

1 FATAL EXPLOSIONS

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2 MANY TYPES OF BOMBS (Short List)

- 1 • Atomic Bomb
 - C4
 - Car Bomb
 - Cluster Bomb
 - Dirty Bomb
 - Guided Bomb
 - Hydrogen Bomb
 - Improvised Explosive Device (IED)
 - Land Mine
 - Nail Bomb
 - Nuclear Bomb
 - Pipe Bomb
 - Pressure Cooker Bomb
- 2 • Smoke Bomb
 - Stink Bomb
 - Suicide Bomb
 - Suitcase Bomb
 - Shoe Bomb
 - Time Bomb

3 Bomb Threats

4 EXPLOSION DEFINITION

"THE SUDDEN CONVERSION OF POTENTIAL ENERGY (CHEMICAL OR MECHANICAL) INTO KINETIC ENERGY WITH THE PRODUCTION AND RELEASE OF GAS(ES) UNDER PRESSURE."

5 Two More Definitions

- High-Order Explosives
 - Releases energy rapidly through detonation
 - Produces an over-pressurization shock wave
 - TNT, C-4, SemTex, Nitroglycerine, Dynamite, and ANFO
- Low-Order Explosives
 - Releases energy slowly through deflagration (burning)
 - Produces a sub-sonic explosion and lacks an over-pressurization wave
 - Pressure builds slowly during burning within a confined space/object

- Pipe Bombs, Gunpowder, Molotov Cocktails

6 **Over-Pressurization Wave or Shock Wave**

7 **Common Causes of Explosions**

8 **1. Natural or Propane Gas Leaks**

9 **EXPLOSION EXAMPLES-Part 1**

<https://youtu.be/a4ktGQe7g4>

(Idaho State Fire Marshal Case)

And

<https://youtu.be/Bt3vtTbhSb4?t=80>

(Minnesota State Fire Marshal Propane Gas Migration Experiment)

10 **Dallas County House Explosion**

11 **Explosion (A-Side)**

12 **Explosion (Basement)**

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17 **Leak in NG Line**

18 **2. Fireworks**

19 **3. Gender Reveal Parties**

20 **4. Illicit Drug Labs**

21 **5. Runaway or Uncontrolled Chemical Reactions**

22 **Explosion Examples-Part 2**

<https://youtu.be/LNDhIGR-83w>

Beruit Explosion-Fireworks Stored With Ammonium Nitrate)

<https://youtu.be/AEppqKWMbjUI>

(Barton Solvents Plant-Des Moines, IA (10/2007)

23 **6. Homemade Incendiary Devices (“Booby Traps”)**

24 **7. Terrorist Activity**

25 **Common Blast Injuries**

26 **Primary Blast Injuries**

- Caused by the initial blast wave moving through the body

- Primarily affects gas and fluid filled anatomy
 - Lungs
 - GI tract
 - Middle ear

This injury is mostly linked to high order explosions.

27 **Secondary Blast Injuries**

- Flying debris and bomb fragments impact body

- Commonly causes both blunt and penetrating injuries to body

28 **Tertiary Blast Injuries**

- Injuries to the body caused by the individual being thrown onto or into an object by the blast wind.

- Again, both blunt and penetrating trauma can result.

29 **Quaternary Blast Injuries**

- Injuries to the body as a result of post-blast activity, such as:
 - 1) Smoke
 - 2) Heat
 - 3) Fire
 - 4) Building Collapse

30 **Quinary Blast Injuries**

- Injuries or illnesses caused by post-detonation environmental contaminants.
 - 1) Chemical (Sarin Gas)
 - 2) Biological (Anthrax)

3) Radiation (Dirty Bombs)

31 **Scene Investigation**32 **Scene Investigation**

- Treat scene similar to that of a fire scene, except:

1. Scene perimeter is larger

Rule of Thumb: Outer perimeter of the scene should be 1.50 times the distance of the furthest piece of debris evidence found.

2. Bodies may not be intact
3. Comingling of human remains is possible
4. Identification of decedents is more challenging
5. Increased scene hazards

33 **Boston Marathon Bombing Scene**34 **Scene Investigation**

- Obtain background information about the incident location.
 - Witness statements
 - If business, personnel accountability logs
 - Maintenance records
 - Weather reports
 - SOPs
 - Pre-explosion photographs/drawings of buildings
- Obtain background information about missing/deceased individuals
 - Medical histories
 - Identification information (clothing, jewelry, tattoos, scars, dental, etc.)
 - Consider collecting known DNA samples (i.e. buccal swabs)
 - Last seen alive
 - Location found

35 **Scene Investigation**36 **FBI ERT Performing Line Search - Boston Marathon Bombing**37 **Scene Investigation**

- Document scene via diagrams and photos (Aerial/Drone Video)

38 **Car Bomb Explosion-Epicenter**39 **Human Remains Recovery**

- 1) Photograph body/body part in place
- 2) Document location found
- 3) Examine body/body part for any fragile evidence
- 4) Collect evidence immediately

** Work with fire/explosion investigator when processing scene **

40 **Human Remains Recovery**

- Tag body or body part
- Place body/body part into individual body bag
- Securely close body bag
- Attach identification tag to bag
- Request forensic autopsy
-

41 **SAFETY CAVEAT**

- It may be necessary to x-ray bodies/body parts or personal effects in the field prior to recovery in order to ensure no live ordnance or other dangers are present.

- Suicide bombers
- Terrorist acts

42 **Forensic Autopsy**

- Types of cases to be autopsied and authorization are described by Iowa Code and Administrative Rule.

- Forensic Autopsies have both confirmatory and evidentiary value.

43 **Forensic Autopsy**

- Objectives:
 - Identify the decedent
 - Evidence collection
 - Determine cause and manner of death
 - Assist with reconstruction of the events leading up to an explosion
- Identification
 - Visual
 - Dentals
 - Fingerprints

- Surgical/implanted devices
- DNA

44 **Forensic Autopsy**

- Autopsy Protocols (Accident vs Criminal):
 - Full body radiographs
 - Full autopsy
 - Toxicology
 - Histology (as needed)
 - Major case hand prints
 - Tissue samples
- Physical Evidence Collection at Autopsy
 - Clothing (explosive residues)
 - Explosive/foreign matter
- Biological Evidence Collection at Autopsy
 - Body fluids
 - Organs/tissues

45 **Forensic Autopsy**

- Reconstruction
 - Location and extent of injuries are important.
 - May not always observe external trauma.
 - Lung hemorrhages due to shock wave (concussive injury)
 - Perforated ear drums
 - Spared, crow-like creases at corners of eyes indicate squinting at time of blast.
- Common to have clothing blown-off decedents located nearest the epicenter of an explosion.

46 **Putting It All Together**

- Compare autopsy findings to scene findings
- Determine if decedent was alive or deceased prior to explosion
- Determine if any human elements played role in explosion

Goal: Prevent future explosions from occurring by studying how people died from them.

47 **Resources**

- State Fire Marshal's Office

- Bureau of Alcohol, Tobacco, Firearms, and Explosives

- Local and Regional EOD / Bomb Squads

- Des Moines PD

- Cedar Rapids PD

- Waterloo PD

- Quad Cities Regional Bomb Squad

- Johnson County Sheriff's Office

- Pottawattamie County Sheriff's Office

48 **QUESTIONS ?**