MODULE 9: EXPLOSIVES AND CRITICAL INFRASTRUCTURE

Day: 4 **Time:** 3.5 Hours **Level of Understanding:** Comprehension

Instructional Strategies:
- Lecture
- Large-Group Discussion
- Case Study
- Video
- Small-Group Exercise
- TeachBack Moment

Module Equipment/Facilities:
- Standard Classroom Setup
- Explosives Informational Posters
- Letter or Package Bomb Poster
- Handout 9.1: IED Components Activity Answer Key

Participant Materials/Handouts:
- Workbook 9.1: IED Activation Methods
- Handout 9.1: IED Components Activity
- Workbook 9.2: Explosive Capacity and Distance Tables
- Handout 9.2: Oklahoma City Bombing Case Study
- Workbook 9.3: Attack Scenarios and Safe Distances Exercise

Terminal Learning Objective

By the end of this module, you will be able to explain the effects of explosives on critical infrastructure.

Introduction

Explosives are a popular tool of terrorist organizations in carrying out attacks on selected targets and critical infrastructure. Having a basic knowledge of the characteristics of explosives, how they work, and the blast effects produced in an explosion will provide a basis for assessing the potential consequences of an explosives threat. Understanding blast pressures and other secondary effects of an explosion will assist you in determining minimum safe distances and other mitigation factors for the development of a physical protection system (PPS) against possible explosive attacks.

During this module, you will look at case studies to examine the blast effects of various explosives and discuss how the facility was attacked. You will also have an opportunity to evaluate a specific facility in order to develop a plan for mitigating an interior and exterior attack.

Module Topics

An outline of key topics and an approximate time plan are shown below.

Topic	Enabling Learning Objectives	Approximate Time
Module Introduction	▪ Not Applicable	5 minutes
Explosives	▪ Define explosion and the three main types of explosive substances.	25 minutes
Improvised Explosive Device (IED)	▪ Explain improvised explosive device components, methods of activation, and methods of delivery.	40 minutes
Effects of an Explosion	▪ Explain the physical effects of explosions.	10 minutes
Effects on Structures	▪ Describe the effects of explosions on structures.	10 minutes
Effects on Victims	▪ Describe the effects of explosions on victims.	10 minutes
Mitigating the Threat of an IED	▪ Explain strategies for mitigating the threat of an IED.	25 minutes
CBRN	▪ Describe the elements of chemical, biological, radiological, and nuclear (CBRN) as they relate to terrorism.	10 minutes
Attack Scenarios and Safe Distance Exercise	▪ Not Applicable	65 minutes
Module Summary	▪ Not Applicable	10 minutes

The module times are guidelines only. The actual time required may vary based on the experience level and interest of the participants or other factors encountered during the training session.

Key Terms

Key Term	Description
Binary explosive	An explosive manufactured and packaged in two different containers with each container housing a different component. Neither component is classified as an explosive until mixed when it becomes a detonator-sensitive explosive
Blast seat	The source of an explosives detonation
Blast wave	An area of pressure expanding supersonically outward from the blast seat

Key Term	Description
Command-activated method	Bomber initiated IED by remote control or command detonation
Container	An item or vessel that commonly houses or conceals the complete IED or principle components of the IED
Decay	A shock front's very rapid drop in pressure as it travels away from the blast seat; objects in the path of the shock front can affect the rate of decay
Explosion	An extremely rapid release of energy (gases) in the observed physical forms of light, heat, sound, and a shock wave
Explosives	Substances that have the potential to release a very large amount of energy in a very short period of time
Fragmentation	Occurs when the blast pressure effect of the explosion breaks the material that had been part of the bomb or of nearby objects into pieces
Fragments	Pieces of a bomb or nearby objects that are carried outward by the blast wave
Improvised explosive device (IED)	Any device placed or fabricated in an improvised manner incorporating destructive, lethal, noxious, pyrotechnic, or incendiary chemicals and designed to destroy, incapacitate, harass, or distract
Incident pressure	Exerted at right angles to the point of detonation as the blast wave expands
Initiator	The IED component that activates (initiates) the detonation of the explosive device (main charge)
Large vehicle-borne improvised explosive device (VBIED)	Use of a large vehicle as the container and delivery method for an IED
Line-of-sight	An expression used to describe a straight line or unobscured view between the source of an explosion and its target
Main charge	The primary explosive substance of an improvised explosive device
Power source	Creates electrical energy for an electrically initiated IED
Progressive collapse	Occurs when the collapse of one structural element causes the failure of adjoining structural elements
Reflected pressure	Occurs when incident pressure is not parallel to the direction the wave is traveling as a result of making contact with a structure
Shock front	The leading edge of a blast wave; made of compressed gasses

Key Term	Description
Shrapnel	Materials such as nails, ball bearings, or fence staples included in the construction of a bomb to produce uniform fragments that will be carried outward by the blast wave that are intended to deliberately inflict additional personal and property damage
Switches	IED component that is used to make, break, or change a connection between the power source, initiator, and main charge
Time-activated method	Use of a switch that functions after a set time is reached
Vehicle-borne improvised explosive device (VBIED)	Use of a vehicle as the container and delivery method for an IED
Victim-activated method	Use of a switch that activates by the actions of an unsuspecting individual

Abbreviations/Acronyms

Abbreviation/Acronym	Description
CBRN	Chemical, biological, radiological, and nuclear
IED	Improvised explosive device
LVBIED	Large vehicle-borne improvised explosive device
Kg	kilogram
Mps	Miles per second
TNT	Trinitrotoluene (explosive material)
VBIED	Vehicle-borne improvised explosive device

Topic: Module Introduction	**5 Minutes**

Slide 1 Explosives and Critical Infrastructure
▪ Title Slide
Graphic Description: US Flag and Seal

Module Preparation

- **Timing and Methods:** Use the suggested time plan at the beginning of the module. As with all modules in this course, read all the content (Facilitator Guide and PowerPoint slides) and familiarize yourself with each facilitator note before class.
- Be thoroughly prepared for exercises, discussions, or other activities required for the module. Follow all facilitator notes. Use a combination of lecture, large-group discussion, small-group activities, and TeachBack moments.
- **Note:** during activities and exercises, participants will continue to work in the previously assigned teams.
- **Note:** In preparation for **Addendum 9.5: Attack Scenarios and Safe Distances Exercise** the following preparation is needed:
  - During Zero Week, the facilitator team should have selected a location that will serve as the mock critical infrastructure facility for the exercise. Typically, this is building where classroom instruction takes place. The following parameters should have been used to select the location for the exercise:
    - Training Area 1: The classroom
    - Training Area 2: An exterior of the building that contains the classroom
    - The facilitator team should have also established a point of contact at the location to inform them that the participant teams will merely be conducting an exercise and not a vulnerability assessment of the facility.
    - Prior to the day of the module, review the Course Preparation section of the Course Administration document to confirm specific guidance and parameters for the location.
    - The day before the exercise occurs, remind the point of contact that the participant teams will **not** be conducting a vulnerability assessment of the facility.
    - Prior to the start of the exercise, assign one facilitator to monitor the participants conducting the interior portion of the exercise. Assign another facilitator to monitor the exterior portion of the exercise.

Orientation to Participant Guide

- When beginning this module:
  - Refer participants to the beginning of this module in the Participant Guide.
  - Note the list of addendums participants will use during this module. Explain that instructions for all activities and exercises are included in the addendums.
  - Review the key terms and abbreviations/acronyms before beginning the module.

Slide 2 Module Objective
▪ At the end of this module, you will be able to explain the effects of explosives on critical infrastructure
Graphic Description: No Graphic

- Briefly discuss the terminal learning objective.
- Highlight the key topics to be presented:
  - Explosives
  - Improvised Explosive Device (IED)
  - Effects of an Explosion
  - Effects on Structures
  - Effects on Victims
  - Mitigating the Threat of an IED
  - CBRN

Slide 3 Course Map with VAM Phases
▪ *No Text*
Graphic Description: PPS diagram with Analyze the Threat box highlighted in yellow

- Explain that this module content is part of the second phase of the vulnerability analysis methodology, which is step four on the physical protection system diagram, *Analyze the Threat*.
- Explain that when conducting a threat analysis of a critical infrastructure, it is important to understand the threat and consequences of a terrorist attack utilizing explosives.
- Tell participants that the information discussed in *Module 2: Introduction to Critical Infrastructure Security and Resilience*, *Module 5: Critical Infrastructure Components*, *Module 6: Critical Infrastructure Assets*, and *Module 7: Cybersecurity* provides the foundation for the threat analysis statement.

Topic: Explosives — 25 Minutes

Enabling Learning Objective:
- Define explosion and the three main types of explosive substances.

Slide 4 Definition of an Explosion
▪ An extremely rapid release of energy (gases) in the observed physical forms of light, heat, sound, and a shock wave
Graphic Description: No Graphic

- Define **explosion:** an extremely rapid release of energy (gases) in the observed physical forms of light, heat, sound, and a shock wave.

Slide 5 Characteristics of an Explosion
▪ A sudden escape of gases from a confined space ▪ High temperatures, a violent shock, and a loud noise
Graphic Description: No Graphic

- Explain that many types of explosions exist but all have the following characteristics:
  - A sudden and rapid escape of gases from a confined space
  - High temperatures, violent shock, and loud noise

Slide 6 Explosion Video
▪ *No Text*
Graphic Description: Van exploding with 227 kg of ammonium nitrate and fuel oil

- Tell participants that this module will discuss various explosives.
- Explain that the video is an example of a common terrorist explosion (bombing).
- **Click the image on the slide to play the animation.**
- Show video and elaborate as follows:
  - Explain the visual effects observed in the video, such as the flash of fire and the shock wave that shatters and breaks the van apart into hot fragments that travel outward at high speeds in all directions.
  - Explain that in an explosion of this nature, an individual in close proximity of the detonation would feel the effects of the heat and shock wave, as well as hear the loud boom or noise.

