TERRORIST EXPLOSIVE SOURCEBOOK

COUNTERING TERRORIST USE OF IMPROVISED EXPLOSIVE DEVICES

Stephen Turner

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Warning

The devices described in this manual are deadly explosives, and the procedures for their handling are extremely hazardous. Whenever dealing with explosive devices, special precautions must be followed in accordance with military and law enforcement standards. Failure to strictly follow such standards may result in harm to life or limb. This manual is in no way a substitute for certified and extensive training in explosive ordnance disposal.

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COUNTERING TERRORIST USE OF IMPROVISED EXPLOSIVE DEVICES

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Terrorist Explosive Sourcebook:
Countering Terrorist Use of Improvised Explosive Devices
by Stephen Turner

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Introduction

How are terrorist improvised explosive devices (IEDs) constructed? Why do they sometimes claim the lives of even well-trained and suspicious personnel, and how can we avoid becoming a victim of them ourselves? These are among the questions most often asked by persons attending IED Awareness and Counterterrorist courses. In this manual, which was originally assembled for just such a course, you will find the answers.

The purpose of this manual is to provide a source of easily accessed reference material for both the professional and nonprofessional reader. Special Forces and contract military personnel, law enforcement officers, corporate security personnel, and interested civilians alike will find the information here invaluable. The contents will impart to the reader a sound basic knowledge of the principles and techniques involved in the preparation of IEDs and booby traps, as well as appropriate counterbomb/counterterrorist measures. Several previously unpublished and original techniques are revealed here, not to further terrorist or criminal projects, but in the belief that a wider knowledge of such techniques will do much to improve existing counterterrorist measures. At the very least, any subsequent deployment of related systems will lack the high surprise value which would otherwise be the case. This in itself will help save lives.

Note that for obvious reasons no *specific* explosive manufacturing details are included.

CHAPTER ONE

The Technology

WHAT IS AN IED?

An IED is an explosive assembly (a mine, bomb or booby trap, for example) of a type other than those manufactured commercially for use by military personnel. In other words, it is not one of the many standard explosive devices that may be found in the armories of the world's armed forces. This is not to say, of course, that an IED might not be found in such an armory after its manufacture by military personnel for use in some specific project. Therefore, although reference to an IED is often interpreted as implying a device made by terrorists, this is not necessarily always the case.

The entire IED (including the explosive material it contains) might be improvised, or the device might consist of an improvised actuating or firing assembly coupled to a commercial or military explosive charge. Improvisations for the actuating mechanisms themselves will vary in nature enormously from device to device. They might be as simple as stripped, looped-wire pieces formed so as to create a simple pull switch or they might be based on sophisticated electronic components such as transistors, integrated circuits, and multiple power sources connected so as to create a self-arming, delayed-action device with antihandling features. Between these levels of sophistication lie countless possibilities.

The explosive charge proper, as already stated, might be of the commercial or military type, or it might be improvised from any number of commonly available chemicals and household products. This brings us to our next important question.

WHAT IS AN EXPLOSIVE?

An explosive is a material (either a single substance or a mixture of substances used or manufactured in order to create a practical or useful effect by explosion), which, when suitably initiated (ignited) undergoes a rapid chemical decomposition with the evolution of enormous quantities of gas and heat. This produces a rapid increase in volume and therefore pressure. Such materials are are known as *chemical explosives.* This term distinguishes explosives proper (i.e., chemical explosives) from other things that might explode due to a combination of other factors (for example, a car radiator or a pressure cooker). Both these objects might explode if the internal pressures (generated by the heat energy applied to the water) are not released by a thermostat or a safety valve. But this "explosion" is merely the effect of the sudden rupturing of the body of the item. Take the water out of the radiator and heat it to a similar temperature unconfined and it will evaporate harmlessly. Explosions such as these may be termed *physical explosions*. It is important to remember, of course, that a physical explosion can be just as destructive as its chemical counterpart.

A third type of explosion should perhaps be mentioned here, as it often causes confusion. This is a nuclear explosion as produced by a nuclear weapon. A nuclear explosion causes the sudden production of massive amounts of heat (and through this heat the expansion of the surrounding air with its attendant destructive effects) by the process of fission.[1] The radioactive elements, however, are not themselves chemical explosives, although conventional chemical explosive material is used to trigger the reaction.

WHAT IS AN EXPLOSION?

