

CBRNE Awareness Module 5

Overview of Explosive & Incendiary Agents




Overview 1 NJSP HMRU

CBRNE Awareness

Explosives

- ◆ Terrorist weapon of choice
- ◆ 70 percent of all terrorist incidents in the United States
- ◆ Can deliver death themselves or disperse an agent of death
- ◆ IED's
 - ◆ Vehicle bombs
 - ◆ Pipe bombs
 - ◆ Satchel devices



Overview 2 NJSP HMRU

CBRNE Awareness

Incendiary Devices

- 20-25% of all Domestic Bombings
- Ignites 75% of Time
- Preceded by Threat Less Than 5% of incidents




Overview 3 NJSP HMRU

CBRNE Awareness

Common Components

- **Components**
 - Ignition Sources
 - Combustible Filler
 - Housing or Container
- **Common Material Used**
 - Road Flares
 - Gasoline/Motor Oil
 - Light Bulbs
 - Matches/Fireworks
 - Electrical Components
 - Propane Cylinders
 - Plastic Pipes and Containers



Overview 4 NJSP HMRU

CBRNE Awareness

Explosive Devices

- **≥70% of Domestic Terrorist Incidents are Explosive**
- **Between 1990-1995 FBI Data Reveals 10,122 Actual Bombings Resulting in 355 Deaths and 3176 Injures.**




Overview 5 Kenya

CBRNE Awareness

Energetic Materials

- Pyrotechnics
- Propellants
- Explosives



Overview 6 NJSP HMRU

CBRNE Awareness


Pyrotechnics

PURPOSE

- Create smoke, light, heat and sound.

EXAMPLES:

- Display Fireworks
- Road Flares
- Smoke Grenades
- Thermites

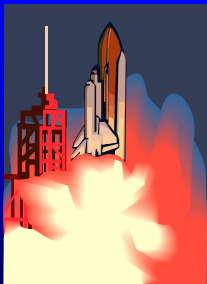


Overview 7 NJSP HMRU

CBRNE Awareness

Propellants

- Designed to procedure a controlled release of gases for the propulsion of objects.





Overview 8 NJSP HMRU

CBRNE Awareness

Explosives

- Designed to produce almost instantaneous production of super-heated gases which rapidly expand into a greater volume.



Overview 9 NJSP HMRU


CBRNE Awareness


Explosive Terminology

Explosives

- Low vs. High
- Explosives
- Blast Pressure
- Fragmentation
- Thermal Effects

Positive Blast Pressure + Negative Blast Pressure





Overview 10


CBRNE Awareness

Explosive Effects

HE in Car


Car Bomber

Hazards of being too Close



Overview 11


NJSP HMRU



CBRNE Awareness


Low Explosives

- Better known as “propellants”
 - Gunpowder
 - Fuels
 - Designated to burn and produce output as gas.
 - Combustible materials containing both fuel and oxygen.



Overview 12

NJSP HMRU



CBRNE Awareness

Shock Wave (Effectiveness)

- Explosive undergo rapid Chemical Reaction.
- Reaction pushes a shock wave
- The Speed of the shock wave is: detonation velocity.

Overview 13 NJSP HMRU

CBRNE Awareness

Initiation & Fire Train



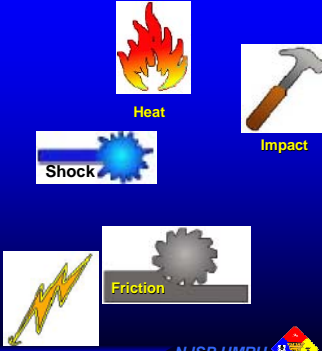
- Detonated by small impetus (spark, flame, impact)
- Large impetus that primary required to detonate
- Requires huge impetus to detonate

Overview 14 NJSP HMRU

CBRNE Awareness

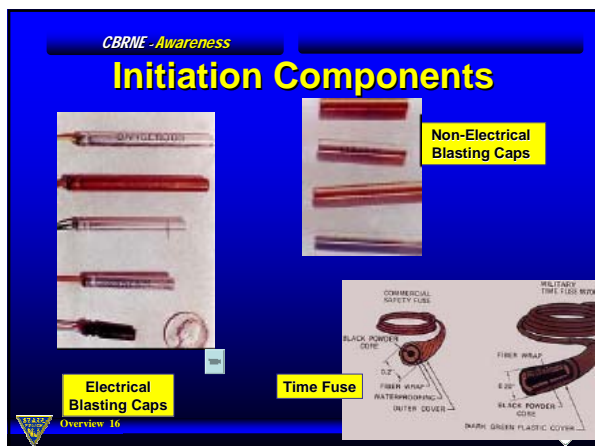
Stimuli (insults)