Slide 7 Discussion Questions
▪ What would be your greatest protection against a van filled with explosives, located at a critical infrastructure? ▪ What experience or training do you have with explosives?
Graphic Description: No Graphic

- Ask participants: **What would be your greatest protection against a van filled with explosives, located at a critical infrastructure?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Distance or separation*
- Ask participants: **What experience or training do you have with explosives?**
- Acknowledge responses. *Responses will vary but may include:*
  - *I received explosives training in the military.*
  - *I have received explosives training in other ATA courses.*
  - *I have investigated bombing incidents.*

Slide 8 Definition of Explosives
▪ Substances that have the potential to release a very large amount of energy in a very short period of time ▪ All manufactured explosives are chemical explosives
Graphic Description: No Graphic

- Define **explosives**: substances that have the potential to release a very large amount of energy in a very short period of time.
- Explain that all manufactured explosives are chemical explosives.

Slide 9 Beneficial Use of Explosives
▪ Mining ▪ Agriculture ▪ Road construction ▪ Demolition ▪ Oil exploration
Graphic Description: Building demolition explosion

- Explain that the energy generated by chemical explosives is used every day for military and commercial industrial purposes including:
  - Mining
  - Agriculture
  - Road construction
  - Demolition
  - Oil exploration

Slide 10 Types of Explosives
▪ Military ▪ Commercial ▪ Homemade
Graphic Description: Each of the effects of explosions from military, commercial, and homemade explosives

- Explain that the most popular type of terrorist attack involves the use of chemical explosives because terrorists may have:
  - Access to military or commercially manufactured explosives
  - The ability to manufacture their own explosives with chemicals available on the open market and instructions provided on the internet
- Tell participants that explosives are the primary tools of terror.
  - Besides the physiological effects, chemical bombs can cause death, destruction, and economic detriment.
  - It is important to be aware of the characteristics of chemical explosives in order to protect critical infrastructures and the people who may be located in them.

- Provide examples of terrorist attacks using each type of chemical explosive:
  - **Military** — Ramadi, Iraq; May, 2015
    - ISIS used multiple suicide vehicle borne IED's in an attack on an Iraq Military Headquarters.
    - The 25 to 30 VBIEDs ranged from large dump trucks to passenger vehicles carrying military explosives.
    - First waves of the VBIEDs penetrated security perimeters allowing others closer access to headquarter positions.
    - The Iraq military was forced to abandon positions and stockpiles of military weapons.
    - Entire city blocks were destroyed and fifty-five soldiers were killed in the attacks with unknown numbers wounded.
  - **Commercial** — Oslo, Norway, July 22, 2011
    - A lone right-wing extremist by the name of Anders Behring Breivik detonated a VBIED loaded with ammonium nitrate and fuel oil (ANFO) with safety fuse and boosters purchased commercially in Poland.
    - The vehicle borne IED detonated in front of the prime minister's office in downtown Oslo.
    - When the bomb exploded, it blew out the windows on all floors of the building, killed eight people, and injured 92.
    - The blast could be felt seven kilometers away.
    - Breivik then went on to carry out an armed shooter attack against the members of a youth camp, killing 69 more people.
  - **Homemade** — Brussels, Belgium, March 22, 2016
    - At least three attackers arrived at the Zaventem Airport in the northeast part of Brussels, Belgium.
    - At least two of them detonated improvised explosive devices (IEDs), which had been concealed in luggage.
    - One was detonated at a Delta check-in counter and the other at an American Airlines check-in counter.
    - Approximately an hour later, a second attack with explosives occurred in the tunnel between the Maelbeek Metro Station and the Arts-Loi Metro Station, located near the center of the city.
    - Thirty-two persons were killed and 200 wounded. Authorities discovered two unexploded IEDs concealed in suitcases at the airport, constructed with between 20 and 40 pounds of TATP (triacetone triperoxide), metal bolts, and nails.
    - One unexploded suicide belt was also recovered at the airport.
    - Law enforcement searched the residence from which the bombers departed earlier that morning and recovered two more IEDs concealed in suitcases, consistent with those recovered at the airport.
- Tell participants that the next section will discuss improvised explosive devices.

Topic: Improvised Explosive Device (IED) — 40 Minutes

Enabling Learning Objective:

- Explain improvised explosive device components, methods of activation, and methods of delivery.

Slide 11 Improvised Explosive Device (IED) Definition
▪ A device placed or fabricated in an improvised manner ▪ Incorporating destructive, lethal, noxious, pyrotechnic, or incendiary chemicals ▪ Designed to destroy, incapacitate, harass, or distract
Graphic Description: No Graphic

- Define **improvised explosive device (IED)**: any device placed or fabricated in an improvised manner incorporating destructive, lethal, noxious, pyrotechnic, or incendiary chemicals and designed to destroy, incapacitate, harass, or distract.
- Tell participants that simply defined, an improvised explosive device is a terrorist bomb — when detonated an IED can have devastating effects on structures and result in significant loss of human life.

Slide 12 Improvised Explosive Devices
▪ This section will cover: • Characteristics • Components • Activation methods • Tactical design • Delivery methods
Graphic Description: No Graphic

- Explain that this topic will discuss how terrorists modify explosive materials and components to create these weapons.
- Tell participants that this topic covers IED:
  - Characteristics
  - Components
  - Activation methods
  - Tactical design
  - Delivery methods
- Explain that the intention of this section is to provide information:
  - On the basic types and categories of IEDs manufactured and used by terrorists
  - To help recognition of potential vulnerabilities and ways to implement detection procedures for IEDs when securing critical assets
  - That may save lives, including those of the participants

Slide 13 IED Characteristics
▪ Normally nonmilitary components ▪ Constructed from various materials ▪ May be concealed in a package or container

▪ Can take any form ▪ Designed to deceive and compromise a facility's physical protection system
Graphic Description: No Graphic

- Explain that an IED:
  - May incorporate military explosives, but is normally devised from nonmilitary components
  - Can be constructed from various materials and creation is limited only by the imagination of the terrorists and their accessibility to explosive materials and device components
  - Are commonly concealed in some form of packaging or container that will permit access to the target
  - Can take any form so additional components may be added for concealment, transportation, or to enhance the damaging effects of the explosive
  - Designed to deceive and compromise a facilities physical protection system
- Tell participants that as plans develop to protect critical assets, the terrorists will attempt to develop a plan and possibly design an improvised explosive device to defeat security.

Slide 14 IED Components
▪ This section will cover: • Main charge • Initiator • Power source • Switches • Container
Graphic Description: An IED with the components labeled

- Tell participants that IEDs typically consists of the following components:
  - Main charge
  - Initiator
  - Power source
  - Switches
  - Container
- Tell participants that this section will explain each component.

Slide 15 Main Charge
▪ Primary explosive substance of an IED ▪ Capable of providing an explosion by its own energy
Graphic Description: An IED with the main charge indicated

- Define **main charge:** the primary explosive substance of an IED.

- Tell participants that the explosive used for the main charge can be commercial, military, or homemade.
- Explain that the main charge shown in the slide is a binary high explosive with nuts or nails added to enhance the potential for injury and death.
- Define **binary explosive**: an explosive manufactured and packaged in two different containers with each container housing a different component. Neither component is classified as an explosive until mixed when it becomes a detonator-sensitive explosive.

Slide 16 Initiator
▪ Primary component ▪ Activates the detonation of the explosive device
Graphic Description: An IED with the initiator indicated

- Define **initiator:** the IED component that activates (initiates) the detonation of the explosive device (main charge).
- Tell participants the following facts about initiators:
  - The initiator may or may not be a detonator, but must be of sufficient energy to activate the main charge.
  - Some explosives only require a spark while most explosives need a detonator.
  - Initiators may be electric or nonelectric and may be manufactured for commercial or military explosives, or homemade by the terrorist.
- Explain that the initiator is the electric detonator indicated with the red and yellow wires in the image on the slide.

Slide 17 Power Source
▪ Creates electrical energy for an electrically initiated IED
Graphic Description: An IED with the power source indicated

- Define **power source:** creates electrical energy for an electrically initiated IED.
- Tell participants that most IEDs incorporate a battery as the power source.
- Point to the batteries in the photo on the slide; they are the direct current power source.
- Explain that without a proper power source, the IED may not function.
- Tell participants that most IEDs have an electric firing system and contain circuitry, which requires the use of a power source such as a battery.

Slide 18 Switches (1 of 2)
▪ Make, break, or change a connection between the power source, initiator, and main charge ▪ Arming — breaks the connection between the power source, initiator, and main charge ▪ Firing — makes the connection between the power source, initiator and main charge
Graphic Description: No Graphic

Slide 19 Switches (2 of 2)
▪ Some switches perform both functions ▪ There may be multiple switches in the circuit
Graphic Description: An IED with the switches indicated

- Define **switches:** IED component that is used to make, break, or change a connection between the power source, initiator, and main charge.
- Tell participants that the technical design of an IED is the device circuitry and may include multiple switches with various purposes.
- Explain the two primary purposes of switches:
  - Arming — breaks the connection between the power source, initiator, and main charge
  - Firing — makes the connection between the power source, initiator and main charge
- Tell participants that depending upon the IED design:
  - Some switches perform both the arming and firing function.
  - There may also be multiple safe or arming switches and multiple firing switches in the device circuitry.
  - For example, in the Pan AM Flight 103 terrorist attack over Lockerbie, Scotland, the bomber used a clock as an arming switch and a barometric pressure switch for firing. Because of a flight delay, the detonation occurred over Lockerbie rather than the mid-Atlantic, as intended.
- Explain the switches on the image.
  - Switch 1 (alarm clock) is the arming switch.
    - Switch 1 is a time delay; the terrorist may set whatever time he needs to escape after placing the device.
    - He will turn on switch 2 after setting the time.
    - When the time has passed, the IED will now explode when switch 3 is activated.
  - Switch 2 is a safe arming switch.
    - Switch 2 is an on and off toggle switch and as long as it is in the off position the device cannot detonate.
    - This allows the terrorist to transport the IED safely.
  - Switch 3 is an antidisturbance firing switch that will initiate the device when an unsuspecting person picks up, moves, or opens the IED container.
  - The three switches each interrupt the electric circuit between the power source, initiator, and main charge.
- Tell participants that the discussion will focus next on using switches for various activation methods.

