Fire Investigation & Explosives

33

Section IV - Technical Operations

Metro Arson Strike Team - MAST

Fire Investigation

Preserving The Fire Scene

Explosives

Revised - December 2018

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Objectives

- Describe the Roles and Responsibilities of MAST
- Describe the role of NFPA 921 in Fire Investigations
- Describe the Scientific Method
- Describe the Four Fire Cause Classifications
- Describe Various Fire Patterns
- Describe the Indicators of an Incendiary Fire
- Define Arson
- Describe the Roles and Responsibilities of Fire Suppression Personnel in Preserving the Fire Scene
- Describe the Impacts of Salvage and Overhaul to a Fire Investigation
- Describe the Juvenile Fire Setter Program
- State the difference between low and high explosives
- Describe the different types and causes of explosions
- Describe the effects of an explosion
- State the procedure to follow when a suspected explosive device is found
- Describe the evacuation distances and safety precautions to take when a suspected explosive device is found
- Describe the procedure for handling fireworks, pyrotechnics, and ammunition that is turned in to the fire station for disposal

Introduction

Fire investigation plays a key role in fire hazard recognition and mitigation. Fire suppression works efficiently to mitigate the immediate danger to life and health that a fire presents. It is the purpose of the fire investigation to determine the origin and cause of the fire. The origin and cause of the fire further mitigates the fire risk by determining the factors responsible for the fire. Was it incendiary or accidental? If it was determined to be incendiary, a criminal investigation will follow and a successful prosecution of an arsonist can decrease fire risk. An accidental fire can be the result of multiple causes. A proper fire investigation, often times, will help identify product failures and malfunctions as well as building and fire code discrepancies

Metro Arson Strike Team - MAST

MAST was created in the late 70's in response to arson fires that destroyed the Aerospace Museum and the Old Globe Theatre in Balboa Park. MAST is the acronym for the Metro Arson Strike Team. It is a multi agency unit tasked with fire and explosion investigations. The unit is located at Fire Station 1 and consists of personnel from San Diego Fire-Rescue, Police, and the Bureau of Alcohol, Tobacco, and Firearms. The unit has two full time fire investigators, two on duty bomb technicians, a bomb commander, three police detectives, a police sergeant, and an ATF special agent.

All members of the team have distinct duties and responsibilities. Investigation 67 & Investigation 69 are the designations of the on duty fire investigators. Their primary duty is to conduct an "Origin and Cause" investigation when summoned. The on duty Bomb Squad is responsible for the mitigation of any explosives related incident. This includes ammunition and fireworks pick up, identification of IED's, render safe procedures, and post blast investigations, If a fire is determined to be arson, the police detectives are responsible for the criminal investigation. ATF provides additional personnel and resources when there is a large scale fire loss, explosives event, or when certain establishments such as churches or federal buildings are involved in a fire or explosives event.

MAST Response Criteria

Various criteria have been established indicating when MAST should respond to a fire scene to conduct an investigation. They are outlined in the operations manual and include:

- Arson or suspicious fires in structures (Consider TAC Channel for consult on small fires, trash, debris, etc).
- Significant accidental fires in structures (i.e. over $50,000).
- Fire fatality or major injury/burn (except vehicle accidents).
- When an arson arrest has been made by a police officer.
- Juvenile fires age 15 years and above.
- Bomb or suspected bomb-related incident.
- Any incident where the incident commander deems a response necessary.
- Automatic on second or greater alarm structure fires.

MAST Consult Criteria

The officer in charge should contact MAST (INV 67) by land-line, cell-phone or TAC Channel when any of the following circumstances exist:

- Small arson or suspicious fires in structures (i.e. trash, debris, clothing, etc.).
- Structure fires where the cause is in doubt.
- Arson vehicle fires. Depending on the type of witness/suspect/evidence information available at scene, MAST could respond immediately or handle as a cold fire scene. If the mutual agreement is to handle the fire as a cold scene, no scene preservation is necessary. Generally these fires are handled the next morning prior to MAST going off-duty.
- Any fires that are a part of a series; structure, vehicle, rubbish and grass.
- Juvenile fires when the parents are not cooperative.
- When MAST consultation is desired.

