EHAT Lesson 1.1: Introduction to Explosive Hazards

Overview

1.1.1 Characteristics of Explosives

1.1.2 Introduction to Explosive Hazards

1.1.3 Explosive Hazard Environmental Indicators

Terminal Learning Objectives

At the end of this module, the participants will be able to describe the different types of explosive hazards and identify the indicators of their presence in an operational environment.

1.1.1 Characteristics of Explosives

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.

Physical States of Explosives

Solid

Liquid

Gaseous

Slurry/Gelled

Foamed

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Manufacturing Standards of Explosives

The three main standards for the manufacture of a useable explosive are:

- Safety
- Reliability
- Performance

Products of an Explosion

Heat (Flash/Light)

Smoke

Fragmentation/Missiles

Blast/Shockwave

Sound

Chemical Composition of Explosives

The two main constituents of an explosive are:

- Fuel: something to burn
- Oxidant: something to sustain burning

This decomposition characteristic takes place in one of two ways:

- Deflagration: rapid burning
- Detonation: explosion

Classes of Explosives

Low Explosives – generally have a normal design mode to deflagrate

High Explosives – have a normal design mode to detonate

Deflagration

Deflagration is a series of chemical reactions in the form of a rapid, sub-sonic, surface burning, which takes place when the explosive is ignited in a dry unconfined or confined state.

Factors affecting deflagration:

- Surface area
- Density
- Surrounding Pressure

Low Explosives

Effects of confinement

- Unconfined - normal rate
- Partially confined - propulsive
- Totally confined - bursting

Uses of Deflagration

- Propelling Charges
- Pyrotechnic Fillings
- Burning Fuzes

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, mortar 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.

Primary and Secondary Explosives

Primary Explosives. Those explosives easily ignited by flame or electrical spark and are highly sensitive to mechanical shock, friction and heat. They are too sensitive to be used except in small amounts to initiate less sensitive explosives and therefore their use is restricted to initiating roles in detonators or explosive trains.

Secondary explosives. Those explosives which can be made to detonate when initiated by a detonation wave or other shock front but which do not normally detonate when heated or ignited

Summary of Low and High Explosives

Low Explosives

- Rapid burning
- Burning on surface area only
- Pushes
- Confinement increases rate of burnin

High Explosives

- Detonation
- Shockwave travels through explosive
- Shatters
- VoD is not affected by confinement

1.1.2 Introduction to Explosive Hazards

Categories of Explosive Hazards

Conventional Explosive Ordnance (EO):

All munitions containing explosives, nuclear fission or fusion materials and biological and chemical agents

Categories of Explosive Hazards

Types 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

1.1.3 Explosive Hazard Environmental Indicators

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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