Introduction to Explosives

Overview

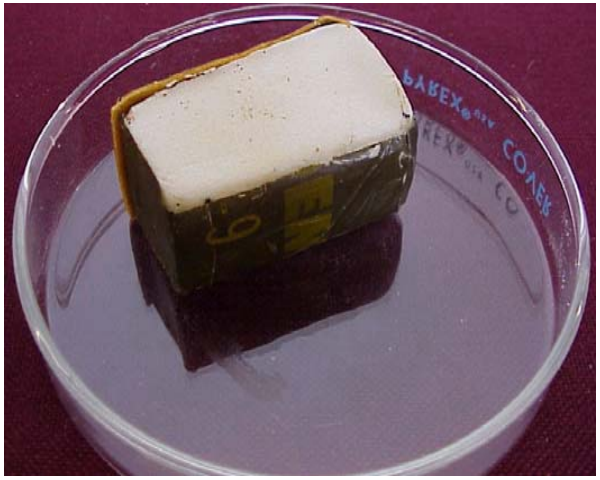
- Military Explosives
  - C4
  - HMX
  - PETN
  - RDX
  - Semtex
- Commercial Explosives
  - ANAL
  - ANFO
  - Black Powder
  - Dynamite
  - Nitroglycerin
  - Smokeless Powder
  - TNT
  - Urea Nitrate
- Improvised Explosives*
  - HMTD
  - TATP

*While many military and commercial explosives can be improvised, HMTD and TATP do not have military or commercial purposes.

Military Explosives

C4: Characteristics, Properties, and Overview

- American name for the 4th generation of Composition C Explosives, also called Harrisite
  - Western counterpart to Semtex plastic explosive
  - Requires a blasting cap for detonation



- Ingredients:
  - Approximately 90% RDX; remainder is a plasticizer
- Appearance:
  - Smells like motor oil, light brown putty-like substance
- Uses:
  - Typically for demolition and metal cutting
  - Can be specially formed to create targeted explosion
  - Can be used for underwater operations

- Sensitivity:
  - Non-toxic, insensitive to shock, will ignite and burn

C4: Analysis and Trends

- U.S. manufactured so likely to be found in countries where the U.S. has military connections
- A preferred terrorist explosive
  - Used in 2000 U.S.S. Cole and 2002 Bali nightclub bombings
  - Recommended in Al-Qaeda's traditional curriculum of explosives training
  - Frequently used in IEDs in Iraq
- Can only be purchased domestically by legitimate buyers through explosives distributors
  - Terrorists are likely to resort to theft or attempt to smuggle C-4 into U.S.
- Online terrorist manuals provide improvisation instructions using RDX to produce C-4

Damaged hull of U.S.S. Cole in Yemeni port

Blast effects from Bali, Indonesia nightclub bombing

HMX: Characteristics, Properties, and Overview

- Alternate Names:
  - High Melting Explosive, cyclotetramethylenetetranitramine, homocyclonite, octogen, High-velocity Military Explosive, and His/Her Majesty's Explosive

- Appearance:
  - Odorless white or colorless crystals
  - In detonation cords, HMX is white or dyed pink powder

- Sensitivity:
  - Insensitive to heat, shock, and friction

- Uses: Primarily used by the U.S. military
  - Component of plastic explosives (usually combined with TNT)
  - Component of rocket propellant
  - Detonation of nuclear devices
  - Booster charge can be used as burster to split open ammunition

- Chemical Interactions:
  - Soluble in acetone and insoluble in water

- Precautions:
  - Causes damage to the liver and central nervous system

Plasticized HMX

HMX: Analysis and Trends

- Most powerful solid explosive produced on large scale in U.S.
  - –Domestically only manufactured in the Holston Army Ammunition Plant in Kingsport, TN
  - –Outside of U.S. widely manufactured for both military and commercial uses
- Originally created as by-product of RDX manufacturing process
- HMX's ingredients can be obtained from chemical and agricultural supply stores and camping stores
  - –Improvisation requires thorough knowledge of chemistry and laboratory environment
  - –Most online improvisation instructions are incomplete and provide little detail
- Terrorists more likely to obtain via illegal means than improvisation
- No confirmed reports of terrorist attacks involving HMX