Fire Investigation

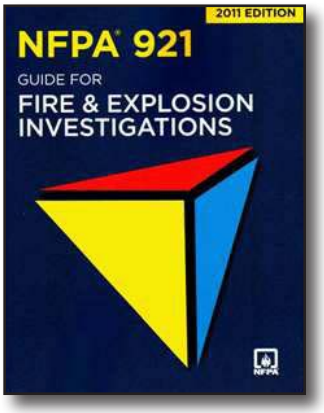
Arson

Arson is the crime of willfully and maliciously starting a fire. It is a felony that is punishable by a mutli-year prison sentence. 451 is the California Penal Code for the crime of arson. Motive and intent are elements needed to help identify potential suspects of arson. Motive is defined as the inner drive or impulse that is the cause of specific behavior. Intent is the deliberateness of the act. There are six major motive classifications for the crime of arson;

- Crime concealment
- Revenge (The most dangerous of the motives)
- Extremist
- Excitement
- Profit/Fraud
- Vandalism

Before an accused can be convicted of arson of property, the following elements must be proved to a judge or jury, beyond a reasonable doubt;

- A person set fire to, burned, caused to be burned or aided, counseled or procured the burning of property
- The fire was set or burning was done willfully and maliciously
- The fire caused property to burn.



NFPA 921

NFPA 921 is the Guide for Fire & Explosion Investigations. It is an authoritative text and is referred to by all stakeholders in the fire investigation arena. The investigative methods and procedures outlined in the document are accepted as industry norms.

The Scientific Method

Over the past 20 years, the field of origin and cause determination has shifted from being an "Art" of reading smoke and fire damage patterns, to utilizing a systematic, "Scientific" approach. The Scientific Method is the systematic approach which is used in the physical sciences. The systematic approach should ensure a thorough physical evaluation of the scene, careful collection of evidence, and complete documentation of the scene and evidence, all of which are required for proper fire cause determination. Here are the seven steps to the Scientific Method and how they can be applied to the fire investigation.

1. **Recognize the need**
   A fire has occurred.

2. **Define the problem**
   What caused the fire?

3. **Collect data**
   Firefighter observations, witness statements, fire patterns.

4. **Analyze data**
   Evaluate meaning of data collected

5. **Develop a hypothesis**
   Develop a cause determination theory

6. **Test the hypothesis**
   Are there other plausible cause theories?

7. **Select a final hypothesis**
   Make final cause determination

Fire Cause Classifications

There are four general categories used to classify a fire or explosion cause.

Accidental

The accidental fire cause is when there is no deliberate act associated with the fire. Common causes of accidental fires include cooking, heating, smoking materials, candles, electrical, appliances, mechanical, and spontaneous combustion.

Natural

Fires caused without direct human intervention or action can be classified as natural. Some examples include lightning, wind, and earthquakes.

Incendiary

An incendiary fire cause is when fires are intentionally ignited under circumstances in which the person knows the fire should not be ignited. Often times the terms arson and incendiary are used interchangeably. However, **motive and intent are necessary to charge a person with arson**. A lesser charge, such as a reckless fire, can also be classified as an incendiary fire.

Undetermined

When a fire cause cannot be proven to an acceptable degree of certainty, then it should be classified as undetermined.

Fire Patterns

Analysis of fire patterns is performed in an attempt to trace fire spread, identify areas of origin, and identify the fuels involved in a fire. Fire patterns are defined as the visible or measurable physical changes, or identifiable shapes, formed by a fire effect or group of fire effects. There are three basic manners in which fire patterns can be generated: heat, deposition, and consumption. Patterns can be used to interpret the movement and intensity of the fire.

If a fire progresses to flashover, fire patterns can give false indications. In pre-flashover fires, the heat energy from the fuel burning in specific locations create burn patterns near those locations. In post-flashover fires, fuel gases are everywhere. The areas where these gases burn most efficient and release the most heat is where they encounter oxygen; not necessarily where they originated.

