



SAFETY SERVICES ORGANISATION



Session 4.5

Special Safety Precautions

**IATG Foundation Course:
Ammunition Storage & Operations Module**



Lesson Objectives

By the end of this lesson, you should be able to:

- Identify the additional hazards, above the inherent explosive one, of certain types of ammunition
- Identify procedural and physical mitigation that may be employed to reduce those risks

Introduction

- A variety of stimuli may cause an explosive to function
- Inadvertent initiation during storage and handling may have catastrophic consequences
- This can lead to death or serious injuries
- All efforts should therefore be made to minimise the likelihood of these stimuli occurring during storage and handling

Introduction

- **Main stimuli to cause an explosion, include:**
 - Impact
 - Friction
 - Spark
 - Heat
 - Electrostatic discharge
 - Radio frequencies (RF)
 - Induced current
 - Reaction with another substance
 - Inherent chemical instability



Hazards of Specific Types of Ammunition

- **Many munitions contain dangerous chemicals in addition to the explosive hazard and require special storage and handling arrangements**

Hazards of Specific Types of Ammunition

- **White Phosphorus (WP) is used in ammunition to produce smoke**
- **It is highly flammable and unless kept wet it ignites spontaneously on contact with air**
- **Additional equipment is required at locations where WP is stored, including:**
 - Water-filled containers large enough to completely submerge the largest ammunition package
 - Additional first aid provisions must also be provided and arrangements in place for anyone affected by WP burns to swiftly reach medical support



Hazards of Specific Types of Ammunition

- Red Phosphorus (RP) is also used in smoke producing ammunition
- It is also highly flammable, but in contact with water it produces phosphine gas, which is toxic and flammable
- Ammunition containing RP should be kept in well-ventilated storage and it is imperative that water is not used on it



Hazards of Specific Types of Ammunition

- **Phosphide-filled munitions are activated by water. They also generate phosphine gas and should be stored under similar conditions to RP ammunition**
- **Metallic powders (e.g. aluminium) are often added to high explosives to provide an enhanced blast effect**
 - In contact with water or in high humidity, they can produce hydrogen gas, which is highly explosive in air
 - Therefore, where these materials are stored precautions should be taken to ensure they do not become wet



Hazards of Specific Types of Ammunition

- Stacking and storage of ammunition with additional hazards such as these are subject to additional storage limitations
- Ammunition containing WP, RP and phosphides should be stored in such a manner as to allow access to any individual package in order to facilitate rapid removal to minimise the chance of fire
- These ammunition types are to be frequently checked to identify potential leakage



Hazards of Specific Types of Ammunition

- **It is imperative to segregate WP, which requires the presence of water for safety purposes, from:**
 - RP, phosphide-filled munitions
 - Munitions containing metallic powders, which must be kept in dry conditions

Health Hazards

- **In addition to the explosive hazard, many explosives present a hazard to health due to the toxic chemicals used in their manufacture.**
- **Personnel may be affected by toxic chemicals due to:**
 - Inhalation
 - Ingestion
 - Absorption through the skin

Health Hazards

- Organo-nitrates (e.g. TNT, Tetryl/CE) are easily absorbed through the skin or by inhalation. Toxic effects can be severe, including dermatitis
- Nitrate-esters (e.g. NG) are also readily absorbed through the skin or by inhalation. Exposure can cause severe toxic effects, including excruciating headaches. Long-term exposure can lead to heart failure
- Nitramines (e.g. RDX, HMX) are less easily absorbed through the skin, but the dust can be readily ingested or inhaled. Severe cases can result in fatality
- Pyrotechnics and the taggants used to enable detection of explosives contain toxic chemicals, which present health hazards including toxic effects and dermatitis



Health Hazards

- **The main safety precautions to be applied when handling explosives include:**
 - The use of correct PPE
 - Good ventilation and extraction systems in areas where explosive vapours or dust may be present
 - Cleanliness and husbandry procedures to prevent accumulation of potentially toxic explosive dust

‘Free From Explosives’ Procedures

- **It is important that management arrangements are implemented to reduce the risk of accidents involving ammunition and explosives**
- **Fundamental to this is to ensure that ammunition and explosives are not:**
 - Left lying around
 - Disposed of with non-explosive waste

...where they may be found by people not familiar with the hazards and safety requirements for handling ammunition and explosives



‘Free From Explosives’ Procedures

- **Requirements of the “Certification of Free From Explosives (CFFE)” processes for:**
 - Items of ammunition – this is particularly important for items of ammunition that may be used for instructional purposes and display, including museum items
 - Ammunition and explosives packaging



‘Free From Explosives’ Procedures

- Buildings and land – any building or area of land that is no longer required for explosives-related work should be cleared of potential explosives contamination before being released for non-explosives use
- This is a significant task, but can be reduced by ensuring that effective procedures are in place to prevent contamination occurring in the first place



Emergency Arrangements

- Even with well-trained personnel and excellent procedures in place, it cannot be guaranteed that all accidents and incidents can be eliminated
- Therefore, management procedures should be in place in case they occur

Emergency Arrangements

- **Accidents involving ammunition and explosives may be confined to the explosives area, but may impact upon the surrounding locations**
- **Arrangements therefore are required for the evacuation of the ammunition facility and a wider evacuation of the local area if necessary**
- **Co-ordination is required with local authorities and emergency services to enable effective response to an ammunition-related incident, including:**
 - Regular liaison
 - Practising of the emergency response arrangements



Questions?

Lesson Objectives

You should now be able to:

- Describe some of the ammunition and explosives that present additional hazards in addition to the explosive hazard
- Apply physical and procedural mitigation against these additional hazards
- Understand and know how to counter the health risks of certain categories of explosives
- Understand the importance of the “Free from Explosives” procedures
- Identify and comply with emergency procedures



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