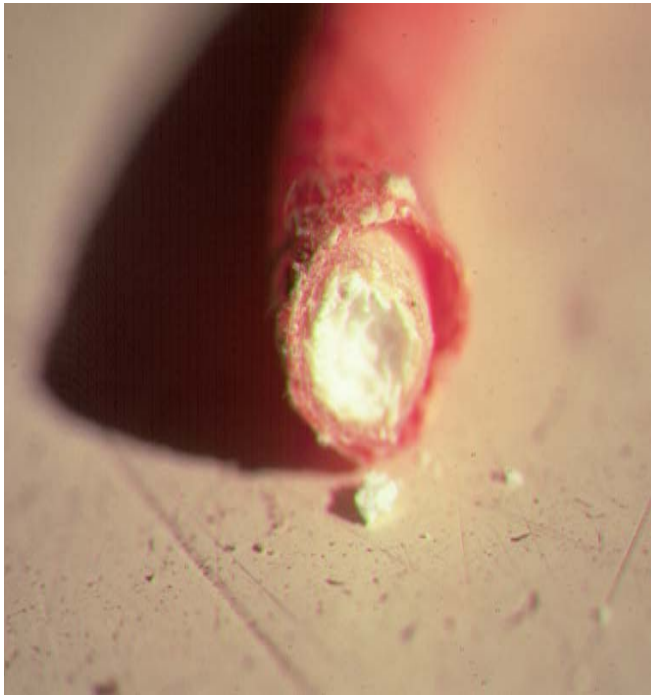
PETN (Pentaerythritol Tetranitrate): Characteristics, Properties, and Overview

- Alternate Names:
  - Penthrite, niperyth, or nitropenta
- Appearance:
  - White crystalline solid or crystals, odorless
- Sensitivity:
  - Sensitive to heat, shock, and friction

- Uses:
  - Booster and bursting charges of small caliber ammunition
  - Base charges of detonators in some land mines and shells
  - Explosive core of detonation cords
  - Ingredient of Semtex
- Chemical Interactions:
  - Insoluble in water; barely soluble in alcohol, ether, and benzene; and soluble in acetone and methyl acetate

PETN (Pentaerythritol Tetranitrate): Analysis and Trends

- One of the strongest existing high explosives
  - Requires very little priming charge to initiate detonation
- Can be manipulated and combined with a variety of chemicals and explosives
- Sheet explosives frequently contain PETN
  - Threat to commercial aviation and other forms of transportation because can be easily concealed in luggage
  - Conventional detection systems can not fully prevent the smuggling of sheet explosives because X-ray scanners can barely identify their low-atomic signatures
- Used by shoe bomber Richard Reid as the main charge in his 2001 attempt to blow up an aircraft over the Atlantic Ocean and in the 2002 Bali resort bombings



PETN Detonation Cord

RDX (Cyclotrimethylenetrinitramine): Characteristics, Properties, and Overview

- Alternate Names:
  - Cyclonite, hexogen, cyclotromethylene, trinitramine, Research Department Explosive, and Royal Demolition Explosive

- Appearance:
  - White or colorless crystals
  - Will appear red to pink in detonating cord

- Uses:
  - Primarily high explosive military warheads, mines, demolition explosives, booster explosives, missiles, and rocket propellants
  - Used in civilian oil well penetrators, heating fuel, and rat poison

- Chemical Interactions:
  - Soluble in hot acetone or hot phenol and insoluble in water

- Precautions:
  - Inhaling RDX dust can cause intoxication, seizure, and loss of consciousness

RDX (Cyclotrimethylenetrinitramine): Analysis and Trends

- Considered the most powerful and brisant of military high explosives, owing to its high density and high detonation velocity
  - Unless initiated with a blasting cap it will burn, can be melted due to low heat sensitivity
  - Very sensitive when crystallized
- Commonly mixed with other explosives and plasticizers or desensitizers
- Insurgents in Iraq have used RDX in roadside bombs against Coalition Forces
- The perpetrators of the 2005 Amman, Jordan hotel bombings used RDX as the main explosive in their suicide vests

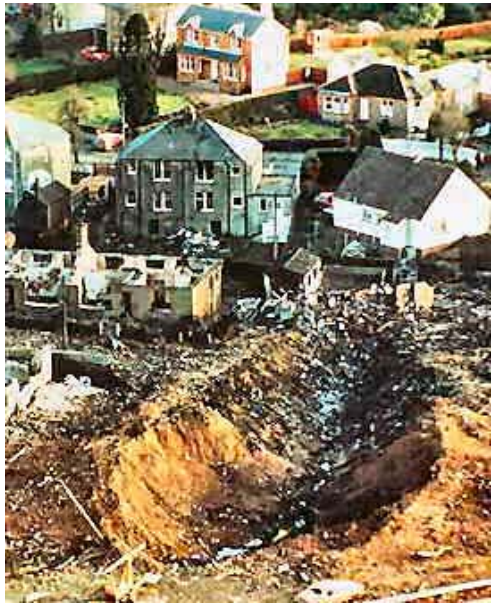
Semtex: Characteristics, Properties, and Overview