Slide 20 IED Activation Methods (Workbook 9.1)

- This section will cover:
  - Time-activated switches
  - Victim-activated switches
  - Command-activated switches

Graphic Description: No Graphic

- Tell participants that the three primary methods of activating an IED are:
  - Time-activated switches — activate when a particular time frame has passed. Digital watches and clocks are often used as switches.
  - Victim-activated switches — activate when the victim performs an action. For example, starting the ignition of a vehicle that has been wired as a switch to detonate a bomb in the vehicle.
  - Command-activated switches — activate when the command has been sent by the bomber, typically by remote control.
- Refer participants to **Workbook 9.1: IED Activation Methods.**
- Explain that the addendum contains various tools used in each of the activation methods and will be discussed on the following slides.
- Allow participants a few minutes to read the addendum.
- Call participants' attention to the numbered notes at the bottom of the tables that correspond to the superscript numbers in the column headings.

Slide 21 Time-Activated Method (Workbook 9.1)

- Function: initiation occurs after a set time is reached
- Discussion questions:
  - What is an advantage for the terrorist in using a time-activated switch?
  - What is the disadvantage?

Graphic Description: No Graphic

- Define **time-activated method**: use of a switch that functions after a set time is reached.
- Explain that timing devices may be mechanical, electronic, or chemical and many times are included in a device as an arming switch and not the firing switch.
  - Given the prevalence of electronic timers in today's world, a device can be set to activate months ahead on a certain date, hour, and minute.
  - If the terrorist constructs a device to activate at a specific time in the future, he or she must consider the life expectancy of the power source or battery.
- Refer participants to **Workbook 9.1: IED Activation Methods, Table 1: Common Time-Activated Switches**.
- Explain the use of mechanical timers, the first example in Table 1.
- Ask participants: **What is an advantage for the terrorist in using a time-activated switch?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Allows terrorist time to escape*

  - *Can reach a target that has set patterns or routines*
- Ask participants: **What is the disadvantage?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Target must maintain a pattern or routine*

Slide 22 Time-Activated Method Digital Example (Workbook 9.1)

- *No Text*

Graphic Description: A Casio watch used in an IED seen from the front and back

- Refer participants to **Table 1: Common Time-Activated Switches** in **Workbook 9.1: IED Activation Methods**.
- Explain the use of digital and electronic timers, the second example in Table 1.
- Provide an example using the images on the slide showing the front and backside of the use of a digital watch in an IED.
  - Explain that the wires are connected to the alarm for **up to** 23 hours and 59 minutes or less.
  - Numerous terrorist bombing incidents have used the Casio watch. For example, on February 16, 1999, five terrorist bombs were detonated in Tashkent, Uzbekistan, killing sixteen and injuring over one hundred people.
    - A digital Casio watch was used to activate all of the IEDs.
    - Later in a search of the terrorist bomb-making house, several Casio watches pre-wired for IED construction were found.
- Explain the use of chemical reaction delay, the third example in Table 1.
  - Terrorists sometimes use chemical agents mixed together in a sealed container as a time-activated switch.
  - The chemicals take time to heat up and expand, exploding the container.
  - Another format is to place a chemical in a capsule and put the capsule in another incompatible chemical substance.
  - When the capsule dissolves over a period of time, the two chemicals combine and explode.

Slide 23 Victim-Activated Method (Workbook 9.1)

- Function: initiation occurs as a result of the victim's actions
- Advantage: terrorist does not need to be present because the device is activated by the victim
- Disadvantage: the victim of the device may not always be the intended target

Graphic Description: No Graphic

- Define **victim-activated method:** use of a switch that activates by the actions of an unsuspecting individual.
- Tell participants that these types of switches are also very common in security technology designed to detect intruders. *Module 13*: *Security Technology* will discuss many of these.
- Explain the advantage and disadvantage of victim-activated method:

  - **Advantage** — because the switch relies on the target of the device to carry out some form of action that will cause the device to function, the terrorist need not be present.
  - **Disadvantage** — victim may not be the intended target. For example, a secretary may open a letter bomb having a loop switch instead of the security chief or another intended target.
- Refer participants to **Workbook 9.1: IED Activation Methods, Table 2: Common Victim-Activated Switches.**
- Explain how each device in the table functions in relation to the IED and provide examples.
- Explain that victim-activated switches are easily obtainable.
  - Multiple types of victim-activated switches are commercially made and used lawfully in electronics, household furnishings, appliances, and other goods. Most every type of switch can be purchased at an electronics or hobby store.
  - Tell participants that in many instances, the terrorist will manufacture a victim-activated firing switch from household items.
    - For example, removing the mercury switch from a thermostat and creating a disturbance switch can make a victim-activated switch.
    - Terrorists may also use the infrared or photocell switches found in motion detectors or automatic lighting and garage door mechanisms.

Slide 24 Victim-Activated Method Discussion (Workbook 9.1)

- What is an example of a light-sensitive switch used to activate an IED?
- What examples of a victim-activated switch could be present in the classroom?

Graphic Description: No Graphic

- Ask participants: **What is an example of a light-sensitive switch used to activate an IED?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Enclosed in a briefcase, box, or trunk that when opened and exposed to light will detonate.*
- Explain that another name used for this type of device is entrapment explosive device.
- Tell participants other examples of victim-activated devices include mail bombs, delivered packages that are left or placed at the target, or IEDs wired to a victim's vehicle.
- Ask participants: **What examples of a victim-activated switch could be present in the classroom?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Opening a door*
  - *Turning on lights*
  - *Settings on the thermometer*
- Ask participants to view the room for other examples.

Slide 25 Command-Activated Method (1 of 2) (Workbook 9.1)

- Function: initiated by the bomber by remote control device or command detonation
  - Terrorist may touch wire to battery terminals or have an ON or OFF switch
  - Suicide bomber may have a firing switch in hand

Graphic Description: No Graphic

Slide 26 Command-Activated Method (2 of 2) (Workbook 9.1)

- Advantage: allows terrorist to choose the optimum moment of initiation
- Disadvantage: the terrorist must be within the frequency range of the receiver and transmitter and generally be able to see the target in order to know when to detonate the explosive

Graphic Description: No Graphic

- Define **command-activated method:** bomber initiated IED by remote control or command detonation.
- Tell participants that to initiate the device, the terrorist may:
  - Touch a wire to a battery or have an ON or OFF switch
  - Have a firing switch in hand
- Explain the advantage and disadvantage:
  - **Advantage** — allows terrorist to choose the optimum moment of initiation. In most cases, the terrorists will be located nearby observing the target and choosing their time for detonation.
  - **Disadvantage** — requires the terrorist to remain nearby to stay within the frequency range distance between the transmitter and receiver.
- Explain that this type of remote control device has become more common as technology advances and more and more households use remote controls to operate televisions and other electronic devices, such as toys, car alarms, garage door openers, and telephones.
- Refer participants to **Workbook 9.1: IED Activation Methods, Table 3: Common Command-Activated Switches.**
- Explain how each device functions in relation to the IED.

Slide 27 Container

- An item or vessel that commonly houses the complete IED or principle components of the IED

Graphic Description: An IED with the briefcase indicated

- Define **container:** an item or vessel that commonly houses the complete IED or principle components of the IED.
- Tell participants that in the IED on the slide, the container is the briefcase.

Slide 28 Container Selection
▪ Terrorists choose based on: • Best way to reach target • Security and accessibility • Ability to conceal
Graphic Description: No Graphic

- Explain that the container is a very important component that may determine how the terrorists can reach their selected target.
  - The IED container or packaging selected by the terrorists is generally determined after completion of an assessment and extensive surveillance of the target.
  - Based on the security and accessibility to a critical infrastructure, terrorists will select a container capable of reaching close proximity to the target, even if only for a brief period, and achieve the greatest goals.
  - Most IEDs are concealed in some form of container that serves to hide and transport the device as well as maintain all of the components in place.

Slide 29 Container Characteristics
▪ Containers vary in size ▪ Original containers may be altered ▪ Size helps to determine amount of explosives
Graphic Description: An IED contained in basketballs

- Explain that containers:
  - Can vary in size
  - Are sometimes altered from the original shape to have all the components function properly
  - The size of the IED container helps determine the quantity or weight of explosives.
- Provide examples:
  - If a remote control switch is included in the IED circuitry the receiver may require that an antennae wire be visible outside of the container. Terrorists may also attempt to conceal a safe arming switch on the exterior of the container.
  - A briefcase may contain up to 20 kg of explosives, while a large vehicle can hold approximately 27,000 kg.
  - Some IEDs, such as a pipe bomb, require containment to obtain explosive effects.
    - The pipe is concealed in another container, such as a backpack, and becomes a component of the main charge.
    - For example, imagine a pipe bomb with a burnt fuse that appears as though it did not function.
    - However, inside the pipe are a battery, mercury switch, timer, and initiator.
    - When an unsuspecting person moved the pipe bomb thinking it was nonfunctional, the IED detonates instead.

Slide 30 Security Awareness
▪ Be observant and suspicious of containers with alterations ▪ Determine what size vehicles and packages will be permitted at access points ▪ Be aware that checkpoints can be targets
Graphic Description: No Graphic

- Explain that security has to be observant and suspicious of any containers with alterations or modifications that look out of the ordinary.
- Explain that critical infrastructure security personnel should examine all access points to their facility and determine permissible sizes for vehicles and packages at each access point.
- Tell participants that many times terrorists will target a security checkpoint after determining that security will not allow them further access. While this attack may not disrupt the critical infrastructure, it may be a symbolic achievement.

Slide 31 IED Components Activity (1 of 2) (Handout 9.2)
▪ Purpose: to identify components of an IED • Duration: 10 minutes (5-activity; 5-debrief) • Group composition: table groups • Debrief: large-group discussion
Graphic Description: No Graphic

Slide 32 IED Components Activity (2 of 2) (Handout 9.2)
▪ *No Text*
Graphic Description: IED

- Refer participants to **Handout 9.2: IED Components Activity.**
- Tell participants to:
  - Work with their group to identify the numbered components on **Figure 1: Improvised Explosive Device Components**.
  - Use the list of components provided in the addendum to label each component by completing the table under Figure 1.
- Advance to the slide that shows the image of the IED and call on participants to share their responses with the class.
- Be sure to point out all the components.