An explosion is the sudden expansion of gases into a volume far greater than its initial one. It is this expanding, heated, high-pressure gas that works against its surroundings to create lifting, heaving or shattering effects, and the propulsion of fragments or

[1]Nuclear Fission: Splitting of the nuclei of certain heavy elements (i.e., plutonium or uranium 235) into lighter nuclei by the impact of neutrons. Additional neutrons are released as a result of fission and can themselves induce further fissions, this effect being known as a chain reaction.

debris. A given amount of explosive, then, can be looked upon as having many times that volume of stored energy available for (effectively) instantaneous release. Such commercial or military explosive material can be safely transported and handled.

CATEGORIES OF EXPLOSIONS

It used to be stated in most works on the subject that explosives could be divided into two convenient categories: (1) those that *detonated*, and (2) those that burned rapidly or *deflagrated*. These terms refer to the way in which the stored energy in an explosive is liberated when it is initiated. Nowadays, as the capability of several explosives to function in either capacity is being exploited more frequently, it is perhaps preferable to divide the explosive *process* into these two categories (detonation and deflagration), rather than the explosive *material* itself. Besides, many explosives will burn to detonation (on which, more later) when a sudden increase in the speed of the burn transforms it into a shock wave.

At one time, explosives intended to function by detonation were invariably classified as *high explosives* while those designed to function by burning (deflagration) were termed *low explosives*. As the majority of materials falling into this latter category are propellants, they are now frequently referred to as *propellant explosives* or just propellants.

Explosives vary in their *sensitiveness* (sensitivity) to initiation. Those which are readily initiated by a small stimulus are known as *primary explosives*; those requiring a more severe stimulus are known as *secondary explosives*.

Deflagration

With the obvious exception of water-based slurries, most explosives will burn when ignited in an unconfined condition. As explosives do not rely on a supply of oxygen from the atmosphere to sustain their combustion, they can also burn when confined. Burning is essentially a series of chemical reactions (transforming solid material into a gas) occurring on or just above the surface of the material. When this occurs, the surface of the burning material recedes at a rate determined by the velocity of heat transfer into the material. The primary condition affecting this velocity (the linear burning rate of a particular explosive) is the pressure at its surface because pressure will accelerate the flow of heat into the material. By confining a burning explosive, then, the gases produced are unable to escape, and this increase of pressure at the burning surface thereby increases the linear burning rate still further. Such reactions can occur in literally millionths of a second and produce the explosive effect known as deflagration.

Detonation

Detonation of an explosive is achieved by means of a traveling shock wave rather than the transmission of heat. The velocity of a shock wave in typical solid explosives is between 1800 and 9000 $m\ s^{-1}$. This speed is one to three times faster than that of a deflagration. Detonation can be provoked in two ways: (1) shock to detonation, or (2) burning to detonation.

Shock-to-Detonation

This is the most usual way of initiating detonation in an explosive and requires the production of a sufficiently powerful shock wave. This is commonly supplied by a detonator. The detonator (known also as a *blasting cap* or simply *cap*) usually takes the form of a metal cylinder 16mm to 55mm in length and 5mm to 7mm in diameter, although detonators as small as 10mm long and 5mm in diameter do exist. A typical detonator contains an ignition or *flash charge*, an intermediate or *priming charge* of compressed primary explosive, and a *base charge* of secondary explosive. However, this is not always the case.

The ignition or flash charge in the detonator is initiated either electrically or via a length of safety fuse, depending on the type of detonator. In the case of electrical detonators, the firing current might cause a resistance *bridge wire* to heat instantly to incandescence, whereupon a heat/flash sensitive explosive (such as a lead azide compound) burns to detonation, detonating the base charge.

Alternatively, the EBW (exploding bridge wire) technique might be used. In this technique, an instantaneous capacitive discharge (rather than a continuous DC current) causes the bridge wire itself to explode. This produces a shock wave of sufficient power to detonate a secondary high explosive (commonly PETN). This type of detonator negates the traditional dangers from *Radhaz* (radio frequency hazard) wherein the EED (electro-explosive device) is susceptible under certain circumstances to premature initiation through induced currents caused by emissions from nearby high-power radio transmitters, radar systems, or power-lines.