Below are some basic fire patterns and their interpretations. Some interpretations have changed after scientific evaluation over the years. Many "arson myths" are based on old misinterpretations of the patterns. An asterisk will indicate fire patterns that have had their meanings overhauled. Rarely should a single fire pattern in and of itself be relied upon to be the basis of an origin and cause interpretation.

Figure 33-1 Annealing

Annealing

Annealing is the loss of temper from steel. It can result in the distortion or collapse of steel springs like those found in furniture. Partial annealing may reflect the direction of the fire movement.

** It was thought that annealing of springs was indicative of smoldering ignition or the presence of an ignitable liquid. Springs can collapse from their own weight, from drop down, or from extreme heat. Uniform collapse is not an indication of an accelerated fire.*

Figure 33-2 Calcination

Calcination

A process in which chemically bound water is driven out of gypsum (drywall) by the heat of the fire.

Char

Figure 33-3 Charring

Char is the carbonaceous material that has been burned or pyrolyzed and has a blackened appearance. Char patterns are dictated by fire intensity, ventilation, and location of fuel packages. Char depth is more related to heat intensity rather than it is to time.

** Shiny blisters (alligatoring) used to be interpreted as evidence of a "hot & fast" fire. Also, it was interpreted as an indicator of the use of ignitable liquids. Depth of char was interpreted as an indicator of the length of burning time.*

Crazing

Cracks that can be either straight or crescent shaped and can extend through the entire thickness of the glass. It is generally caused by a sudden cooling of hot glass.

** It was believed that crazing of glass was due to a "hot and fast" fire in which an ignitable liquid is used.*

Figure 33-4 Irregular Patterns

Drop Down

The spread of fire by the dropping or falling of burning materials. Synonymous with fall down. Drop down can give the appearance of multiple fire origins.

Irregular Patterns

Irregular, curved, or "pool shaped" patterns can be encountered by fire crews and investigators. Post-flashover, long extinguishment times or building collapse can create irregular patterns. If ignitable liquids are suspected, a sample of the affected area should be collected for laboratory analysis.

** These patterns on floors and floor coverings should not be identified as resulting from ignitable liquids on the basis of visual appearance alone.*

Figure 33-5 Oxidation

Oxidation

The basic chemical process associated with combustion. Metals will oxidize as a result of fire and heat exposure and will display a change in color.

Protected Patterns

A protected area results from an object preventing the products of combustion from depositing on the material that the object protects, or prevents the protected material from burning.