Slide 33 TeachBack Moment
▪ What are the three methods of activating an IED?
Graphic Description: No Graphic

- Conduct a TeachBack moment to assess how well the participants understand the content presented in this section of the module.
- Ask participants: **What are the three methods of activating an IED?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Time-activated*
  - *Victim-activated*
  - *Command-activated*
- Ask participants whether they have any questions about IED components or activation.
- Tell participants that next they will learn the tactical design and delivery methods of an IED.

Slide 34 IED Tactical Design Considerations (1 of 2)

- Ineffective security measures lead to terrorists' undetected access
  - Tactics chosen to achieve goal of getting past security and reach the target
  - Terrorists look to exploit critical infrastructures' vulnerabilities

Graphic Description: No Graphic

- Explain that effective security measures can limit a terrorist's ability to access and introduce an IED into or near critical infrastructure without detection.
- Tell participants that in order to achieve their goals, terrorists must employ IED design tactics that increase the likelihood that the IED will get past the security measures and reach the intended target.
- Explain that most critical infrastructures have some vulnerable access point and terrorists are very resourceful and patient in exploiting these vulnerabilities.
- Provide an example: A successful design tactic targeting the US military incorporated a very simple IED.
  - The October 12, 2000, attack on the US Navy ship, USS *Cole*, by two suicide bombers in a small boat was considered a significant accomplishment and motivated anti-US terrorist sympathizers.
  - The attackers used an estimated 200 to 300 kg, which killed 17 and injured 39.
  - The Navy ship was on a routine refueling stop in the harbor of Aden, Yemen.

Slide 35 IED Tactical Design Considerations (2 of 2)

- Geographical area of the target
- Position or placement of the IED
- Method of delivery and activation of the IED
- Concealment techniques
- Security barriers and checkpoints
- Escape routes and time of day

Graphic Description: Planters used as security barriers

- Explain that the terrorists' tactical design of an IED includes but is not limited to:
  - Geographical area of the target
  - Position or placement of the IED

  - Method of delivery and activation of the IED
  - Concealment techniques
  - Security barriers and checkpoints
  - Escape routes and time of day
- Tell participants that terms used to describe a specific type of device or component of a device are often used to describe all or part of the tactical design, such as the IED delivery methods that will be discussed in the next section.

Slide 36 IED Tactical Delivery Methods
▪ This section will cover: • Vehicle-borne IEDs (VBIEDs) and large vehicle-borne IEDs (LVBIEDs) • Letter or package bombs • Suicide bombs • Launched IEDs
Graphic Description: No Graphic

- Explain that this section will cover the primary IED delivery methods:
  - Vehicle-borne IEDs (VBIEDs)
  - Letter or package bombs
  - Suicide bombs
  - Launched IEDs

Slide 37 VBIED and LVBIED
▪ Are the preferred method of delivery ▪ Pose the most destructive threat to critical infrastructure ▪ Result in massive destruction and high numbers of casualties ▪ Most effective security measure — distance and separation
Graphic Description: Vehicle on fire

- Define **vehicle-borne IED (VBIED):** use of a vehicle as the container and delivery method for an IED
- Define **large vehicle-borne IED (LVBIED):** use of a large vehicle as the container and delivery method for an IED
- Explain that the vehicle-borne improvised explosive device is the preferred method of delivery by terrorists because in many instances, a VBIED is capable of getting very close to a target without detection.
- Tell participants that the VBIED is the most dangerous threat to a critical infrastructure due to its massive destruction and casualty capabilities, even at significant distances.
  - For example, a suicide bomber with a large vehicle carrying thousands of kilos of explosives drives a vehicle to the security point can cause devastation.
  - However, a suicide bomber walking up to a security gate may be able to have on his or her body 10 kg of explosives, which will still cause destruction but not as much if a terrorist used a VBIED.

- Tell participants that the single most effective security measure against a large vehicle-borne improvised explosive device is distance and separation, but this is not always possible.
- Provide examples of previous attacks using VBIEDs and LVBIEDs:
  - A failed vehicle bombing in London, one VBIED was unknowingly towed for illegal parking to an impound lot.
    - No one suspected that the vehicle contained an explosive device.
    - The impound lot notified proper authorities only after an attendant smelled a strong odor of gas coming from the vehicle.
    - Fortunately, in this instance, the authorities rendered the VBIED safe with no casualties inflicted.
  - One of the first terrorist attacks using this method occurred on April 18, 1983, at the US Embassy in Beirut, Lebanon.
    - A suicide bomber initiated the attack using a VBIED carrying approximately 910 kilos of high explosives who drove to the front of the embassy building.
    - The blast caused the front façade of the structure to collapse, killing 63 people, and injuring over 120.
    - Terrorists in the region recognized great success with this VBIED attack.
  - Within a few months of the embassy attack, on October 23, 1983, terrorists used another VBIED to attack the US Marine barracks, also in Beirut, Lebanon.
    - In this attack, a suicide driver drove a truck through security checkpoints and crashed into the barracks, initiating 5,400 kg of TNT and killing over 300 individuals.
    - Because of the success of the 1983 attacks in Beirut, terrorists continued to use this IED tactic in several successful subsequent attacks.

Slide 38 Characteristics of VBIEDs and LVBIEDs (1 of 2)
(Workbook 9.2)

- Classified based on size of the vehicle, not the quantity of explosives

Graphic Description: No Graphic

Slide 39 Characteristics of VBIEDs and LVBIEDs (2 of 2)
(Workbook 9.2)

- Advantages for terrorists:
  - High mobility
  - Mass devastation and casualties
  - Cost
- Disadvantages for terrorists:
  - Vehicle acquisition
  - Explosives acquisition
  - Driving experience

Graphic Description: No Graphic

- Refer participants to **Workbook 9.2: Explosive Capacity and Distance Tables, Table 1: ATF—Vehicle Bomb Explosion Hazard and Evacuation Distance**.

- Explain that VBIEDs are classified based on the size of the vehicle involved and not necessarily, the quantity of explosives contained.
  - Tell participants that terrorists will likely use a vehicle suitable to the type and quantity of explosives they have access to.
  - Discuss the explosive capacity, blast range, evacuation distance, and falling glass hazard for each type of vehicle shown.
- Refer participants to **Workbook 9.2: Explosive Capacity and Distance Tables, Table 2: DOD—IED Safe Standoff Distance Sheet**
- Discuss the distances needed for evacuation of each type of IED in the table.
- Explain the characteristics of LVBIEDs that appeal to terrorists.
  - **High mobility** — terrorists can drive the bomb right up to the target thus making the vehicle both the bomb and mobile delivery system.
    - For example, in Riyadh a group of terrorists sped up to the checkpoint, killing the guards with small arms fire and then drove VBIEDs into the protected compound and activated the IED.
  - **Mass devastation** — the LVBIED can cause considerable destruction. Remind participants of the previously discussed examples, US Marine barracks in Beirut, Lebanon, and the US Federal building in Oklahoma City, Oklahoma.
  - **Mass casualties** — a large vehicle loaded with explosives can cause mass casualties. Over 400 people were killed in the two bombings in Beirut and Oklahoma City.
  - **Cost** — compared to other forms of weapons of mass destruction, the LVBIED is inexpensive to build. The bomb in Oklahoma City cost the bomber about $3,000.00 US dollars, and he rented the vehicle.
- Explain the negative factors the terrorists may encounter:
  - **Vehicle acquisition** — the terrorists may have trouble acquiring a large vehicle and storing it until they are ready to construct the device.
  - **Explosives acquisition** — terrorists may have trouble acquiring the large quantity of explosives needed and experience challenges finding a location suitable to transfer and load the explosives without detection. When the terrorists try to manufacture and use homemade explosives the complexity of their tasks increases.
  - **Driving experience** — the terrorists must have an experienced driver, capable of driving, maneuvering, and parking an LVBIED.

Slide 40 Discussion Questions
▪ What are some examples of VBIED attacks? ▪ What makes a VBIED attractive to terrorists? ▪ What difficulties could a terrorist encounter when attempting to use a VBIED?
Graphic Description: No Graphic

- Conduct a brief discussion by asking participants the following questions.
- Ask participants: **What are some examples of VBIED attacks?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *June 25, 1996, Khobar Towers*
  - *August 7, 1998, US Embassies in Kenya*
  - *Tanzania, October 4, 2011, Mogadishu*

- Ask participants: **What makes a VBIED attractive to terrorists?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *High mobility*
  - *Mass devastation*
  - *Mass casualties*
  - *Inexpensive cost*
- Ask participants: **What difficulties could a terrorist encounter when attempting to use a VBIED?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Acquisition of a vehicle*
  - *Acquisition of a large quantity of explosives*
  - *Insufficient driving experience*

Slide 41 Delivered IED — Letter or Package
▪ Constructed of a flexible or moldable explosive ▪ Firing switch could be a pull switch, loop switch, or photosynthesis cell
Graphic Description: Man in protective gear carefully lifting a letter off a desk

- Tell participants that the letter or package bomb is designed to be delivered through a mail carrier, private courier, or hand-delivered by the terrorist.
- Explain letter or package bomb construction:
  - This IED is constructed with a flexible or moldable explosive and a victim-activated switch that explodes when the target opens it or pulls the contents out.
  - The firing system typically initiates by a pull switch, loop switch, photosynthesis cell, or other similar switch. For safety, an arming switch may be included in the circuitry.
  - The switches for the letter bomb have to be designed in such a way that detonation does not occur during the delivery process.
- Explain the significance of the power source and the size limitations for these types of IEDs.
  - The power source is limited in this type of IED. While the quantity of explosives is also limited, it is still capable of killing the target and others nearby.
  - Larger packages, because of their size, may contain larger quantities of explosives and greater flexibility for power sources and switches.
- Ask participants: **What steps do you take at your critical infrastructure to screen mail or delivered packages?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *No screening*
  - *Mail room employees trained to screen for suspicious packages*
  - *X-ray or technical equipment in place*
- Refer participants to the letter or package bomb poster.