- Alternate Names:
  - "magic marble of Pardubice"
  - More commonly used in Europe than C-4, pre-dates C-4
- Appearance:
  - Either an odorless red (Semtex 1A and 10) or orange-yellow (Semtex 1H) moldable solid
  - Semtex manufactured prior to 1991 does not contain specific coloring or chemicals designed to assist in detection
  - After 1991 ingredients were added to give the explosive a distinct odor to improve detection
- Sensitivity:
  - Insensitive to heat, shock, and friction
- Uses:
  - Has both civilian and military applications as a booster charge
  - Secondary blasting
  - Destruction of concrete and metal, underwater demolition, and mining

Semtex: Analysis and Trends

- Requires a detonator for an efficient explosion
  - Variations contain RDX or PETN in a mixture with a polymeric binder
  - Contains a rubber binder that allows the explosive to remain pliable
- Widely considered as the plastic explosive of choice for terrorists in IEDs, continues to be manufactured
  - Approximately 12 ounces was used in the Pan Am 103 bombing over Lockerbie, Scotland in 1988
- Experts believe large amounts of the explosives (as much as 40,000 tons) obtained by illegitimate means through the mid-1990s
  - Remains available on the black market
- Semtex may prove too expensive for use as a main explosive charge when compared to cheaper homemade explosives such as TATP
  - However, Semtex is much stronger and considerably more stable than TATP

Pan Am Flight 103



Lockerbie crash site

Commercial Explosives

ANAL (Ammonium Nitrate and Aluminum Powder): Characteristics, Properties, and Overview

- Ingredients:
  - AN, AL powder, and fuel oil
- Sensitivity:
  - Sensitive to heat but not shock and friction
- Velocity of Detonation:
  - 7,000-15,000 ft/s depending on grade and configuration
- Uses:
  - Certain commercial blasting explosives
  - Especially water-based slurry explosives

ammonium nitrate prills

aluminum powder

ANAL (Ammonium Nitrate and Aluminum Powder): Analysis and Trends

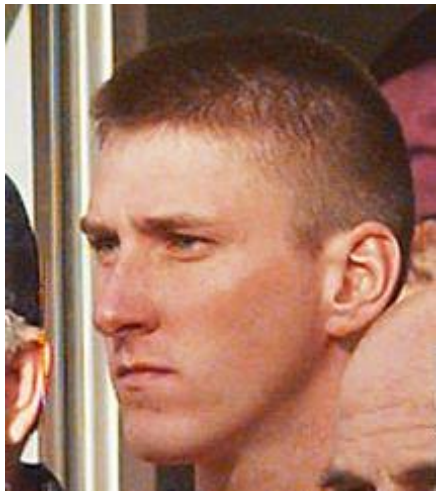
- Can be used as a main charge but requires booster for detonation
- Terrorists use AL powder in main charges to increase heat output
  - Serves to prolong the high pressure of an explosion
- Precursor AL powder extremely easy to acquire from hardware stores, art supply shops, and chemistry supply companies
  - Can be improvised from silver paint by letting it dry and scraping up the residue or grinding up AL cans
- ANAL is common improvised explosive mixture
  - Has been used by Saudi, Irish, Spanish, Chechen, and Kashmiri-based terrorist groups
- Combining ANAL with a high explosive (usually TNT) results in an explosive mixture called Ammonals
  - Ammonals possess industrial uses in mines and quarries but both industrial and military use has significantly declined post-World War II
  - Improvisation instructions exist in both Arabic and English-language documents online
  - Terrorists' use of ammonals as the main charge in an IED may indicate a low inventory of high explosives (e.g., TNT)

ANFO (Ammonium Nitrate and Fuel Oil): Characteristics, Properties, and Overview

- Sensitivity:
  - Relatively insensitive to heat, shock, and friction
- Uses:
  - Used primarily in mining and quarrying operations
- Precautions:
  - Due to ANFO's insensitivity and because mixing AN and fuel oil is relatively safe, special precautions are not required when handling
- TNT Equivalence:
  - Typically around 80%
  - The most efficient ANFO explosive mixtures can be higher

ANFO (Ammonium Nitrate and Fuel Oil): Analysis and Trends

- ANFO can be used as a main charge but requires a booster for detonation
- Requires umilled porous prills of AN because are less dense and retain moisture better
- Improvisation of pure AN is not difficult
  - English and Arabic-language explosives forums provide instructions
  - Its precursors, ammonium hydride and nitric acid, are easily obtainable
- Wide availability of commercial AN fertilizer may cause terrorists to purchase or steal bags
  - Popular among terrorists because of its availability, cost-effectiveness, ease of preparation, and explosive power
- 1995 Oklahoma City bombing used approximately 4,000 lbs of ANFO