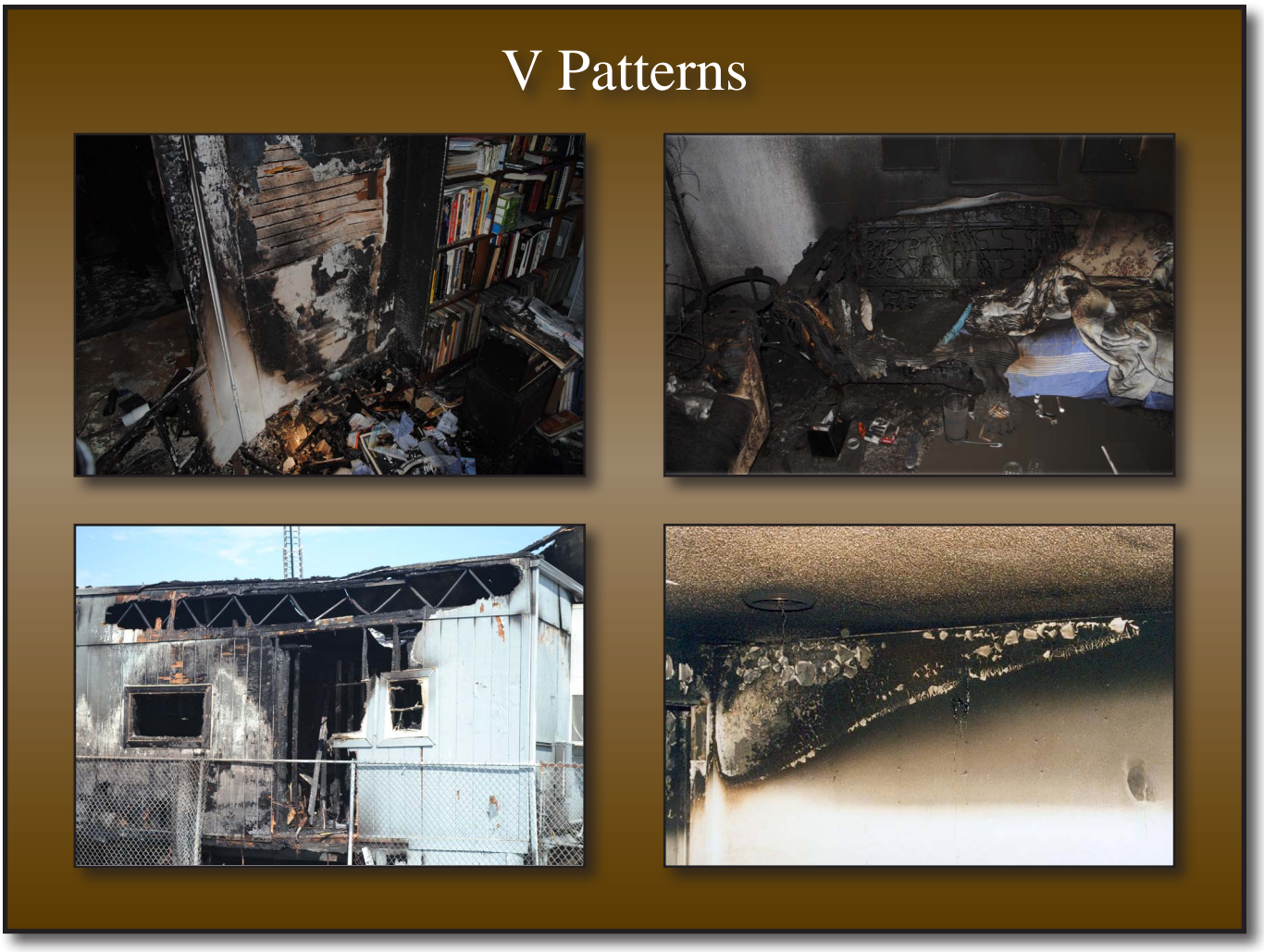
Figure 33-6 Protected Patterns, before delayering (left) and after delayering (right)

Spalling

The chipping or pitting of concrete or masonry surfaces.

** Spalling was once interpreted as an indication of an accelerant pour. It is now interpreted as damage resulting from thermal or mechanical stress.*

Figure 33-7 Spalling (above 2 images)



V Pattern

The V-shaped pattern is created by flames, convective or radiated heat from hot fire gases, or smoke within the fire plume. The pattern often appears as lines of demarcation defining the borders of the fire effect.

The angle of the V shaped pattern is dependent on several variables including the heat release rate, geometry of the fuel, ventilation, combustibility of the surface on which the pattern appears, and the presence of horizontal surfaces above the fire.

** The angle of the V- pattern does not indicate the speed of fire growth or rate of heat release of the fuel alone; that is, a wide V does not indicate a slowly ("slow") growing fire, and a narrow V does not indicate a rapidly ("fast") growing fire.*

Inverted V pattern

Inverted V or cone patterns are commonly caused by the vertical flame plumes not reaching the ceiling. The characteristic two dimensional shape forms a triangle with the base at the bottom. Inverted V patterns are indicative of or a relatively short lived fire, or a fire with a limited fuel load.

** Inverted V patterns have been interpreted as proof of ignitable liquid fires, but any fuel source that produce flames that do not become vertically restricted by a horizontal surface, such as a ceiling or furniture, can produce an inverted V pattern.*

Figure 33-8 Inverted V Pattern (above 2 images)

Line of Demarcation

Lines of demarcation are the borders defining the differences in certain heat and smoke effects of the fire on certain materials. They appear between the affected area and adjacent, unaffected area.