Slide 42 Indicators of Delivered IED — Letter or Package (1 of 3)

- Foreign mail or special delivery markings
- Restrictive markings, such as confidential or personal
- Excessive postage
- Handwritten or poorly typed address
-

Graphic Description: No Graphic

Slide 43 Indicators of Delivered IED — Letter or Package (2 of 3)

- Incorrect titles
- Titles but no names
- Misspelling of common words
- Missing or suspicious return address

Graphic Description: No Graphic

Slide 44 Indicators of Delivered IED — Letter or Package (3 of 3)

- Stains, strange odors, or excessive weight
- Thick, bulky, or rigid envelope
- Protruding wires or tin foil
- Excessive tape or string

Graphic Description: No Graphic

- Explain that a letter or package may contain an IED if it displays any of the following characteristics. Briefly discuss each of the following:
  - Foreign mail, airmail, or special delivery markings
  - Restrictive markings, such as confidential or personal
  - Excessive postage
  - Handwritten or poorly typed address
  - Incorrect titles
  - Titles but no names
  - Misspelling of common words
  - No return address or fictitious return address
  - Return address does not match post office cancellation mark
  - Stains or strange odors
  - Excessive weight; heavy
  - Thick, bulky, or rigid envelope
  - Protruding wires or tin foil
  - Excessive securing material, such as tape or string

Slide 45 Handling of Delivered IEDs — Letter or Package

- Do not open it
- Determine whether it can be moved

▪ Attempt to learn details
Graphic Description: Person in protective gear carrying a package

- Explain that a critical infrastructure should have a policy or procedure in place for dealing with suspicious mail or packages that should include the following:
  - Do not open it
  - Determine whether it can be moved:
    - If the letter or package was delivered through the general mail, it can probably withstand limited movement. Take it to the designated screening area.
    - If the letter or package cannot be moved, evacuate the area where the suspicious item is located and contact trained professionals to conduct further examination.
  - Make an effort to learn as many details as possible about the letter or package:
    - Try to confirm the return address, whether it was sent by mail or hand-delivered, and whether it was sent by way of courier or delivery service.
    - If there is no return address, or the address or sender appear fictitious or incorrect, treat the item as suspect.
    - Treat the item as suspect if after contact with the addressee determines the item is unexpected, or if an X-ray of the item and the contents appear suspicious
    - If an IED is suspected, follow those procedures and notify appropriate officials.

Slide 46 Suicide Bombers
▪ Extremely motivated ▪ Have control and flexibility
Graphic Description: No Graphic

- Explain that suicide bombings are one of the most challenging forms to prevent.
  - The premeditated certain death of the suicide bomber clearly illustrates the extreme motivation in carrying out this type of attack.
  - The terrorist's ability to determine and adjust an attack up to the point of detonation further complicates countermeasures.

Slide 47 Suicide Bombs Preferred by Terrorists
▪ Require relatively few resources and training ▪ Have a high rate of success
Graphic Description: Man wearing a simulated suicide bomb device

- Tell participants that terrorists prefer this method because it:
  - Requires relatively few resources and training
  - Has a high rate of success

Slide 48 Suicide Bombs — Tactics and Delivery Methods (1 of 3)
▪ Can be person-borne or VBIED ▪ Person-borne has less power but still considered successful

- Bomber controls the location, method of delivery, and timing
- Can change target as circumstances dictate

Graphic Description: No Graphic

- Tell participants that suicide bombers carry the explosives either on their person or in a vehicle.
- Explain that an IED concealed on an individual has less power and is likely to cause fewer casualties than large main charge devices concealed in objects like motor vehicles. However, terrorist sympathizers may perceive even an attack at the first line of security as successful.
- Explain that suicide bombers are completely aware of their mission and as they approach a previously chosen target, they can control the time and location to detonate their devices to inflict the most destruction and injury.
- Tell participants that a well-disciplined suicide bomber becomes a low-technology precision guided weapon with the ability to change target selection as circumstances dictate.

Slide 49 Suicide Bombs — Tactics and Delivery Methods (2 of 3)

- *No Text*

Graphic Description: No Graphic

- Click the image on the slide to play the video.
- Explain that this video shows a bus explosion in Volgograd (formerly Stalingrad), Russia, on 21 October 2013, the first of three in that city, which is located near Sochi, the site of the 2014 Winter Olympics.
  - The suicide bomber was a female who detonated a suicide belt containing 500-600 grams of TNT
  - The bus carried about fifty passengers and the explosion killed seven people and injured thirty-six others.

Slide 50 Suicide Bombs — Tactics and Delivery Methods (3 of 3)

- Critical elements of a suicide bombing:
  - Design of the explosive device
  - Method of delivery
  - Target selection
- Concealment and deception:
  - Often hidden in clothes or concealed in vehicle
  - False pregnancy or physical disability

Graphic Description: Woman holding a bomb shaped to simulate pregnancy

- Explain that the critical elements of a suicide bombing are:
  - **Design of the explosive device:**
    - The design is relative to the method of delivery.

    - An effective person-borne IED on a person is more difficult to design than a vehicle-borne IED.
  - **Method of delivery:**
    - Some suicide bombers are sent on foot to attack targets that are well protected against car bombs.
    - Another tactic is to attack in two stages, the first bomber breaches security, then a second attempts to attack the primary target during the confusion following the first attack.
  - **Target selection:**
    - With the ability to activate the device on command, the suicide bomber will attempt to breach as many security barriers as possible with the intent of reaching the most protected area.
- Explain that for a suicide bomber to reach the target without detection, the bomber must use some type of concealment.
  - Hiding the suicide bomb within an article of clothing worn close to the body, such as a vest, belt, jacket, or concealed within a pocketbook, briefcase, or backpack
  - Concealing the main charge by various methods and in various locations within a vehicle, such as in the trunk or attached to the undercarriage
- Emphasize that critical infrastructure site managers should watch for creative deception tactics, such as persons appearing to be pregnant or physically disabled to avoid scrutiny, or unusual vehicle behavior.
- Provide additional examples:
  - Richard Reid, also known as the Shoe Bomber, attempted to initiate an explosive device on an American Airlines flight from Paris to Miami on December 22, 2001.
    - He molded a main charge of plastic explosive into a hollow section of his tennis shoe.
    - Fortunately, he was unable to activate his homemade detonator, and his attempted suicide bombing failed.
  - The means to conduct a suicide attack vary widely in delivery methods; for example, terrorists have used:
    - Aircraft (11 September 2001 attacks)
    - A small boat (12 October 2000 *USS Cole* attack)
    - Motor vehicles (13 May 2003 al-Hamra residential compound attack in Riyadh)
    - Individuals (1 October 2005 Bali bombings)

Slide 51 Female Suicide Bombers
▪ The number of female suicide bombers has increased significantly in recent years ▪ The fact that female bombers do not appear threatening or fit the typical suicide bomber profile provides them with greater access to targets
Graphic Description: No Graphic

- Explain the advantages, according to terrorists, of using female suicide bombers.
  - The number of female suicide bombers has increased significantly in recent years, particularly in certain terrorist organizations that actively recruit female suicide bombers.

- Females do not fit the profile of the typical male suicide bomber, allowing female bombers greater access.
- As the number of female suicide bombings has increased, so has the need for critical infrastructure security managers to recognize the potential indicators of a suicide bomber and that there is no one typical profile of a suicide bomber.

Slide 52 Launched or Thrown IED

- Can be military weapons or improvised devices
- Designed to be launched over security barriers
- Firing mechanisms typically detonate on impact

Graphic Description: Men using a rocket launcher set up in the back of a truck

- Explain the characteristics and design of launched or thrown IEDs.
  - Terrorists have improvised crude weapons capable of launching explosive devices across security barriers.
  - Improvised mortar devices have been manufactured capable of launching explosive-filled 9 kg propane tanks accurately across great distances.
    - For example, a 45 kg tank is used as the mortar or launching tube and 9 kg tanks filled with a high explosive are used as the explosive round.
  - The firing mechanisms are typically percussion type (meaning they detonate on impact), but tanks have also used timed-delay firing mechanisms as well.
  - These types of launched improvised explosive devices have been used effectively by terrorist organizations in South America.
- Tell participants that a thrown IED is typically small and may be of military design such as a hand grenade or an IED such as a pipe bomb filled with explosive substance.

Slide 53 TeachBack Moment

- What are the delivery methods of an improvised explosive device?
- Why are suicide bombs the preferred delivery method of terrorists?

Graphic Description: No Graphic

- Conduct a TeachBack moment to assess how well the participants understand the content presented in this section of the module.
- Ask participants: **What are the delivery methods of an improvised explosive device?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Vehicle-borne IEDs (VBIEDs)*
  - *Letter or package bombs*
  - *Suicide bombs*
  - *Launched IEDs*
- Ask participants: **Why are suicide bombs the preferred delivery method of terrorists?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Bomber is extremely motivated*

- *Bomber has control and flexibility*
- *Have a high rate of success*
- *Bomber can change target*
- *Require few resources and training*

Topic: Effects of an Explosion	**10 Minutes**

Enabling Learning Objective:
- Explain the physical effects of explosions.

Slide 54 Effects of an Explosion

- This section will cover:
  - Thermal effect
  - Blast pressure effects:
    - Shock front
    - Blast wave (blast pressure time phase)
    - Incident and reflected pressures
  - Fragmentation

Graphic Description: No Graphic

- Explain that during an explosion numerous physical effects occur.
- Tell participants that this section will cover the following effects:
  - Thermal effect
  - Blast pressure effects:
    - Shock front
    - Blast wave (blast pressure time phase)
    - Incident and reflected pressures
  - Fragmentation

Slide 55 Thermal Effect (1 of 2)

- Results from the tremendous quantity of heat produced
- Duration and intensity greatly affects the damage and injury potential

Graphic Description: Fireballs following an explosion

Slide 56 Thermal Effect (2 of 2)

- Commercial explosives do not generally generate enough heat to ignite nearby combustibles
- Military explosives are:
  - Designed for a greater thermal event
  - Produce secondary fires

Graphic Description: No Graphic

- Explain that the thermal effect is a result of the tremendous quantity of heat produced during the explosion.
- Tell participants, for example, the detonation of TNT generates temperatures approximately 3,600 degrees Celsius.
- Explain the following about thermal effect:
  - The duration and intensity of the thermal event greatly affects the damage and injury potential of the thermal event created in an explosion.
  - Commercial explosives do not generally generate sufficient heat for a long enough period to ignite nearby combustibles.
  - Military explosives, however, are designed for a greater thermal event and will produce secondary fires.