Timothy McVeigh

Oklahoma City Murrah Building post-blast

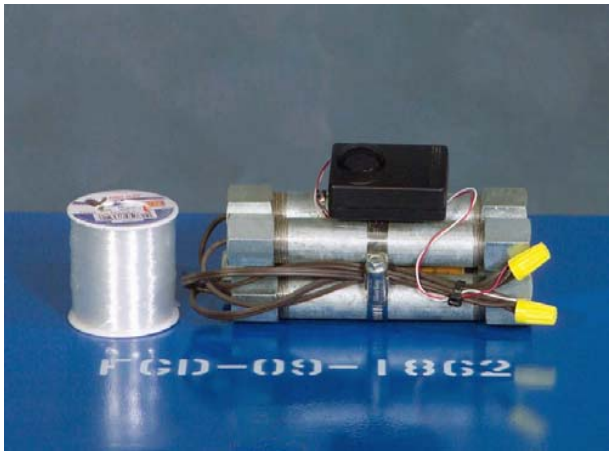
Black Powder: Characteristics, Properties, and Overview

- Alternate Names:
  - Gunpowder or grain powder
- Appearance:
  - Color ranges from coal black to cocoa brown, granularity varies from fine to coarse
- Sensitivity:
  - Extremely sensitive to heat, shock, and friction
- Uses:
  - Primarily used in the core of military and commercial safety fuses
  - Also used for fireworks, model rocket engines, and ammunition propellant for muzzle-loading guns
- Precautions:
  - Individuals should be grounded and only touch with non-sparking utensils due to its sensitivity to static electricity

Black Powder: Analysis and Trends

- Private, conventional uses currently limited but up to 50 lbs can still be purchased without restriction
  - Finished product can also be obtained from stores selling fireworks, bullets, and safety fuses (e.g., sporting good stores, Wal-Mart, and internet)
- English and Arabic-language websites provide info on obtaining ingredients and improvising
- High explosive sensitivity means it can be used in an initiator or a main charge
- Often used in low-explosive pipe bombs but could be used in an explosive train to create a more sophisticated device

Pipe Bombs



Dynamite: Characteristics, Properties, and Overview

- Generic term for explosives containing liquid and solid nitrate esters mixed with solid oxidizers and carbon-based fuels
  - Currently 8 different forms of dynamite
- Appearance:
  - Light brown to reddish-tan; texture is loose, moist, and oily
  - Gelatin dynamite vary from thick liquids to a tough rubbery substance
- Ingredients:
  - Base of EGDN or nitroglycerin and EGDN
- Odor:
  - Straight and ammonia dynamite have heavy sweet odors
- Sensitivity:
  - All dynamite is sensitive to heat, shock, and friction
- Uses:
  - Commercial dynamite is used for construction, demolition, road building, and mining

Dynamite: Analysis and Trends

- All dynamite is considered a secondary high explosive and can be initiated with a blasting cap
  - All are suitable as main charges in an IED
- Terrorists operating domestically will likely try to steal dynamite or improvise its manufacture
  - Mining sites and quarries may be targeted for theft
  - Online improvisation instructions are easily accessible, and a wide variety of precursors can be used
- Likely used in the 2004 Madrid train station bombings and Eric Rudolph's Sandy Springs, Georgia abortion clinic bombing

Nitroglycerin: Characteristics, Properties, and Overview

- Alternate names:
  - 1,2,3-Propanetriol trinitrate, glycerol trinitrate, nitroglycerol, NG, trinitroglycerol, NTG, trinitrin, blasting oil, and trinitroglycerine
- Appearance:
  - Colorless oily liquid when pure, but turns a yellowish-brown when impure
  - Sweet burning smell
- Sensitivity:
  - Extremely sensitive to heat, shock, and friction
- Uses:
  - Powerful high explosive used in dynamite, blasting gelatin, smokeless powder, and cordite
  - Can be used with nitrocellulose in some propellants, especially for rockets and missiles
- Chemical Interactions:
  - Soluble in most organic solvents

Nitroglycerin: Analysis and Trends

- Highly versatile explosive whose strength allows it to be used as a detonator, booster, or main charge
- All precursor materials can be purchased at chemical stores and/or online
- Terrorist-affiliated websites provide improvisation instructions
  - Manufacturing process is complicated and very dangerous due to its sensitivities
- 1995 Operation Bojinka plot planned to use nitroglycerin as main charge to blow up 11 airplanes over the Pacific Ocean
  - Dry run tested a nitroglycerin bomb hidden under a seat killing 1 passenger

Ramzi Yousef

Khalid Sheikh Muhammed

Smokeless Powder: Characteristics, Properties, and Overview

- Appearance:
  - Small grains or pellets, not powder
  - Usually black but can appear as shades of grey; sometimes died blue, red, or green to aid identification
  - Shapes can include cylinders, flakes, disks, balls, flattened balls, agglomerates, and strip shapes
  - Odorless or faint nitrogen scent