Figure 33-21 Line of Demarcation (above 2 images)

Incendiary Fire Indicators

There are indicators of incendiary fires that can be observed by first responders. An understanding of these indicators will help in identifying and protecting of potential evidence as well as help with cause determination.

Figure 33-9 Trailer

Trailers

A trailer is used to connect separate fuel packages, or to communicate fires from one level to another, or one room to another. Some fuels used for trailers may be ignitable liquids, solids, or combination of these items.

Accelerants

A fuel or oxidizer, often an ignitable liquid, used to initiate a fire or increase the rate of growth or spread of fire.

Flammable Liquid
A liquid that has a flash point that is below 100 F.

Combustible liquid
A liquid that has a flash point that is above 100 F.

Figure 33-10 A gas can near the point of origin may indicate the use of an accelerant or an incendiary fire

Incendiary Devices

Incendiary device is a term used to describe a wide range of mechanisms used to initiate an incendiary fire. Examples of some incendiary devices include:

- Improvised books of paper matches and cigarettes
- Tampered or modified electric devices
- Fire Bombs, commonly called Molotov cocktails.

Lack of, or Unusually Large, Fuel Loads

The first responder should observe if the fire damage is inconsistent with the amount of fuel load in the area of origin. Conversely, the presence of an unusually large fuel load in the area of origin should also heighten the first responder's index of suspicion.

Figure 33-11 Delay Device

Multiple Fires

Multiple fires are two or more separate, non related, simultaneously burning fires. Fires in different rooms, fires on different stories with no connecting fire, or separate fires inside and outside a structure are examples of multiple fires.

Other Incendiary Indicators

First responders should be cognizant of other potential incendiary indicators such as fires in remote locations, blocked or obstructed entry points, removal or replacement of contents prior to fire, and damaged or sabotaged fire protection systems.

Impacts of Salvage and Overhaul

Salvage

The movement or removal of items from a fire scene can make the reconstruction difficult for the investigation. Moving, and particularly removing contents and furnishings or other evidence at the fire scene should be avoided until the documentation, reconstruction, and analysis are complete.

Overhaul

It is during overhaul that any remaining evidence not damaged by the fire is susceptible to being destroyed or discarded. Excessive overhaul of the fire scene prior to the analysis and documentation of fire patterns can affect the investigation, including failure to determine the area of origin.

While the firefighters have the responsibility to control and extinguish the fire and then check for fire extension, they are also responsible for the preservation of evidence. These two responsibilities may appear in conflict and, as a result, it is usually the evidence that is affected during the search for hidden fire. However, if overhaul operations are performed in a systematic manner, both responsibilities can be met successfully.

Figure 33-12 A good example of systematic overhaul with minimal damage prior to the investigators arrival

Figure 33-13 Excessive overhaul prior to the investigators arrival can destroy the scene and fire patterns.

Fire Scene Preservation

Figure 33-22 Scene preservation until the arrival of fire investigators requires a strong command presence

Firefighters function as the eyes and ears of the fire investigator during the early stages of the response. First responders play a crucial role in the fire investigation because they provide the first, and sometimes only, observations of the fire close to the time the event began.

The firefighter must maintain the fire scene as close to original form as possible, making only essential changes necessary during and after fire extinguishment. Keen observation, overt attempts to preserve and protect the fire scene, and communication by the first responder is vital to the fire investigation. A strong command presence is often required by company officers to preserve the scene.

Pre Extinguishment Considerations

- Observation of witnesses at the fire scene.
- Observation of persons fleeing the fire scene.
- Observation of the security of points of entry.
- Observation of windows.
- Observation of burglar and/or smoke alarms

Extinguishment Considerations

- Judicious use of hose streams
- Disturb as little as possible
- Observation of incendiary indicators
- Observation of fire behavior

Post Extinguishment Considerations

- Establish a perimeter
- Do not allow occupants, press, or civilians in the scene
- Limit salvage and delay overhaul operations
- Use thermal imager, make small holes with pike poles, minimize drywall removal
- Do not change positions of knobs, switches, valves, or other controls
- Do not use gas tools inside the fire scene or area of origin

Fire Deaths

Extra caution should be taken when a fire death occurs. As soon as a body is discovered, and it is determined that it is beyond resuscitation, efforts should be made by fire crews to minimize firefighting operations near the victim. This includes limiting foot traffic, minimizing the use of hose lines and equipment, and avoiding the movement or manipulation of the victim.