Another type of detonator (known, because of the manner in which it functions, as a *slapper detonator*) is designed so that the energy generated by the exploding bridge wire propels a small piece of plastic at high speed into the secondary explosive, causing it to detonate. Again, PETN or HNS (hexanitrostilbene) is typically used. Thus, when fired, the detonator produces an enormous localized shock or pressure wave which passes into the surrounding charge causing it to undergo compression and *adiabatic heating* [1]. Some of the chemical energy of the material is released, accelerating the shock wave and increasing the pressure at the wave front. This releases still more energy from the explosive and the process continues until it reaches the speed of sound. When filmed with high-speed camera equipment, a burst of light indicates the commencement of detonation.

Detonators of various powers and configurations are available: instantaneous or delay, electric or nonelectric, special, etc. The No.6 and No.8 commercial types are perhaps the most well known. The less sensitive the high explosive to be detonated, the more powerful the detonator required. Some commercial detonators are not powerful enough to initiate detonation in the more insensitive types of military or improvised secondary explosives. Because of this, special compound detonators are used, or a *booster charge* (comprising an explosive of an intermediate sensitiveness) is placed between the detonator and the secondary charge proper. An alternative uses the lower power detonators in pairs.

Detonators may be improvised from, for example, used rifle cartridges or copper or aluminum tubing with one end soldered closed. They may be loaded with any number of improvised primary and secondary explosive mixtures. Flying-model rocket engine igniters or pyrotechnic matches may be used to initiate

[1] Adiabatic: A temperature change in which no heat actually enters or leaves the system.

them electrically, as may modified flashlight or vehicle bulbs. (See Chapter Two for specific devices.)

Commercial detonators can (using great care) be squashed slightly to reduce their characteristic cylindrical profile and so render them less easy to detect in mail bomb searches. The electric types might also be disguised as various innocent electronic components and concealed inside electronic or electrical equipment. All-metal detonators will show up on an X-ray screen, but plastic and card-bodied detonators do exist and these will not show as well. Until ready for use, electric detonator leg wires are always shorted together to lessen the risk of premature firing due to induced electrical currents.

Burning-to-Detonation

Burning-to-detonation is an effect wherein the speed of burn of an explosive accelerates until it becomes transformed into a shock wave. The conditions required to bring about this transition and the susceptibility of explosives to it vary considerably. Confinement and a high burning rate index or the presence of a critical amount of explosive material may cause the effect. For example, a single stick of dynamite might simply burn fiercely when ignited, whereas a pile of loose sticks of the same material might provide enough self-confinement to burn to detonation. In any event, the process accelerates the linear burning rate to the speed of sound, at which point a shock wave forms, causing the remainder of the explosive to detonate.

EXPLOSIVE EFFECTS

In the case of an explosive being detonated without confinement, much of the released energy is held in the shock wave passing through the charge. The wave spreads into the surrounding atmosphere but slows quickly and is soon passed (within a few charge diameters) by the expanding gas wave. As it moves, the gas wave compresses the air in front of it and produces a powerful blast wave. This blast wave contains much of the intrinsic energy of the explosive. More force is produced here by the expanding gases than the shock wave.

If the same explosive is detonated against a dense object, the

shock wave is transmitted more effectively and produces extreme compression for a very short period. Brittle materials will fail under this compression, and not-so-brittle material will fail in tension when the extreme compression is suddenly reversed by reflection. The shock wave forces which are produced cause damage to the strongest of materials, the resulting debris then being moved violently by the expanding gases following it. This division or partition of energy between shock and blast wave is predictable for a given type of explosive detonated at a known velocity, and thus for commercial and military operations, specific types of explosive are selected with a view to achieving a desired effect.

EXPLOSIVE EFFECTIVENESS

The overall effectiveness of a particular explosive depends upon the amount of energy it can produce and, more importantly, the speed at which that energy can be released. Various performance parameters are used to determine the effectiveness of the different explosives:

- **Detonation Pressure**: the peak pressure in the shock front
- **Heat of Explosion**: the heat released under adiabatic conditions
- **Temperature of Explosion**: the maximum temperature the gases produced by the explosion can reach if no heat is lost to the surroundings
- **Pressure of Explosion**: the maximum static pressure achieved when a given weight of the explosive is burned in a closed container of fixed volume
- **Detonation Velocity**: the speed at which the detonation wave moves through the explosive
- **Rate of Burning**: the rate of consumption of a burning explosive in terms of mass per unit of time, or the rate of

regression of the burning surface in length per unit of time under a given pressure and temperature