Examples of varying grades

- Sensitivity:
  - Sensitive to heat, insensitive to shock and friction

- Uses:
  - Primarily used as standard propelling powder for ammunition in small arms
  - Also used in mortar shells, artillery shells up to 280 mm, and as the propellant charge in naval artillery

Examples of different grain shapes

- Precautions:
  - Exposure to extreme temperatures can lead to ignition

Smokeless Powder: Analysis and Trends

- Burns in the open but detonates when confined
  - Most widely manufactured low explosive in the world
  - Called “smokeless” because emits little smoke compared to black powder, more powerful than black powder

- “Smokeless powder” is an umbrella term for 3 types of low explosives with nitrocellulose bases
  - Single-base: least powerful, contains graphite
  - Double-base: contains either nitroglycerin, nitroglycol, or dinitrotoluene; also contains graphite
  - Triple-base: most powerful, contains nitroglycerin and nitroguanidine, often used by the military

- Online manuals have instructions for improvising nitrocellulose, nitroglycerin, and nitroglycol
  - Both single and double-based powders are available for purchase

- Most likely to be used as main charge in pipe bombs

TNT (Trinitrotoluene): Characteristics, Properties, and Overview

- Appearance:
  - Pale yellow solid compound in its basic state; odorless
  - TNT will turn brown toned with prolonged exposure to sunlight
  - Some manufacturers add graphite during the production process which turns the compound gray

- Sensitivity:
  - Moderately sensitive to heat; relatively insensitive to shock and friction

- Uses:
  - Primarily mines and demolition explosives
  - Also used in booster explosives and missile and rocket propellants
  - Military use decreased significantly after World War II

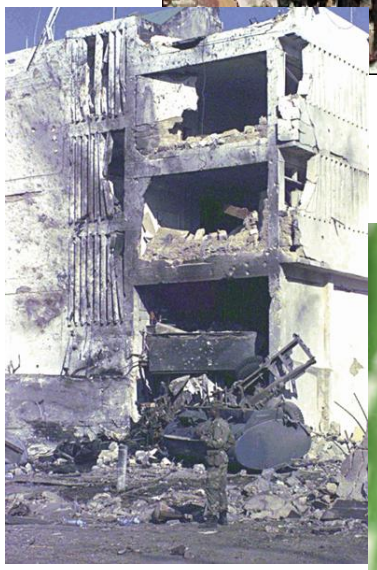
- Chemical Interactions:
  - Interacts with alkalis (bases) to form very sensitive explosives
  - Not hygroscopic (i.e., having the tendency to retain water)

- Precautions:
  - Toxic and can be absorbed through the skin
  - Can irritate the eyes, skin, and respiratory system

TNT (Trinitrotoluene): Analysis and Trends

- Principal constituent ingredient of many explosives
- Stable secondary explosive that is used as either a main or boosting charge in a high-explosive train
- Preferred choice for conventional and improvised explosive devices
- Main explosive used in several high-profile bombings including:
  - 1998 U.S. embassy bombings (2) in Africa
  - 2002 Bali, Indonesia resort bombings
  - 2005 assassination bombing of former Lebanese Prime Minister Rafik Hariri
- Readily available on international black market
  - Supplies not expected to decrease in near future

U.S. embassy in Nairobi, Kenya



U.S. embassy in Dar es Salaam, Tanzania

Rafik Hariri

Urea Nitrate: Characteristics, Properties, and Overview

- Alternate Names:
  - Acidogen nitrate
- Appearance:
  - Colorless crystals or white powder with strong ammonia or urine-like odor
- Sensitivity:
  - Not sensitive to heat, shock, or friction
- Uses:
  - Used and manufactured for agricultural fertilizers, chemical de-icers, plastics manufacturing, and military bombs
- Chemical Interactions:
  - Because of its acidity will interact with metal
- Precautions:
  - Improvising can result in injury due to the corrosivity of its two main ingredients

Urea Nitrate: Analysis and Trends

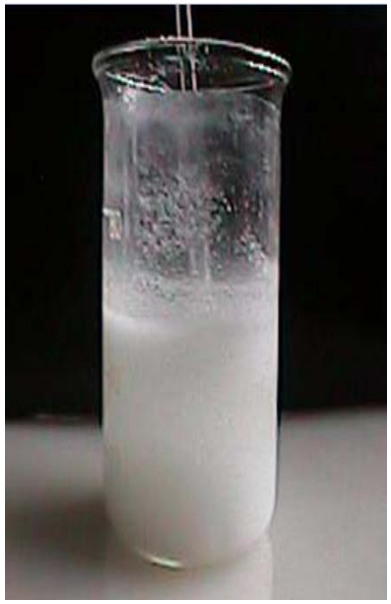
- Most suitable as a main charge secondary explosive
  - Due to its insensitivity requires booster secondary explosive to detonate
- Urea and nitric acid are primary precursor materials
  - Both readily available for purchase and can be improvised from numerous products
- Limited availability of equipment capable of detecting
  - May result in law enforcement and private industry giving less focus to urea nitrate
- 1993 WTC attack used over 1,500 lbs of urea nitrate
- Urea nitrate or instruction on its improvisation has been discovered in foiled plots in Australia, the U.S., and throughout the Middle East