Courtroom Testimony

Firefighters may be subpoenaed to testify in either civil or criminal proceedings. Your testimony should be impartial and relate to your observations and actions. Do not embellish or speculate in your testimony. If you do not know the answer to a question, or cannot recall the answer, simply state that you do not know. Prior to testifying in court, you may contact members MAST regarding courtroom conduct and procedures.

Juvenile Fire Setter Program

Over 50% of incendiary fires are started by juveniles. Often times, the fires are a result of childhood curiosity. In an effort to educate and prevent an unnecessary criminal prosecution of the juvenile, the option of entering the Juvenile Fire Setter Program is offered to the offending child and family. The program is administered by the Burn Institute. It provides education and counseling to the child in an attempt to deter further fire setting behavior. Entry into the program should be initiated by the first responder's company officer. Further details can be found in the operations manual.

Explosives

For the most part, firefighters will not have to deal directly with explosives. There may be occurrences, however, where firefighters will respond to incidents as a result of injuries or fires related to a bombing, or to assist the Metro Arson Strike Team/Bomb Squad during the investigation and render-safe procedures (RSP) of explosive devices.

Understanding the effects of explosions and the operating procedures at bomb incidents will aid firefighters in determining the best methods of containing the bomb scene, ensuring their own safety and that of the public, and assisting with the investigation afterwards.

Types of Explosions

Explosions can be broadly defined as the sudden and rapid escape of gases from a confined space, accompanied by high temperatures, violent shock, and loud noise. Explosions are often associated with a rapid change of liquid or solid matter to a gaseous state, although there are gases that may also explode. The difference between explosions and fires is the rate at which energy is released from the substance. Explosions are broadly categorized by the materials producing the energy and the method and rate of energy release.

Figure 33-14 Boiling Liquid Expanding Vapor Explosion, aka, B.L.E.V.E.

Mechanical Explosions

Also known as pressure-release explosions, mechanical explosions are characterized by the gradual buildup of pressure in a confined space. When the container is no longer able to withstand the pressure, it fails suddenly, releasing fragments violently from the container itself and its contents outwards in all directions. Examples include BLEVE's, steam boilers, and pressure cookers.

Chemical Explosions

Chemical explosions are caused by extremely rapid changes in the chemical nature of explosive compounds. Three types of chemical change can occur: rapid oxidation, runaway polymerization, and decomposition. Generally, the change is from a solid or liquid explosive compound to a gas, which occupies a much greater volume. This change in state takes only a fraction of a second to occur, produces extremely high temperatures, and is accompanied by shock and loud noise.

Rapid oxidation is the most prevalent of explosive conditions and is characterized by a rapid vaporization of the chemical. Polymerization is the ability of molecules to form long chains of bonds, releasing large amounts of energy (heat). The reaction, if sufficient energy is released, will initiate more polymerization at a faster rate setting off the explosion. Breaking molecular bonds, known as decomposition, will also release energy. Decomposition reactions can become explosive if they occur rapidly. Examples of decomposable chemicals are linseed oil, nitro glycerin, and decomposing dynamite. With the single exception of nuclear explosives, all manufactured ordnance are chemical explosives.

Other types of chemical explosions include the detonation or deflagration of flammable/ combustible gases, mists, and vapors (if mixed with air or an oxidizer in the proper ratio). Dust explosions are similar in nature to gas-air explosions. With just the right conditions (low humidity, fine-grade combustible material adequately dispersed in a confined space) friction, heat, spark or open flame can initiate a detonation of dusts. Examples of fuel-air explosions include the combustion engine, coal dust explosions in mining shafts, and grain dust explosions in storage silos.

Nuclear Explosions

Nuclear explosions can be induced by either fission (splitting of the nuclei of atoms) or fusion (uniting nuclei of atoms), processes which release immense quantities of energy. In addition to the devastating shock, heat, and displacement of matter, nuclear explosions release large quantities of radiation (see hazardous materials section).