Slide 57 Blast Pressure Effect

- When an explosion occurs, it produces the following effects:
  - **Blast seat**
  - **Blast wave**
  - **Incident pressure**
  - **Reflected pressure**
  - **Shock front**

Graphic Description: No Graphic

- Explain that when an explosion occurs, it produces the effects listed on the slide.
- Define the following terms:
  - **Blast seat:** the source of an explosives detonation
  - **Blast wave:** an area of pressure expanding supersonically outward from the blast seat
  - **Incident pressure:** exerted at right angles to the point of detonation as the blast wave expands
  - **Reflected pressure:** occurs when incident pressure is not parallel to the direction the wave is traveling as a result of making contact with a structure
  - **Shock front:** the leading edge of a blast wave; made of compressed gasses
- Tell participants the next slides will present more information about these effects.
- Remind participants of the video of the female suicide bomber and the effect of the blast.

Slide 58 Shock Front

- Moves spherically away from explosion
- Drops in pressure rapidly as it moves away
- Shock front pressure decay can be affected by:
  - Reflective barriers
  - Tunnels
  - Corners
  - Other structural features

Graphic Description: No Graphic

- Tell participants that the leading edge of the blast wave is the shock front. It moves outwardly from the source of the explosion.
- Tell participants that as the shock front travels away from the source of the detonation (the blast seat), it loses strength and will experience a very rapid drop in pressure called decay.
- Define **decay**: a shock front's very rapid drop in pressure as it travels away from the blast seat; objects in the path of the shock front can affect the rate of decay.
- Tell participants that shock front pressure can be reduced or increased by contact with:
  - Reflective barriers
  - Tunnels
  - Corners
  - Other structural features
- Tell participants that the next section will explore the result of this build-up of pressure.

Slide 59 Blast Wave

- Hot expanding gases from an explosion compress the surrounding air to form a blast wave
  - Formed in 1/10,000 of a second
  - Travels outward at speeds greater than the speed of sound

Graphic Description: No Graphic

- Explain how the blast wave is formed:
  - As gases from an explosion expand rapidly, they create extreme pressures on the surrounding atmosphere; as the surrounding air is compressed, a blast wave forms.
  - The wave forms in 1/10,000 of a second.
  - The blast wave moves out from the point of detonation at speeds greater than the speed of sound and decay with distance to a sonic velocity.
  - A person standing at a distance from an explosion across a grassy field could see the blast wave approach as it moves across the grass, but would not hear the explosion until the wave had passed them.
  - This wave moves outward like a giant expanding bubble, destroying everything in its path.
  - The pressure wave decays very rapidly over time and has only a brief span of existence.

Slide 60 Incident and Reflected Pressures (1 of 2)

- Incident pressure is exerted at a right angle
- Reflected pressure occurs when incident pressure is not parallel to the direction the wave is traveling
- Reflected pressure may be two to nine times greater than incident pressure

Graphic Description: No Graphic

Slide 61 Incident and Reflected Pressures (2 of 2)
▪ *No Text*
Graphic Description: Diagram showing direction of incident and reflected pressures

- Remind participants of the following definitions:
  - **Incident pressure:** exerted at right angles to the point of detonation as the blast wave expands
  - **Reflected pressure:** occurs when incident pressure is not parallel to the direction the wave is traveling as a result of making contact with a structure
- Explain the differences between incident and reflective pressure.
  - Incident pressure wave is exerted outward from the source at a right angle (90 degrees) as the blast wave expands.
  - When this incident pressure makes contact with a structure that is not parallel to the direction of the wave's travel, it is reflected and reinforced, producing what is known as reflected pressure.
  - Reflected pressure is always greater than the incident pressure at the same distance from the explosion or blast seat.
  - Whatever the angle of the incident pressure, the reflected pressure wave always reflects at right angles to the exposed surface.
  - When the blast wave strikes any surface in the line of travel, there is a rapid amplification of pressure because of the piling up and reflection of the wave off the surface.
  - This reflection of the pressure occurs even though the exposed surface may collapse.
  - The reflected blast wave pressure travels away from the target surface and decreases as it travels from the reflected surface.
  - Reflected pressure may be two to nine times greater than the incident pressure produced by the explosion, which results in greater potential for structural damage.

Slide 62 Fragmentation
▪ Occurs when the blast pressure effect of the explosion breaks bomb and nearby objects into pieces ▪ Bombs can be constructed to include **shrapnel** ▪ Post-blast investigators use flight path and direction of **fragments** for bomb reconstruction
Graphic Description: IED with metal balls embedded in the explosive

- Define the following terms:
  - **Fragmentation:** occurs when the blast pressure effect of the explosion breaks the material that had been part of the bomb or of nearby objects into pieces
  - **Fragments:** pieces of a bomb or nearby objects that are carried outward by the blast wave
  - **Shrapnel:** materials such as nails, ball bearings, or fence staples included in the construction of a bomb to produce uniform fragments that will be carried outward

by the blast wave that are intended to deliberately inflict additional personal and property damage

- Explain that fragmentation occurs when the blast pressure effect of the explosion breaks the material that had been part of the bomb or of nearby objects into pieces.
  - These fragments are hurled in the direction of the blast waves at velocities comparable to a fired rifle bullet (823 mps).
  - These fragments will travel in a ballistic flight path until they lose velocity and either fall to earth or strike an object and ricochet or become embedded.
  - Explosive devices produce high velocity fragmentation emanating both from the device casing and from material close to the point of explosion, also called secondary fragmentation.
- Tell participants that occasionally, bombs are constructed to include other materials, such as nails, ball bearings, or fence staples.
  - These types of fragments are **shrapnel**.
  - Shrapnel, however, is not technically fragmentation, but a component of the bomb construction intended for the specific purpose of personal and property damage.
- Explain that post-blast investigators analyze flight paths and the direction of travel of fragmented bomb parts to identify and reconstruct an explosive device.
- Tell participants that responders find the fragmented pieces in all directions from the blast seat, inside walls, on rooftops, or in the bodies of victims.

Topic: Effects on Structures — 10 Minutes

Enabling Learning Objective:

- Describe the effects of explosions on structures.

Slide 63 Effects on Structures

- External — outside a structure
- Internal — inside a structure
- Amplification of pressures will cause greater damage and affect the structural integrity

Graphic Description: No Graphic

- Tell participants that there are two categories of blast effects:
  - External — outside a structure
  - Internal — inside a structure
- Remind participants of the explosion process previously discussed.
  - An explosion begins with a thermal event of varying magnitude followed by a violent shock.
  - The blast wave expands and the incident pressure decreases until it makes contact with objects in its line-of-sight, such as a building.
  - Then rapid amplification of reflected pressure occurs.
- Tell participants that the structural integrity of the building is affected by the amplification of pressures, both internally and externally.

- Explain that the effects of the explosion can vary significantly, depending not only on the quantity and type of explosives used, but also on the placement of the main explosive charge — outside or inside of a structure, for example.

Slide 64 External Explosion Effects Diagram (1 of 2)
1. Breaks windows; exterior walls blown in and columns may be damaged 2. Forces floors upward
Graphic Description: External explosion effects progression indicated as blast wave expands

Slide 65 External Explosion Effects Diagram (2 of 2)
3. Surrounds structure; downward pressure on roof and inward pressure on all sides
Graphic Description: External explosion effects progression indicated as blast wave expands

- Explain that when an explosion occurs outside a building, the blast wave exerts peak pressure against the building surfaces.
- Tell participants that the resulting pressure may be several times greater than the loads the building is able to withstand.
- Explain the effects that an external explosion has on a building using the diagram on the slide:
  - Remind participants that the shock front of the blast wave will first make contact with the exterior of the building (walls, exterior covering, and other attachments).
  - Then, the shock front will push on the exterior walls at the lower stories; depending on the amount of pressure produced by the blast, the walls may collapse and the windows may shatter.
  - Before the failure of the walls and windows, reflective pressure will have already built up, magnifying the force of the blast pressure.
  - As the shock front continues to expand, it enters the structure, pushing both upward and downward on the floors, causing shifts in the load.
  - Most buildings are not designed to withstand these shifts in the load; consequently, the floors will begin to collapse.

Slide 66 External Explosion Effects Protection
▪ Design buildings for resilience against **progressive collapse**
Graphic Description: Building with visible progressive collapse damage

- Explain that the more blast pressure that enters the building, the more damage occurs as the blast wave moves down hallways and up elevator shafts and stairwells.
- Tell participants that this can result in additional wall failure and floor collapse if enough explosive is used.
- Tell participants that the most important factor for protection against the detonation of explosives is the resilience of the wall and the design of the building against what experts refer to as **progressive collapse**.

  - Define **progressive collapse:** occurs when the collapse of one structural element causes the failure of adjoining structural elements.
  - For example, the collapse of the main floor of a building can cause additional floors to collapse, causing even greater damage.
- Provide the following example:
  - In the bombing of the Federal Building in Oklahoma City, the impact area was a large glass wall of the building that did little to deter the blast wave.
  - While the glass in windows will fail more rapidly than a solid wall, the reflected pressure still builds behind the glass, amplifies, and enters with a greater force.
- Tell participants that later in this module they will have the opportunity to study the Oklahoma City bombing.

Slide 67 Discussion Questions
▪ Have you witnessed or experienced external explosion effects to a building? ▪ If so, how would you describe it?
Graphic Description: No Graphic

- Ask participants: **Have you witnessed or experienced external explosion effects to a building? If so, how would you describe it?**
- Acknowledge responses. *Responses will vary.*
- If no participants have this experience, ask what participants think would happen to the building based on the images and videos they viewed in this module.

Slide 68 Internal Explosion Effects
▪ Reflected pressure is enhanced even more when it collides with other reflected pressures because of the many obstacles, corners, and angles inside a building ▪ This reinforcement increases the strength of the blast wave and produces more damage ▪ Predicting internal damage is highly complex
Graphic Description: No Graphic

- Explain what occurs when an explosion occurs inside a building.
  - With internal explosions, the reflected pressure is enhanced even more when it collides with other reflected pressures because of the many obstacles, corners, and angles inside a building.
  - This reinforcement increases the power of the original blast wave and consequently produces even more damage.
  - Obviously, with all of this complexity, the detailed effects of explosive interactions on internal structures are highly complex, dependent upon many factors, and impossible to predict with accuracy.