- **Power Index:** a comparative expression of the work capacity of the explosive against that of another standard explosive

In the United States military, the combined characteristics of a given high explosive are usually indicated by means of a *relative effectiveness number*. This parameter assumes the use of the explosive as a breaching charge and considers it in relation to the standard: TNT (trinitrotoluene). TNT, being the benchmark, so to speak, has a relative effectiveness of 1. By way of comparison, C4 has a relative effectiveness of 1.34. At the other end of the scale, ammonium nitrate has a relative effectiveness of only 0.42. This is one reason why terrorist bombs based on this substance are so large.

In the British army, for historical reasons the standard explosive is picric acid, which is assigned what is known as a *power index value* of 100. From this is calculated the relative power of other explosives, said relative power also being expressed in terms of a *power index number*. EGDN (nitroglycol) has a power index value of 170, PETN (Pentaerythritol Tetranitrate) a value of 161, and RDX (Cyclonite/Hexogen or trimethylenetrinitramene) a value of 159.

Having considered the basic principles of explosives, we will now move on to examine the various ways in which such material might be configured into an IED by the terrorist.

CHAPTER TWO

IED Construction Principles

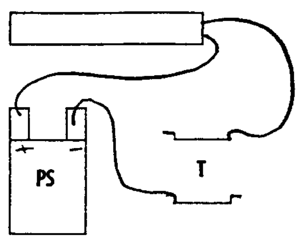
This chapter covers the basic principles underlying electrical and nonelectrical IEDs. An understanding of these principles will enable the reader to visualize more clearly the specific device designs detailed in subsequent chapters.

ELECTRICAL/ELECTRONIC IEDs

In addition to the charge, all electrical/electronic IEDs comprise:

(1) power source or sources
(2) electrical detonator or initiator (improvised or commercial)
(3) means for conducting current from the power source to the detonator/initiator. This may be wire, printed circuit track, improvised circuit track created with the use of conductive silver paint or metal foil, or a combination of any of the above
(4) trap switch or timer system (often both), activation of which causes current from the power source to flow to the detonator.

Regardless of specific designs, this type of IED fires when current from the power source is caused or allowed to flow into the detonator. At this point the detonator explodes. The



Illus.1: Simple Series Circuit

ED=Electric Detonator

T=Trap Switch (firing contacts)

PS=Power Source

basic principles underlying all electrically fired IEDs are outlined in the following pages.

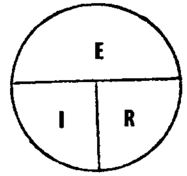
When the trap switch is caused to close, circuit continuity occurs and electrical current flows from the power source to the electric detonator, which fires.

Firing Current

As a specific, minimum amount of power is required to fire a given electric detonator, the power source must be able to supply at least this amount. The voltage and current (and therefore battery type) needed for a given device can be arrived at by using the basic laws of electricity. The relationship between current, voltage, and resistance is known as Ohm's Law and is expressed by the formula :

Voltage (E) = Current (I) x Resistance (R)

Current is expressed in amperes (amps), resistance in ohms, and the equation is usually written as E=IR. Thus it can be seen that via this equation, assuming knowledge of any two of the relevant values, the third (unknown) value can always be found. This formula is used to ensure that a particular power source is adequate for the job. An easy way to determine values is with the use of the diagram below. By covering up the symbol relating to the required value, the appropriate equation through which it may be determined is revealed. If we cover E, we are left with IR. (According to the above formula, E does indeed equal I times R.) If we cover the R, we are left with E over I (E divided by I) and therefore resistance equals voltage divided by current, and so on.



Illus. 2 : Ohm's Law

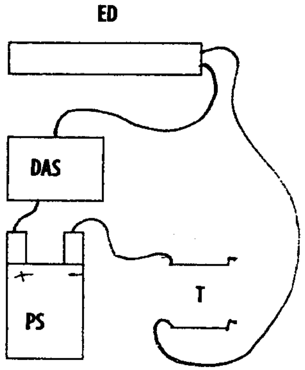
Typical commercial or military electrical detonators have an average resistance of between 1.5 and 2 ohms and a current requirement of .5 to 1.5 amps. Typical EBW-type detonators require a capacitive discharge of around 700 amps, but only for a fraction of a microsecond. The resistance and current requirements of specific IED detonators will, however, vary considerably depending on whether they are commercial, military, improvised, and so on. Assuming a simple series circuit, the resistance of the detonator must be added to any additional resistance introduced by interconnecting wires, switches, etc., when determining required power source values.