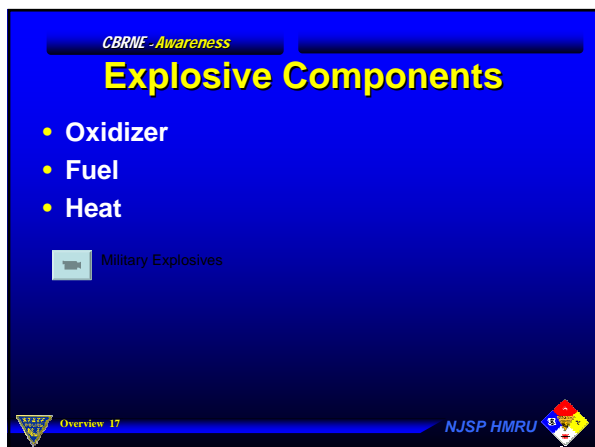
- Initiation can occur in five forms
- All created differently, but with the same final result.
- All impart energy in the form of Heat



Heat
Shock
Impact
Friction
Heat Electrostatic Discharge ESD

Overview 15 NJSP HMRU





CBRNE Awareness

Potential Oxidizers

| Name | Oxidizer | Common Counter Ions |
|--------------|--------------------------------|---|
| Perchlorates | ClO ₄ | K, NH ₄ , Na, Ba, & Ca |
| Chlorates | ClO ₃ | K, Li, Na, & Ba |
| Hypochlorite | OCl | Ca (OCl) ₂ |
| Nitrates | NO ₃ | K, NH ₄ , Na, Ba, Ag, & Sr |
| Chromates | CrO ₄ | Pb, Ba, Ca, & K |
| Dichromate's | Cr ₂ O ₇ | K ₂ Cr ₂ O ₇ |
| Iodates | IO ₃ | K, Pb, & Ag |
| Permanganate | MnO ₄ | KMnO ₄ |
| Peroxides | O ₂ -2 | Na, & Ba, also H ₂ O ₂ |

Overview 18 **NJSP HMRU**

CBRNE Awareness

Potential Fuels

- Energetic Hydrocarbons**
 - Nitrobenzene
 - Nitrotoluenes
 - Nitrocellulose
 - Picric Acid
- Others**
 - Halogens (Cl, F, etc)
 - Powdered Metals (Al, Mg, Sb)
 - Carbon Disulfide (CS₂)
 - Phosphorus (P₄)
 - Sulfur (S₈)
 - Antimony Sulfide (Sb₂S₃)


Hydrocarbons

- Petroleum
- Turpentine
- Naphtha
- Castor Oil
- Sugar
- Wax, Paraffin
- Vaseline
- Dextrin
- Shellac
- Rosin
- Saw dust
- Glycerin

Overview 19 NJSP HMRU

CBRNE Awareness

Comparisons



Overview 20 NJSP HMRU

CBRNE Awareness

Relative Effectiveness Factor

| Type of Explosive | Relative effectiveness Factor |
|-----------------------|-------------------------------|
| TNT | 1 |
| Black Powder | 0.55 |
| Nitroglycerin | 1.5 |
| Composition 4 | 1.34 |
| Composition B | 1.1 |
| Dynamite 40% | 0.65 |
| Dynamite 60% | 0.83 |
| Dynamite, Ammonia 40% | 0.41 |
| Dynamite, Ammonia 60% | 0.53 |
| Dynamite, Gelatin 40% | 0.42 |
| Dynamite, Gelatin 60% | 0.76 |

Overview 21 NJSP HMRU

CBRNE Awareness

TNT Equivalency

- The mass of TNT needed to replicate the effects produced by a test explosion, divided by the mass of the explosive tested

If 2 lbs. of explosives are needed to do the work of 1 lb. of TNT, TNT Equivalency = $\frac{1}{2}$ or 50%

If 1/2 lb. of explosives are needed to do the work of 1 lb. of TNT, TNT Equivalency = 2.0 or 200%

CBRNE Awareness

Improvised Explosive Devices

- Vehicle
- Bombs
- Pipe Bombs
- Satchel
- Charges



Overview 23 NJSP HMRU

CBRNE Awareness

Note



- High explosives are not required to make bomb.
- Traditional bomb – steel shell, filler with BP
- Fireworks fills placed in a pipe also common.

Overview 24 NJSP HMRU

CBRNE Awareness

Summary

- The most common CBRNE/WMD agents in use are still incendiaries and explosives.
- A wide variety of substances can serve as oxidizer and fuel for an explosive device, even common sugar.
- It doesn't have to be a high (1) explosive to be a deadly threat.

 Overview 25  NJSP HMRU
