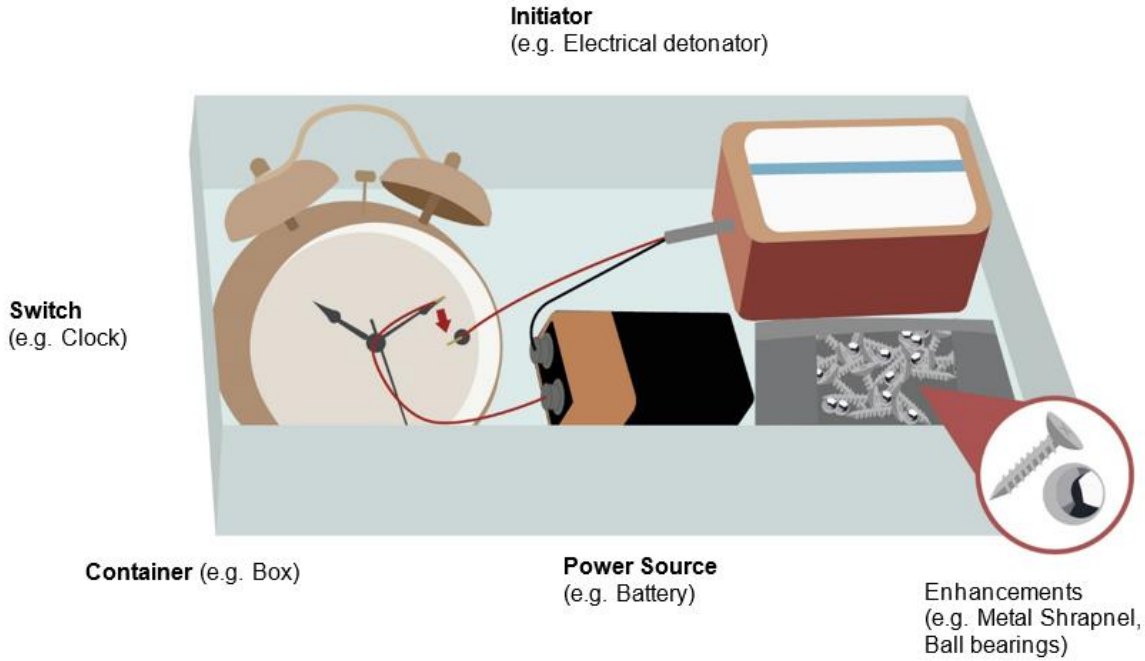
The logic behind such attacks is the belief that an IED delivered by a human has a greater chance of achieving success than any other method of attack

IED Initiation Systems: Time

- Time initiated is the method by which an IED self-initiates at a predetermined time or delay.
- The relies on accurate predictions by the aggressors of the intended target's time at a specific location.
- Used for targeting static, predictable targets.

Types of timed IEDs

- Mechanical
- Chemical
- Electronic



IED Initiation Systems: Time

Advantages

- Allows time to evacuate
- Allows time to escape
- Can be placed long before known event

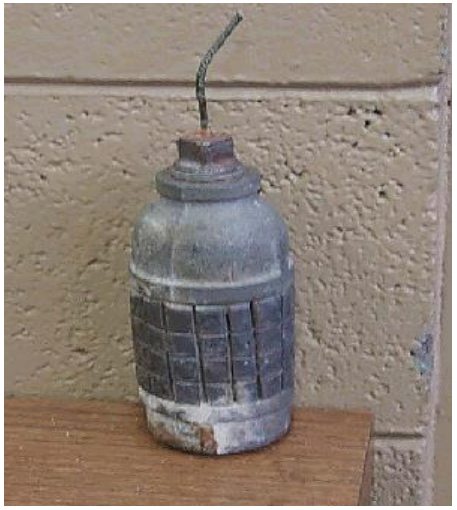
Disadvantages

- Difficult to attack a specific target
- Can be stopped by trained IEDD/EOD team
- Once set the terrorist loses control

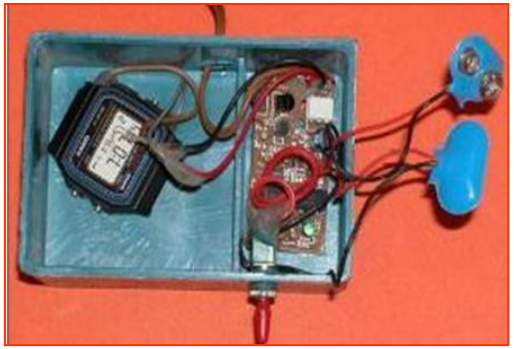
IED Initiation Systems: Time

Mechanical

Chemical



Electronic



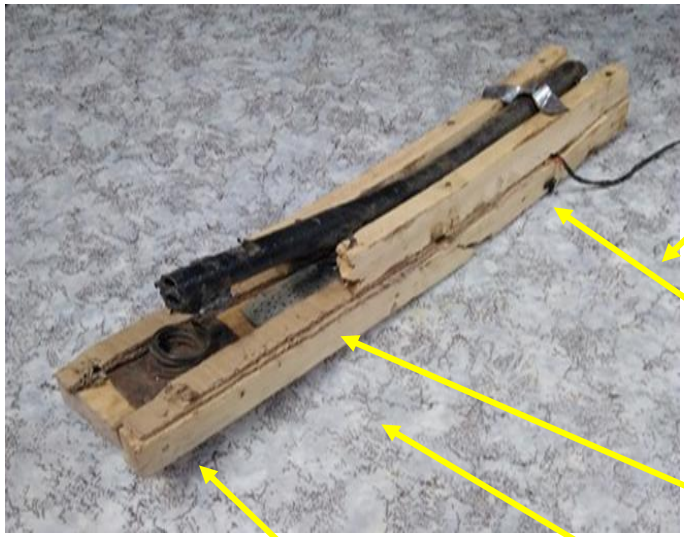
IED Initiation Systems: Victim

A switch that is activated by an unsuspecting individual. These switches rely on the intended target to carry out some form of action that will cause it to function.

Methods Of Operation

- Pull
- Release (including Anti-Lift)
- Pressure
- Movement
- Environmental Changes

IED Initiation Systems: Victim



Connection Cables

Securing/joining metal sheets

Insulated conducting lever bar

Wooden Plates

Contact point

Waterproofing polythene

When pressure is applied on top of the plate, contact of the insulated sheet of metal and spring is established at the end points and hence completion of the electrical circuit which then initiates the device.

Quiz

1. Name the components of an IED
   - *Switch, Initiator, Main Charge, Power source, Container, Switch and Enhancements (optional)*
2. Name sources of explosive used to make IEDs ?
   - *Military, commercial and Home Made Explosive.*
3. Name type of switches
   - *Command, Time, Victim operated*
4. Give examples of containers
   - *Plastic containers, small metal boxes, MILORD, vehicles, machined containers, vests*

Questions?

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