Ordinary Combustion / Deflagration / Detonation

Combustion is a chemical process whereby a fuel, an oxidizer, heat, and chemically-freed ions produce heat and light. The process of combustion will stop if any one of these four elements is removed. Deflagration is a very rapid combustion; detonation is an instantaneous combustion. The rate of the burning action (or detonation velocity in explosives) is the only difference between ordinary combustion, deflagration, and detonation.

High vs. Low Explosives

Chemical explosives are broadly classified by their rate of detonation, or combustion, into low explosives (materials with a rate of detonation less than 3000 ft/sec.) and high explosives (materials with a rate of detonation 3,000 ft/sec. or greater—some as fast as 30,000 ft/sec.).

Figure 33-15 Low Explosives

Low Explosives

Low explosives tend to deflagrate (burn rapidly and intensely), unless confined. Examples include:

- Black powder
- Smokeless powder
- Firecrackers
- Fireworks

High Explosives

Figure 33-16 High Explosives

With a detonation, the explosive material is completely vaporized before any gas can escape. This process releases very hot (up to 6,0000 F) highly-pressurized gases (up to 700 tons per square inch pressure at the point of origin) at high velocities. The strength of an explosive is dependent on the amount of gas and heat produced. Brisance, the shock that an explosive projects upon its surroundings, is derived from the velocity of the detonation wave. Examples of high explosives include:

- TNT (trinitrotoluene)
- Nitroglycerin
- Dynamite
- Military ordnance (C-4, HMX, RDX, Composition-B)

When an explosive is detonated, the block, or stick of chemical explosive, is instantaneously converted from solid into a rapidly expanding mass of gases. The detonation of the explosive will produce three primary effects: blast pressure, fragmentation, and incendiary thermal effect.

Blast Pressure

Figure 33-17 Blast Pressure

Blast pressure occurs in two phases: a positive-pressure phase where gases and debris are propelled outward, and a negative- pressure phase where gases and debris return to fill the void created by the explosion. When an explosion occurs, extremely hot, expanding gases are expelled rapidly, sometimes at pressures exceeding 1,500,000 psi. This mass of expanding gas rolls outward in a spherical pattern from the point of detonation like a giant wave weighing tons, pushing, shattering, and propelling any object in its path. This wave dissipates with distance. The pressure wave leaves a partial vacuum which draws some of the gases and debris back to the point of detonation. Blast pressures can rupture eardrums and alveoli in the lungs.

Fragmentation

Encased explosives contain the rapidly expanding gases until the casing ruptures and breaks into fragments (e.g., pipe bombs, grenades). These fragments are propelled outward in all directions at great velocities. The average fragment from a pipe bomb will reach the approximate velocity of a military rifle bullet (2,700 feet/ second). These fragments will travel in a straight line of flight until they lose velocity and fall to the earth or strike an object and ricochet or become imbedded. Loose debris can also be propelled by the blast pressure creating additional fragments.

Incendiary Thermal Effect

The incendiary thermal effect is usually seen as a flash or fireball at the instant of detonation. The heat produced by an explosion, although short in duration, can cause flash burns and ignite surrounding dry, combustible materials. The incendiary effect, or the igniting of surrounding materials, is highly variable depending on the flammability of the materials and the explosive used. The responsibilities of firefighters at a suspected or actual bomb scene falls into three areas:

- To provide medical aid and rescue as necessary
- To provide fire suppression support
- To help establish an evacuation perimeter in conjunction with law enforcement personnel and MAST/Bomb Squad

First Responder Roles on Explosive Incidents

Search

Under most circumstances, it is not the duty of firefighters to search for suspected bombs or IEDs in a bomb threat situation. Acts of terrorism are considered criminal and fall under the jurisdiction of the FBI and/or SDPD. Firefighters will not be dispatched to a bomb scene unless an actual bomb or suspected device or explosive material is found, or if the circumstances indicate explosives will be found. If there is a need for explosive disarmament and/or disposal, the Metro Arson Strike Team/Bomb Squad will be dispatched to the scene.

