Evaluating Explosive Situations

Forensic Science
Part #3
Bell-Ringer

- **Forensic Science**
- Based on the lecture discussed in class last week...what are the 5 reasons why someone might intentionally start a fire?
  - Cover Their Tracks
  - Insurance Fraud
  - Psychological Reasons
  - Murder
  - Revenge
Introduction

- **Fire and explosions** are similar reactions - both result from a combination of fuel and oxygen - the difference is simply the rate of the reaction.

- **Fires** consume their fuel (Wood, Paper, Trees) more slowly than **explosions**, which consume their fuel (gasoline, dynamite) almost instantaneously, in part because the material is confined.
So.

- If *ignited* in an unconfined space, the material simply burns, but if you tightly pack the material into a container, it *explodes* when you ignite it.

- *Explosions* create numerous problems for investigators. The explosive device and any surrounding structures are heavily damaged, if not completely destroyed.
Unless a secondary fire occurs, investigators usually can determine the point of origin with ease; however, finding fragments of the device or any igniters or timers may be difficult.
Defining Explosives

- Explosives are categorized as either high or low by the speed of their resulting pressure wave.

- **Low Explosives** typically move at rates of 1,000 m/s or less.

- **High Explosives** may reach speeds as high as 8,500 m/s.
Commonly Used Explosives

- The most readily available and commonly used low explosives are black powder and smokeless gunpowder.

- A combination of sugar and potassium chlorate makes another easy explosive.

- Bombers need not be very sophisticated!
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- What is the difference between high and low explosives?
- What causes the “Mushroom Cloud” after a nuclear explosion?
- Due at the end of Class
  - A) Bell-Ringer and Journal
  - B) P/U Pre-Lab and Experiment #31, titled, Fast Food Arson.
Division of Explosives

- **High Explosives** can be divided into two categories, depending upon their sensitivity to heat, friction or mechanical shock.

- **Initiating Explosives** are very sensitive to these effects. Because of the potential for unexpected detonations, home manufactured bombs rarely use initiating explosives.
Explosives Continued

- The explosives more often appear in primers and blasting caps, where they initiate other less sensitive non-initiating explosive materials.

- **Mercury Fulminate** and **Lead Azide** are commonly used in this way.
Non-Initiating Explosives

- NIE are less sensitive and more commonly used in commercial and military applications.
- These explosives include dynamite, **TNT, RDX** and **PETN**.
- Although you can still find dynamite, it and other nitroglycerine-based explosives have largely been replaced by– based explosives. AFNO, an **ammonium nitrate** easily made explosive material, is a mixture of ammonium nitrate and fuel oil.
Ammonium Nitrate

- **Ammonium Nitrate** is an oxygen rich oxidant that can be found in fertilizers.
- Bombs produced from this substance were involved in the Oklahoma City and 1993 World Trade Center Bombings.
Investigating a Bombing Scene

- Searching the scene for an explosion requires the same attention to detail as does the search for a fire scene.
- Finding fragments from the explosive device, igniter, and timer may be crucial to determining the type of explosive used, and ultimately, the person responsible for the bombing.
Continuing the Investigation

- In addition to locating these fragments, investigators direct their searches toward collecting debris to test for unexploded residue, which almost always is present.
- Microscopic examination of debris may reveal black powder or gunpowder, both of which are easily recognizable by the color and shape of their particles.
Continued Analysis

- After the microscopic inspection, the lab technician rinses the debris with a solvent in which most explosives are soluble (acetone is a common one) and then analyze the resulting solution, using **TLC or GC/MS**.
- Identification of the explosive is made using a combination of these tests.
- After finding out what particular explosive was used, investigators focus on finding the **seller and buyer** of that explosive.
Thanks for your attention

- Please turn in the following before you leave today:
  - A) Bell-Ringer
  - B) Journal Entry