Slide 69 Internal Explosion Effects Video

- *No Text*

Graphic Description: Woman detonating a suicide bomb inside a building

- Play video of female suicide bomber.
- Discuss the video pointing out the following:
  - How the loose clothing conceals the device
  - The command detonation at the time the woman has chosen
  - The blast effects
    - Notice the direction of the blast across the desk
    - How the people to the rear are all able to run from the scene

Topic: Effects on Victims **10 Minutes**

Enabling Learning Objective:

- Describe the effects of explosions on victims.

Slide 70 Effects on Victims

- This section will cover:
  - Primary blast injuries
  - Secondary blast injuries
  - Thermal injuries
  - Other injuries

Graphic Description: No Graphic

- Explain that many types of injuries can occur if people are inside or near a critical infrastructure that explodes. These include:
  - Primary blast injuries
  - Secondary blast injuries
  - Thermal injuries
  - Other injuries
- Explain that not all injuries cause death, but many are significant and need attention from medical personnel.
- Tell participants that this section will explain the different type of blast effects on victims.

Slide 71 Primary Blast Injuries

- Direct effects of close proximity to the blast wave can include significant bodily damage:
  - Limbs and body parts ripped away or blown off
  - Damage to ear drums, lungs, and gastrointestinal organs
  - The large intestines are the abdominal organ most frequently affected

Graphic Description: Blast victims with missing limbs in a clinic

- Explain that primary blast injuries are a direct effect of the blast wave:
  - A person in close proximity to the blast seat will experience significant bodily damage, with limbs and body parts ripped away or blown off.
  - Depending on the proximity to the blast and the blast characteristics, a person may receive damage to ear drums, lungs, and gastrointestinal organs.
  - The large intestine is the abdominal organ most frequently affected by primary blast injury.

Slide 72 Secondary Blast Injuries

- Occur further from the blast seat
- May result from large flying objects but usually from smaller fragments
- May be minimal or extensive

Graphic Description: No Graphic

- Explain that secondary blast injuries occur farther from the blast seat.
- Tell participants that these injuries may be the result of large flying objects, such as cinder blocks, but are more frequently the result of smaller fragments.
  - Fragmented pieces of material, from either the device or surrounding structural materials, travel at very high speeds and far distances.
  - Fragment injuries may be minimal, with minor lacerations, or extensive, with full-body lacerations, tremendous loss of blood, severed appendages, and major orthopedic trauma.
  - Broken glass from windows typically causes extensive injuries to victims inside a structure.

Slide 73 Thermal Injuries

- Burns caused when victims are exposed to the intense heat of the thermal effect
- Injuries vary depending upon the type of explosives used

Graphic Description: Arm of a burn victim in a hospital

- Explain that when victims are exposed to the intense heat or thermal effect of the blast thermal blast burn injuries are the result.
- Tell participants that the injuries vary based on the type of explosives.
  - Thermal properties of the explosion vary based on the type of explosives used.
  - Flammable devices are designed to create extensive fire damage to victims.

Slide 74 Other Injuries

- Commonly occur when victims are attempting to escape:
  - Falls
  - Smoke inhalation

Graphic Description: People evacuating from a smoky hallway

- Explain that other injuries are those that commonly occur when victims are attempting to escape from the blast area or conditions created as a result of the explosion:
  - Falls caused by structural collapse
  - Smoke inhalation injuries
- Explain that the goal is to mitigate threats from an IED in order to protect critical infrastructure and above all innocent victims.
- Tell participants that in the next section they will learn strategies for mitigating the threat of an IED allowing them to prevent loss of life and injuries.

Topic: Mitigating the Threat of an IED **25 Minutes**

Enabling Learning Objective:
- Explain strategies for mitigating the threat of an IED.

Slide 75 Mitigating the Threat of an IED

- This section will cover:
  - Recognizing safe distance
  - Hardening the potential target
  - Protecting the potential target

Graphic Description: No Graphic

- Tell participants to help avoid the effect on victims, it is important to mitigate the threat of an IED.
- Explain that this section will cover strategies for mitigating the threat of an IED including:
  - Recognizing safe distances
  - Hardening potential targets
  - Protecting potential targets

Slide 76 Recognizing Safe Distance (Workbook 9.2) 

- Mitigate the effects of the largest credible explosive threat by:
  - Determining critical locations
  - Creating distance between critical locations and critical infrastructure assets when possible
  - Monitoring safe distances

Graphic Description: No Graphic

- Explain that in order to mitigate the effects of the largest credible explosive threat security personnel must do the following:
  - Determine the critical location by assessing the critical infrastructure site, the building layout, and the security measures in place

  - Create distance between critical locations and critical infrastructure assets is the most effective protection
  - Monitor safe distances for that location
- Tell participants that while the best safety precaution from exposure is distance; it is not always possible:
  - Suicide bombers bring explosives in close range of targets.
  - Some critical infrastructure facilities require public access areas, are located on public streets, and have public parking nearby.
- Provide an example: if it were determined there was threat of an LVBIED attack, the critical location would be the closest point that the bomb-laden vehicle could approach the facility with all security measures in place.
  - Depending on the design of the facility, this could be a parking area directly beneath the occupied building, a loading dock, a curb directly outside the facility, or at the vehicle-access control gate where inspections take place.
  - There are usually different security measures in place at different critical locations of a given critical infrastructure, depending on the type and size of the explosive threat.
- Refer participants to **Workbook 9.2: Explosive Capacity and Distance Tables.**
- Tell participants that the addendum includes information on safe distances categorized by vehicle size and explosive type.
- Allow a few minutes for participants to read the information in the tables.
- Discuss how the information in the tables can help to determine safe distances.
- Explain that that in general, the largest credible explosive can be determined by the security measures in place at particular locations.
  - For example, the largest weapons should only be able to gain access to unsecured public spaces, such as in a vehicle on the nearest public street.
  - The smallest weapons, such as a brief case bomb or suicide bomber, would only be able to reach the most secured areas of the building but only if they were able to gain access past the security screening.
- Tell participants they will learn more about security measures and explosives detection technology in *Module 12: Security Force Operations* and *Module 13: Security Technology.*

Slide 77 Hardening the Potential Target (1 of 3)
▪ Reinforce windows and door openings with laminate or other protective coverings ▪ Modify existing structural supports, if possible ▪ Eliminate underground or street parking next to the structure ▪ Locate large occupancy spaces away from windows, streets, or public access areas
Graphic Description: No Graphic

Slide 78 Hardening the Potential Target (2 of 3)
▪ Consider relocating mail or freight receiving areas to a more secure location ▪ Protect utility service areas such as electrical or communication systems ▪ Block off streets with barricades
Graphic Description: Road barricades

- Explain that the term *target* is used to describe the critical infrastructure facility because that is how the terrorists perceive it.
- Explain that one way to mitigate loss is to harden the target, meaning to implement measures that will reduce the effects of a blast.
- Tell participants that based on an assessment of the critical infrastructure's location, service, and accessibility, a determination should be made as to what steps can be taken to harden the target, protect the target, or both.
- Provide examples of how to harden a target to make the target more secure against IED threats:
  - Reinforce windows and door openings with laminate or other protective coverings
  - Modify existing structural supports, if possible
  - Eliminate underground or street parking next to the structure
  - Locate large occupancy spaces away from windows, streets, or public access areas
  - Consider relocating mail or freight receiving areas to a more secure location
  - Protect utility service areas such as electrical or communication systems
  - Block off streets with barricades

Slide 79 Hardening the Potential Target (3 of 3)
▪ Implement all the measures to reduce the effects of a blast ▪ Efforts can only minimize blast effects, not eliminate them
Graphic Description: No Graphic

- Explain that hardening a target includes all the measures used to reduce the effects of a blast.
- Tell participants that efforts to harden the target can only minimize blast effects, not eliminate them.

Slide 80 Protecting the Potential Target
▪ Greatest protection is distance but other measures are needed ▪ Increasing facility's physical security and controlling overall access ▪ Balance the plan by hardening and protecting
Graphic Description: No Graphic

- Remind participants that the greatest protection from exposure to a terrorist explosive device is distance, but that is not always an option.
- Explain that other security measures used to protect a target include the following:

  - Increasing physical security with personnel and technology
  - Increasing physical security around the exterior perimeter, such as at the street or parking areas
  - Limiting public entry access areas and requiring badges or enhanced security to nonpublic areas
- Explain that based on the assessment of the vulnerability and threat level a plan would be developed that includes both hardening and protecting the facility from a terrorist bombing attack.

Slide 81 Case Study — Oklahoma City Bombing (1 of 7) (Handout 9.2)

- Purpose: to examine the blast effects on the Murrah Federal Building in Oklahoma City and identify ways in which the structural damage and loss of life could have been mitigated
  - Duration: 15 minutes (5-activity; 10-debrief)
  - Group composition: table groups
  - Debrief: large-group discussion

Graphic Description: No Graphic

- Explain that participants will now examine a real-world explosive attack on a critical infrastructure facility.
  - The case study involves the Oklahoma City, Oklahoma, bombing. The targeted facility of this terrorist attack was the Alfred P. Murrah Federal Building located in Oklahoma City.
  - The severity of the explosion also resulted in extensive damage to the area surrounding this building.
  - Timothy McVeigh was responsible for the attack, motivated by his extreme hatred for the United States government.
- Refer participants to **Addendum 9.4: Case Study—Oklahoma City Bombing**.
- Tell participants they will have 10 minutes to work with their group to read the case study and 10 minutes to answer large-group discussion questions.
- Tell participants they will view images of the bombings along with reading the details of the incident in the addendum.

Slide 82 Case Study: Oklahoma City Bombing (2 of 7) (Handout 9.2)

- *No Text*

Graphic Description: Timothy McVeigh; explosion aftermath at the Murrah Federal Building

- Explain that this image is of Timothy McVeigh, who chose this building after much debate, selecting it for two reasons:
  - Location — the building had a parking area adjacent to it.
  - Occupants — the building housed law enforcement officials and governmental agencies.
- Tell participants that McVeigh's motivation for the bombing was his extreme hatred for the US government.