WTC garage post-1993 attack

Improvised Explosives

HMTD (Hexamethylene Triperoxide Diamine): Characteristics, Properties, and Overview

- Alternate Names:
  - Hexamine peroxide
- Appearance:
  - Colorless white crystals or powder
- Sensitivity:
  - Extremely sensitive to heat, shock, and friction



- Uses:
  - Extremely sensitive explosive with no commercial or industrial applications
- Chemical Interactions:
  - Practically insoluble in water and in common organic solvents
  - Corrodes most metals
- Precautions:
  - Only stable below 70 F; should be stored in a refrigerator, cooler, or insulated container

HMTD (Hexamethylene Triperoxide Diamine) : Analysis and Trends

- Can be improvised using household equipment and ingredients readily available at common stores
- Maintains its explosive power for between 7-10 days before decomposition becomes noticeable
  - Begins to deteriorate within a few hours of manufacture if stored in metal containers
- Ideal for use in improvised blasting caps because of its outstanding initiating property
  - Can also function as main charge
- In its dry form can appear similar to crack cocaine
  - Reacts violently with drug field test kits
- Ahmed Ressam planned to use HMTD as part of an IED attack on LAX Airport in the 1999 Millennium Bombing Plot

Ahmed Ressam

LAX

Triacetone Triperoxide (TATP): Characteristics, Properties, and Overview

- Alternate Names:
  - Acetone peroxide, peroxyacetone, and “Mother of Slave”
- Appearance:
  - White granular powder (similar to sugar) with an acrid smell
- Uses:
  - Common homemade explosive used in IEDs
  - Can be used as both a main charge or as a booster
  - With a short shelf-life of approximately 10 days, TATP possesses no real commercial or military applications
- Chemical Interactions:
  - Strong hydrogen peroxide is an essential component of TATP
  - At higher concentrations the hydrogen peroxide can emit strong vapors that can detonate at higher temperatures
- Precautions:
  - Extreme care should be taken during transport because of sensitivity to heat, shock, and friction

TATP - Crude (left) and Dry (right)

Triacetone Triperoxide (TATP): Analysis and Trends

- Popular because can be improvised with basic equipment from common household materials such as:
  - Acetone
  - Hydrogen peroxide
  - Hydrochloric acid
  - Sulfuric acid

- TATP has been used in several attempted and successful terrorist attacks such as the 2001 Richard Reid shoe bomb plot (i.e., booster for PETN main charge) and by Palestinian suicide bombers

- Since TATP is a non-nitrogenous compound nitrogen-based detection devices often used in airports fail to detect it

- Production is extremely dangerous and many terrorist manuals stress this danger
  - Significant indicator of a TATP lab is the presence of hydrogen peroxide in large quantities

Richard Reid, aka the "Shoe Bomber"

Reference Materials

Glossary

- ANAL: Acronym for ammonium nitrate (AN) and aluminum powder (AL)
- Ammonium Nitrate (ANFO): One of the least sensitive and most readily available main charge explosives; commercially used as a fertilizer
- ANNIE: Acronym for ammonium nitrate and nitrobenzene
- ANNM: Acronym for ammonium nitrate and sugar
- Base Charge: Secondary high explosives that are sometimes added in small amounts to blasting caps to boost their power
- Binary Explosive: A high explosive derived from the reaction of two non-explosive or non-detonable constituents; provides an explosive which is superior to its components in regard to sensitivity, blast, fragmentation, or loadability
- Blast Effect: Damage to structures and personnel by the force of an explosion on or above the surface of the ground
- Blast Wave: A sharply defined wave of increased pressure rapidly propagated through a surrounding medium from a center of detonation or similar disturbance
- Blasting Agent: An insensitive chemical composition or mixture which will detonate when initiated by high explosive primers or boosters
- Blasting Cap: A small tube, usually copper or aluminum, closed at one end and loaded with a charge or charges of sensitive high explosives; most blasting caps contain a primary high explosive and may also contain a booster (considered more reliable for detonating secondary high explosives)
- Booster: A high explosive element, sufficiently sensitive to be actuated by small explosive elements and powerful enough to cause detonation of the main explosive filler
- Brisance: Property of an explosive which characterizes its shattering (shock force) effect
- Catalyst: A substance that increases the speed of a chemical reaction
- Charge: A given quantity of explosive either by itself or contained in a bomb, projectile, mine, etc. Also called "fill", "filler", or filling

Glossary (cont'd.)