Evacuation

Evacuation of premises is the responsibility of the building management, unless a suspected device is identified. Two factors to consider when establishing a perimeter are safe distances and shielding. Crowds should be maintained 900 ft. from unexploded devices or 300 ft. from the farthest fragment found if the explosion has already occurred. Shielding from solid dense objects such as buildings, solid walls, and the fire engine itself can provide a degree of protection from fragments and blast pressures.

General Operations

Fire companies will stage outside the perimeter of the evacuation line unless otherwise directed by MAST/Bomb Squad, to perform rescue operations or contain a fire. Note: If one explosive device is found, there is always potential for a second (...and third) bomb!

Figure 33-18 Military Flare washed up on beach

NEVER TOUCH OR ATTEMPT TO MOVE ANY SUSPICIOUS OBJECT.

Radio transmissions into or out of a suspected bomb scene should be limited to hand-held portable radios to prevent accidentally initiating electrical-or remote-controlled devices. A MAST/Bomb Squad supervisor may direct all radios (and MDC's) inside the perimeter to be turned to the "Off" position to eliminate all radio transmissions. The MAST/Bomb Squad supervisor will notify the Incident Commander when radio communications may resume.

Figure 33-19 Pipe Bomb

Firefighting operations should be limited to containing or extinguishing the fire before it involves known or suspected explosives. Do not fight fires when known explosives are burning. Burning explosives can detonate without warning. All bomb scenes are considered crime scenes and effort should be taken to preserve any and all evidence. Take special care not to damage or wash away evidence when using water to contain a fire. Crucial fragments from the bomb (e.g., fine wire, small pieces of burned fuse, etc.) can easily be flushed away with hose streams. These pieces could be crucial to the arrest and conviction of suspect(s). Once the scene of an explosion has been contained, remove all personnel from the blast area until MAST/Bomb Squad has completed its investigation.

Fireworks

Fireworks have injured or killed numerous people in San Diego County over the years. Although illegal in most of California, fireworks are frequently brought into San Diego from Mexico and other states and counties. While fireworks may appear harmless, they can cause burns, propel fragments, and if combined or confined in a small area, may detonate simultaneously with explosive force, causing severe damage and injuries.

In order to reduce this hazard to the public and assist local law enforcement officers, MAST/Bomb Squad collects and disposes of fireworks. Fireworks may be turned in to any fire station. Upon receipt, station personnel should notify MAST/Bomb Squad of the type, size, quantity, and location of the fireworks. The explosive filler in fireworks is sensitive to heat, shock, and friction. Fireworks should be stored in a cool, dry, secure location (e.g., hose tower) until picked up by MAST/Bomb Squad.

Ammunition & Military Ordnance

San Diego has former military firing ranges, such as Tierresanta and Mission Trails, where unexploded ordnance is still found occasionally. Unexploded ordnance can be extremely hazardous and potentially fatal. Any ordnance larger than 1/2" in diameter is considered explosive. Do not touch or move the ordnance. Note the location. Evacuate the area. Notify MAST/ Bomb Squad immediately.

Small arms ammunition (bullets/rounds) up to and including .50 caliber (1/2") may be turned in at any fire station for disposal by MAST/Bomb Squad. Follow the same guidelines as above for fireworks.

Figure 33-20 50 Cal Ammunition

Summary

As the fire investigation seeks to reconstruct the chain of events leading up to and determining what caused the fire, the observations and actions of the first responder play a crucial role in making an accurate origin and cause determination. It is important to make observations, take steps to preserve and protect the fire scene, document observations and actions, and communicate them through the chain of command

Media & Link Index

 MAST Narrated Presentation 1 of 2

 MAST Narrated Presentation 2 of 2

 Dynamite Shockwave

 Military Explosion Close-Call - If you can see the explosion, it can see you!

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NOTE: If you have any additional information or content that you feel would be appropriate to contribute to this Chapter or would like to report any errors or misrepresentations, please contact the SDFD Training Division or email the Drill Manual Revision Staff at

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Revisions/Updates

Date	*Revision/Update Description*