- Tell participants that at 0902 hours on April 19, 1995, a large vehicle bomb exploded at the Murrah Federal Building in Oklahoma City, Oklahoma, United States.
- Ask participants: **Why do you think McVeigh chose this day of the week and time?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *McVeigh wanted to cause as much death and destruction as possible; therefore, he chose a day that the building would be full of employees*.

Slide 83 Case Study: Oklahoma City Bombing (3 of 7) (Handout 9.2)

- *No Text*

Graphic Description: A delivery truck in the freight zone

- Point out the delivery truck in the image.
- Explain how the delivery truck is significant to events of the terror plot:
  - The north side (rear) of the structure had a glass exterior face on the third through ninth floors, supported by one main transfer beam having five structural supports beneath it.
  - The structural design of the building contributed to the progressive collapse of the third through ninth floors after the blast.
  - The main transfer beam was located just above and next to the large vehicle bomb.

Slide 84 Case Study: Oklahoma City Bombing (4 of 7) (Handout 9.2)

- *No Text*

Graphic Description: The yellow van and the explosives that were used

- Explain the following details about the images:
  - Yellow van: the bomber used this rental vehicle to transport the explosives. McVeigh drove it to the Murrah Federal Building and parked it in a freight zone next to the building.
  - 189-liter drums: McVeigh placed the explosives in these drums and then linked them together with detonating cord.
- Ask participants: **What steps could building designers, building security, or law enforcement have taken to mitigate some of the damage?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Designed the building so large vehicles could not park under the main supports*
  - *Created distance by adding barriers to prevent large vehicles from getting close to the building*
  - *Stopped or rerouted traffic on the street*
  - *More security at the freight zone*
  - *No stopped or parked vehicles where they should not be*
- Refer participants again to **Addendum 9.3: Explosive Capacity and Distance Tables** to facilitate their discussion of the case study.
- Explain that the ammonium nitrate and fuel oil produced significant thermal effects.

Slide 85 Case Study: Oklahoma City Bombing (5 of 7) (Handout 9.2)

- *No Text*

Graphic Description: Surrounding buildings damaged as a result of the explosion

- Explain that these images depict damage to buildings in the surrounding area that resulted from the explosion at the Murrah Federal Building.

Slide 86 Case Study: Oklahoma City Bombing (6 of 7) (Handout 9.2)

- *No Text*

Graphic Description: Aerial view of Murrah Federal Building and surrounding area

- Explain that this image depicts an aerial shot of the Murrah Federal building and damage to the surrounding area.

Slide 87 Case Study: Oklahoma City Bombing (7 of 7) (Handout 9.2)

- *No Text*

Graphic Description: Murrah Federal Building in the initial moments of being demolished

- Tell participants that the remains of the Murrah Federal Building were demolished using 68 kg of explosives strategically placed.
- Explain that the explosives used for demolition were millisecond detonators that went off in a chain reaction fashion.
- Ask participants: **Why did it only take 68 kg to demolish the building?**
- Acknowledge responses. *If not provided by participants, add the following:*
  - *Because engineers placed the explosives strategically inside the building, the resulting implosion caused the building to literally collapse on itself.*

Topic: CBRN **10 Minutes**

Enabling Learning Objective:

- Describe the elements of chemical, biological, radiological, and nuclear (CBRN) as they relate to terrorism.

Slide 88 CBRN — Awareness

- Awareness of terrorist threats to use chemical, biological, radiological, and nuclear (CBRN) weapons
- A significant threat
- Some terrorist organizations are attempting to develop these weapons

Graphic Description: No Graphic

- Explain that this section will cover awareness of terrorist threats to use chemical, biological, radiological, and nuclear (CBRN) weapons.
- Tell participants that the threat of terrorists using CBRN weapons to produce catastrophic losses in terms of human casualties and property destruction is realistic.
  - Though terrorist attacks using these types of weapons have not been prevalent, the potential threat and effects on critical infrastructure is significant.
  - Law enforcement sources have learned that some terrorist organizations are currently attempting to manufacture or develop their own sources for making these types of weapons.
- Tell participants that ATA provides a complete course on CBRN awareness.

Slide 89 CBRN — Attacks

- Have the potential to indiscriminately kill or injure many thousands of people
- Incidents are rare
- May not cause a lot of physical damage, but high numbers of casualties, panic, and disruption can severely affect the operational capability of the facility

Graphic Description: No Graphic

- Explain that while explosives are currently still the favorite weapon of terrorists, CBRN weapons have the potential to indiscriminately kill or injure many thousands of people.
- Tell participants that incidents are rare primarily due to the difficulty of manufacturing or obtaining the materials and the complexity of using the weapons effectively.
- Tell participants when CBRN attacks have occurred, terrorist groups have generally used chemical or biological weapons only.
- Tell participants that attacks of this nature will not cause significant physical damage to a facility but will cause mass casualties, panic, and disruption.
- Explain that terrorists have a wide variety of potential agents and means of delivery to choose from but success is dependent on the technical expertise of the terrorists involved in:
  - Manufacturing these types of weapons
  - Managing the dispersal or release of the agent being used
- Provide examples of chemical and biological agents:
  - **Chemical agents** are designed to create a large number of casualties. Some examples of chemical terrorist attacks include the following:
    - 1994 — Aum Shinrikyo, a terrorist group in Japan, released a cloud of sarin gas into a neighborhood causing 7 deaths and over 500 injuries.
    - 1995 — the same terrorist group released sarin gas on several commuter trains of the Tokyo metro system during rush hour killing 13 and injuring over 1000.
    - 2006 — several terrorist attacks around the world using explosives to disperse chlorine gas from large transport tanker vehicles caused multiple deaths and hundreds of injuries. All of the deaths in these attacks were the result of the explosives and not the chlorine gas.
  - **Biological agents** include the deliberate release of germs or other biological substances. Some examples of biological attacks include the following:

- In 1984, an extremist group in the US infected salad bars in several restaurants with the biological agent salmonella that caused no deaths but over 750 illnesses.
- In 2001, several mailings containing the biological agent anthrax were sent to five news organizations and two public officials in the US. Because of exposure to anthrax, 5 people died and 17 others were infected. While the event did not cause massive loss of life, it caused significant disruption, fear, and panic to the public. Several buildings were closed for an extended period for decontamination procedures, which cost over $1 billion.

Topic: Attack Scenarios and Safe Distance Exercise **65 Minutes**

Slide 90 Attack Scenarios and Safe Distance Exercise Part 1 (Workbook 9.2 and 9.3)

- Purpose: to plan a terrorist attack against a facility and determine minimum safe distances
  - Duration: 65 minutes (45-exercise; 20-debrief)
  - Group composition: table groups
  - Debrief: team presentation and large-group discussion

Graphic Description: No Graphic

- Refer participants to **Workbook 9.3: Attack Scenarios and Safe Distances Exercise**.
- Tell participants that they will work in their table groups.
  - Then, assign three participants from group to complete the exercise outlined in Part 1 of **Workbook 9.3: Attack Scenarios and Safe Distances Exercise**.
  - Assign the remaining three participants from each group to complete the exercise outlined in Part 2 of **Workbook 9.3: Attack Scenarios and Safe Distances Exercise**.
  - Send three members from each team to Training Area 1: Interior Room. Send the three remaining members of each team to Training Area 2: Exterior.
  - Tell participants in Training Area 1 that they will think like a terrorist and plan an IED attack, with the classroom being their intended target. For this portion of the exercise, the participant teams must:
    - Describe the IED they would use to carry out the attack, such as a letter bomb, suicide bomb, freight delivery, or briefcase.
    - Specify the delivery method and tactics to avoid security countermeasures.
  - Tell participants in Training Area 2 that they must identify the closest location that a vehicle bomb may approach the facility (critical location). For this portion of the exercise, the participant teams must:
    - Identify the critical location, and then use the measuring wheel to determine the distance between the critical location and the facility.
    - Use the charts in **Workbook 9.2: Explosive Capacity and Distance Tables** to:
      - Identify the largest vehicle that can reach the critical location, based on current security measures at the facility.
      - Determine minimum safe distances for lethal air blast range, minimum evacuation distance, falling glass hazard, and building evacuation distance.

- Allow participant teams 15 minutes to write down a summary of their plan.
- Tell participants they will conduct a presentation for the class of their plans.
- After all participant teams have completed their designated exercise (interior attack or determining safe distances), send participants back to the classroom and instruct them to return to their original teams (four groups of six participants each). Instruct those members of the team that went to Training area 1 to share information with those members that went to Training Area 2, and vice versa.
- Allow participant teams 15 minutes to prepare their briefs.
- Select one team to conduct the brief for the exercise in Training Area 1 and another team to conduct the brief for the exercise in Training Area 2.
- Allow participant teams a **total** of 20 minutes (10 minutes for each team) to complete the brief.
- Provide feedback and answer questions as necessary to ensure everyone understood the results of the exercise.
- Note that since answers will vary among the teams, no answer keys are provided.

▪ Refer to the ATF and DOD charts to verify the accuracy of participant team answers to minimum safe distances.

Topic: Module Summary	**10 Minutes**

Slide 91 Module Summary
▪ Explosives ▪ Improvised explosive device (IED) ▪ Effects of an explosion ▪ Effects on structures ▪ Effects on victims ▪ Mitigating the threat of an IED ▪ CBRN
Graphic Description: No Graphic

▪ Summarize the module by reviewing the following points:
- **Explosives**
  - Characteristics of an explosion
  - Beneficial uses
  - Types
- **Improvised explosive device (IED)**
  - Characteristics
  - Components
  - Tactical design
  - Delivery methods
- **Effects of an explosion**
  - Thermal effect
  - Blast pressure effects
  - Fragmentation

- **Effects on structures**
  - External
  - Internal
  - Amplification of pressures will cause greater damage and affect the structural integrity
- **Effects on victims**
  - Primary blast injuries
  - Secondary blast injuries
  - Thermal injuries
  - Other injuries
- **Mitigating the threat of an IED**
  - Recognizing safe distance
  - Hardening the potential target
  - Protecting the potential target
- **CBRN**
  - Awareness
  - Attacks

- Refer participants to **Addendum 9.6: Module Summary**.
  - Ask the participants to take time to review the main points.
  - After participants review the summary, ask whether there are any questions about the contents of this module.
- Explain that *Module 10: Analyzing the Threat* will explain how to create a threat analysis statement for critical infrastructure.

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