- Charge, Shaped: An explosive charge shaped and designed as to concentrate a blast wave in one direction; sometimes called "cavity charge" or a "hollow charge" (UK)
- Charge, Shaped Inhibited: A shaped charge with a conical liner normally having a slightly thicker apex than the sidewall material and constructed of copper and some aluminum; an inhibitor, normally Lucite, is machine fitted into the liner to approximately one-half of the cone's depth
- Charge, Shaped Linear: A semi-rigid, metal-clad container fabricated in various lengths and widths filled with explosive and used for linear cutting of metallic items of various thickness
- Combustible Material: Substances that can be burned to provide heat and power
- Composition C-3: A plastic military-grade explosive composed of RDX and plasticizers
- Composition C-4: Successor to C-3; C-4 contains RDX and has a greater shattering effect than its predecessor
- Cook-off Time: The time required for a weapon to explode or deflagrate (to low order) when exposed to heat or fire
- Cordite: A smokeless, slow-burning powder composed of 30 to 58 percent nitroglycerin, 37 to 65 percent nitrocellulose, and 5 to 6 percent mineral jelly
- Deflagration: The rapid burning of an explosive, at subsonic speed, along the surface of the explosive
- Detonating Cord: Flexible fabric tube containing a filler of high explosive intend to be initiated by a blasting cap; also known as "Primacord"
- Detonation: Chemical reaction that propagates with such rapidity that the rate of advance of the reaction zone into the material exceeds the velocity of sound in the material. The rate of advance of the reaction zone is termed "detonation rate" or "detonation velocity."
- Detonation Velocity: The velocity at which a detonation progresses through an explosive
- Detonation Wave: Shock wave that precedes the advancing reaction zone in a high-order detonation
- Detonator: An explosive train component that can be activated by either a non-explosive impulse or the action of a primer; should be capable of reliably initiating high-order detonations in a subsequent high explosive component of an explosive train; classified in accordance with the method of initiation, such as percussion, stab, electric, and flash

Glossary (cont'd.)

- Disrupter: An explosively powered tool used to enter a container of an IED and disrupt fusing and fusing system components
- Dynamite: Dynamite was the first name introduced for a commercial explosive that is a mixture of nitroglycerine and Guhr dynamite or nitroglycerine and nitrocellulose
- Electric Detonator: A detonator designed for, and capable of, initiation by means of an electric current
- Electro-explosive: Term used to describe an initiator or a system that uses an electrical impulse for initiation of an explosive
- Explode: Change in chemical and physical state usually from a solid or liquid to a gas, by sudden chemical decomposition or vaporization
- Explosion (Chemical): A chemical reaction or change of state that is effected in an exceedingly short space of time with the generation of high temperatures and generally a large quantity of gas; produces a shock wave in the surrounding medium
- Explosive: A substance or mixture of substances, which may be made to undergo a rapid chemical change without an outside supply of oxygen, with the liberation of large quantities of energy generally accompanied by the evolution of hot gases
- Explosive Slurry: Thick liquid solution of oxidizers and fuels, blended with solid oxidizers and fuels with sensitizers; safer to use than dynamite, some may be cap sensitive, while others are blasting agents
- Exudation: The emission of any substance (usually oily, tarry, or gaseous) from an explosive item, generally, the results of chemical reaction or pressure due to thermal changes
- Flexilinear Shaped Charge (FLSC): A flexible, linear shaped charge; sheathing material may be lead, aluminum, copper, silver or other materials
- Fuse: An igniting or explosive cord, consisting of a flexible fabric tube and a core of low or high explosive; fuses with black powder or other low explosive cores are also known as blasting time fuse; also a device with explosive components designed to initiate a train of fire or detonation in ordnance by an action such as hydrostatic pressure, electrical energy, chemical, impact, mechanical time, or a combination of these; a non-explosive device designed to initiate an explosion in ordnance by an action such as continuous or pulsating electromagnetic waves, acceleration or deceleration forces, or piezoelectric action

Glossary (cont'd.)

