The information provided in this presentation is to be considered “Law Enforcement Sensitive”
Introduction to Explosive Recognition and Safety for On-Scene Coordinators

TYPES OF EXPLOSIVES & EXPLOSIVE EFFECTS
Objectives

- Recognize types of explosives
- Familiarization of explosive materials
- Understand explosive effects
- Identify explosives material hazards
- Recognize the dynamics of explosive injuries

TYPES OF EXPLOSIVES & EXPLOSIVE EFFECTS
Types of Explosions

- Nuclear

- Mechanical

- Chemical
Nuclear Explosions

• Fission
  – Splitting of the nucleus of atoms

• Fusion
  – Joining together under great force the nuclei of atoms
Mechanical Explosions

• Conversion of a substance such as water into a gas, in the form of steam.

• Not the conversion of a substance to a different composition, as in a chemical explosion.
Chemical Explosions

Rapid conversion of a substance, solid or liquid, into a gas
Effects of an Explosion

- Blast pressure
- Thermal/incendiary
- Fragmentation
Blast Pressure Two Phases

CONDITIONS PRIOR TO EXPLOSION

TYPES OF EXPLOSIVES & EXPLOSIVE EFFECTS
Primary Blast Pressure

Types of Explosives & Explosive Effects
Primary Blast Wave
Primary Blast Wave
Thermal / Incendiary Effects

- Measured by both length of burn and intensity

- Intense heat is given off by the rapid expansion of gases
Fragmentation Effects

Blast breaks the material around the explosive charge into pieces and projects them at high velocities.
Fragmentation & Shrapnel
Categories of Explosives

- Low Explosives
- High Explosives
- Blasting Agents
Low Explosives

Deflagrate • A rapid exothermic, self propagating chemical reaction through unreacted material
• Velocity - less than the speed of sound
Low Explosives

- When confined, may explode at near detonation velocity
- Usually consist of free flowing powders
  - Black powder
  - Smokeless powder
- Display fireworks are low explosives
Low Explosives
Smokeless & Black Powders
Low Explosives

- Black Powder and Smokeless Powder
- Subject to initiation by friction, impact, heat, flame, spark and static electricity
High Explosives

Detonate

• “Instantaneous” consumption of the explosive
• The speed that shock wave passes through unreacted material is the detonation velocity
• Designed to shatter & destroy
High Explosives

Types of Explosives & Explosive Effects
Primary High Explosives

- Extremely sensitive to initiation by heat, friction, static electricity, shock or a combination of these
- Used in small quantities

- Detonators
- Primers
Primary High Explosives

- Lead Azide, Mercury Fulminate, etc.
- Subject to initiation by friction, impact, heat, flame, spark and static electricity
- May be toxic if not handled properly
- Used in making detonators and firearms primers, as well as military and industrial applications
Detonating Cap
Primary High Explosives

Detonators (Blasting Caps)

- Fuse type – Extremely sensitive to initiation by friction, impact, heat, flame, spark and static electricity
- Electrical type – Extremely sensitive to shock, impact, or heat, and static electricity
- Gas type - Extremely sensitive to initiation by friction, impact, heat, flame, spark and static electricity
Secondary High Explosives

- Dynamite
- C-4
- TNT
- Emulsions
- Cast Boosters
- Slurries
- Det Cord

- **Relatively insensitive to heat, friction, shock, flame or static electricity**
- Usually require the help of a primary high explosive to begin the detonation process

**TYPES OF EXPLOSIVES & EXPLOSIVE EFFECTS**
Dynamite

- Dynamite is generic term
- Straight nitroglycerin dynamite
- Gelatin and semi-gelatin dynamite
- Ammonia and sodium dynamites
Dynamite
Dynamite

(NOTE: Blasting Cap Wires, on the left)
Dynamite

**Nitroglycerin-based products**
- Subject to initiation by friction, impact, heat, flame, spark and static electricity.
- Can cause extreme headaches through skin absorption when handled or fumes are present.
- Long periods of improper storage or varying climatic conditions can cause crystallization of the NG.

**TYPES OF EXPLOSIVES & EXPLOSIVE EFFECTS**
Flash Powder

• Possibly the most dangerous explosives

• A mixture of potassium perchlorate, aluminum and sulfur
Flash Powder
Flash Powder

*Photoflash Powder*
*(Perchlorate Explosive Mixture)*

- Used in fireworks and theatrical effects
- Subject to initiation by friction, impact, heat, flame, spark and static electricity
Flash Powder

Can explode when unconfined under its own weight!
Cast Boosters
Cast Boosters

* Primers and Boosters
  Relatively insensitive
Emulsions

 Explosive materials emulsified in oil
Slurries

Water base with ammonia or sodium nitrate
Detonating Cord

- Military High Explosives
- Designed to be relatively safe in handling
- Detonating Code
- Primer Cord – Relatively insensitive
Blasting Agents

- Any explosive material, intended for blasting, which cannot be detonated by a #8 detonator when unconfined.
- Ammonium nitrate and fuel oil (ANFO)
- Some water gels
ANFO

TYPES OF EXPLOSIVES & EXPLOSIVE EFFECTS
Blasting Agents

- Non-cap sensitive ANFO, water gels, emulsions and slurries –
- Usually very safe
Binary Explosives

- Two part explosives
  - Oxidizer
  - Fuel
- Not an explosive until mixed
Specialty Explosives

- Jet tappers and oil well tools containing shape charges
- Relatively insensitive
- Binary explosives when mixed are same as dynamite for sensitivity.
- Flexible charges (deta sheet, etc.)
The degree of injuries received as a result of an explosion / blast are directly affected by the following:

- Overpressure
- Fragmentation
- Impact
- Thermal effect
Overpressure Injuries

Severity of injuries caused by overpressure will directly depend upon distance/proximity to explosion and the strength of the blast wave.
Fragmentation Injuries

Caused by device fragmentation, shrapnel, or other objects / secondary fragmentation which penetrate the body.
Impact Injuries

Acceleration Injuries
Caused by blunt trauma from projectiles or fragments which impact with body.

AND
The blast pressure wave colliding with body forcing the body to accelerate.
Impact Injuries

Deceleration Injuries

Caused by body impacting a rigid surface after the explosion and acceleration is slowed or terminated.
Thermal Injuries

Burns caused by the explosive thermal effect.
If you have any questions regarding explosives or handling of explosive materials, please contact

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