- High Explosive: An explosive which normally detonates rather than deflagrates or burns, that is, the rate of advance of the reaction zone into the unreacted material exceeds the velocity of sound in the unreacted material
- HMTD: Hexamethylene Triperoxide Diamine
- Hypergolic: A substance capable of igniting spontaneously upon contact
- Igniter: Specially arranged charge of ready-burning composition used to assist the initiation of a propelling charge
- Igniter Train: Step-by-step arrangement of charges in pyrotechnics by which the initial fire from the primer is transmitted and intensified until it reaches and sets off the main charge; also called "burning train"
- Ignition Charge: The most sensitive explosive material of an electrical or non-electrical blasting cap, which is initiated by a spark or flame
- Initiating Agent: An explosive which has the necessary sensitivity to heat, friction, or percussion to make it suitable for use as the initial element in an explosive train
- Initiation: As applied to an explosive, the beginning of the deflagration or detonation of the explosive; first action in a fuse that occurs as the direct result of the action of the functioning medium or switch
- Initiator: A chemical compound or electric device that initiates a chain reaction
- Intermediate Charge: The second charge inside an electric or non-electric blasting cap, detonated by the ignition charge
- Low Explosive: An explosive which deflagrates or burns rather than detonates, that is, the rate of advance of the reaction zone into the unreacted material is less than the velocity of sound in the unreacted material
- LVBIED: Large Vehicle-borne Improvised Explosive Device
- Main Charge: The main explosive component of a device, as opposed to primary or booster elements; generally the least sensitive and most powerful element
- Nitroglycerine: Very powerful and sensitive high explosive used in dynamite and in some propellant mixtures
- Nitrostarch: Explosive used in some blasting compositions; has been used as a substitute for TNT
- Oxidizer: In an explosive or other chemical mixture (such as a propellant), a substance that provides the oxygen for the burning of a fuel

Glossary (cont'd.)

- PETN: Pentaerythritol Tetranitrate
- Plastic Explosive: Explosive that within normal ranges of atmospheric temperature is capable of being molded into desired shapes; can be embedded in high-brisance crystalline explosives such as PETN
- Plasticizer: An additive to a propellant or high explosive that makes the finished product less brittle, and softens the substance so that it can be molded or cut into different shapes
- Platter Charge: A type of shape charge that delivers a less-concentrated explosion than traditional shaped charges
- Precursor: A precursor is a material or substance used as an ingredient in a mixture to create an explosive
- Primary High Explosive: An explosive which is extremely sensitive to heat and shock that is normally used to initiate a secondary high explosive; generally used to refer to a pure compound rather than to an explosive mixture
- Primer: A relatively small and sensitive component of an explosive train; upon actuation it initiates functioning of the explosive train, but will not reliably initiate a main high explosive charge
- Primer-detonator: A unit which consists of a primer, a detonator, and in some types an intervening delay
- Priming Composition: A physical mixture of material that is very sensitive to impact or percussion; used to ignite primary high explosives, black powder igniter charges, and when exploded, undergoes very rapid auto-combustion, the products of which are hot gases and incandescent solid particles
- Projectile High Explosive Plastic (HEP): A thin-walled projectile, filled with plastic explosive, designed to squash against an armored target before detonation, and to defeat the armor by producing spalls which are detached with considerable velocity from the back of the target plate; also called a "squash" head
- Propellant: Provides the energy to propel explosive powder charges for propelling a rocket, missile, bullet, shell; also a low explosive substance or mixture of substances which, through burning, can be made to produce gases at controlled rates and to provide the energy necessary to propel ordnance
- RCIED: Remote-Controlled Improvised Explosive Device
- Secondary Device: A tactic in which a second device follows an initial bomb, real or hoax, targeting responding forces or other entities

Glossary (cont'd.)

- Secondary High Explosive: An explosive relatively insensitive to heat and shock, and usually initiated by a primary high explosive; used for boosters and bursting charges; examples include dynamite, TNT, RDX, PETN, and HMX
- Sensitivity: An explosive's susceptibility to initiation by externally applied energy
- Sensitizer: A substance that increases the sensitivity of an explosive
- Shaped Charge: An explosive charge shaped so as to concentrate its explosive force in a particular direction
- Shrapnel: Fragments, usually of metal, from an exploded artillery shell, mine, or bomb; bombmakers may add small lead, nails, or steel balls to an IED in order to increase the lethality of a device
- Spall: Fragment or fragments torn from either surface of armor plate resulting from the impact of kinetic energy ordnance, or the functioning of chemical energy ordnance
- Stability: The property of an explosive to resist detonation or deterioration under normal storage conditions
- Stabilizer: Material added to a propellant to inhibit or reduce decomposition in storage
- Standoff: The distance between the base of the charge or liner of shaped-charged ordnance and the target at the time of initiation
- Tamping: The process of tightly packing mud, wet sand, clay or other dense material on and around an explosive charge that has been placed on the surface of an obstacle, ordnance, etc.
- TATP: Acronym for triacetone triperoxide
- TNT: Trinitrotoluene
- TNT Equivalence: A standard unit of measure for explosives based on standard TNT
- UVIED: Under-vehicle Improvised Explosive Device
- UXO: Unexploded explosive ordnance which has been fired, dropped, placed or launched but remains unexploded by malfunction, design or other cause and has become a hazard to operations, personnel or infrastructure
- VBIED: Vehicle-borne Improvised Explosive Device
- VOIED: Victim-operated Improvised Explosive Device

Homeland Security