In many devices in which size is not a constraint, any number of commercial batteries might be used. In small booby trap devices and especially in letter bombs and devices utilizing unusual conductive interconnections, the battery needs to be selected with more care. However, the availability nowadays of higher current alkaline cells and lithium coin-shaped cells means that this rarely presents a problem for the booby trapper.

Many IEDs incorporate a separate (usually delayed) arming system. The circuit principles underlying this type of device are identical to those in Illustration 1. The extra switch provides for an extra margin of safety when assembling and deploying the device.

The Transistor as a Switch

Many modern electronic IEDs incorporate a transistor, using it as a nonlatching electronic switch. Instead of the physical action required to operate a mechanical switch, the



Illus 3: Series Circuit with Delayed Arming Switch

ED–Electric Detonator

PS–Power Source

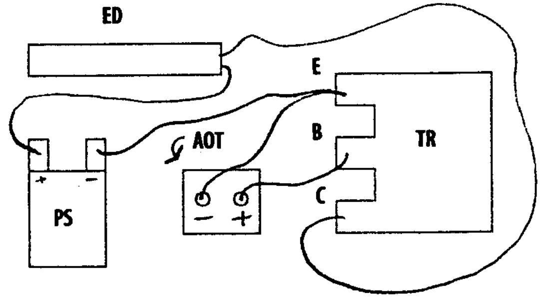
T–Trap Switch (firing contacts)

DAS–Delayed Arming Switch

transistor switching action is initiated by the appearance of a small current flow at its base. This small current flow switches a larger, battery-supplied current into a detonator or initiator.

Basic transistors are composed of three separate layers of semiconducting material, each of which has a positive or negative characteristic. The order of these layers gives the transistor a type designation: PNP (indicating a positive-negative-positive layering), or NPN (indicating a negative-positive-negative layering).

In an NPN-type transistor, for example, two layers of N-type material, known as the *collector* (C) and *emitter* (E), are separated by a thinner layer, the *base* (B), of P-type material. If the collector of such a transistor is connected to a positive battery terminal and the emitter to the negative, a current will try to flow. Electrons from the emitter pass through the thin base layer to the collector, but immediately upon this occurring, a small percentage of them become trapped in the base layer and build up a negative charge. This blocks the current. The switch is "off." If, however, a small positive triggering current is now fed to the base of the transistor, the trapped electrons are neutralized and the main emitter-collector current starts again. The switch is "on."



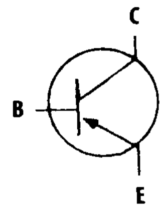
Illus 4 : Transistor and Electronic Travel Alarm IED

ED–Electric Detonator

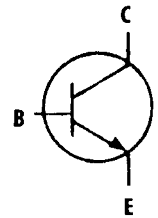
TR–Transistor

AOT–Alarm Output Terminals

FS–Power Supply



Illus. 5a: PNP Transistor



Illus. 5b: NPN Transistor

In an IED configuration, the smaller, triggering current might be supplied by the output from the sounder terminals of an electronic alarm clock. The positive alarm terminal would then be connected to the transistor base and the negative alarm terminal to the emitter. A detonator would be connected in series between the transistor collector and the positive terminal of the firing supply (battery). The negative terminal of the firing supply would connect to the transistor emitter. When the alarm sounds, the small base current thus produced would allow the larger firing supply current to flow, and so the detonator would fire.

In circuit diagrams and reference charts, the NPN or PNP status of a transistor can be determined by the direction in which the small arrow (indicating the emitter) points.

Other semiconductor devices may be used in place of the transistor to obtain a switching effect. The most likely are the *thyristor* (also known as a *silicon controlled rectifier* or SCR), and a *silicon-controlled switch* (SCS). Both these devices have differently named connections/leads. Their operating principles are, however, similar to the transistor in that a change in current flow at one junction allows current to flow via another.

OTHER IED SWITCHES

Switches of a more conventional type are frequently used in IEDs. Regardless of specific type, they have at least one common denominator in the form of connection possibilities.

As the principles are similar, we can consider, by way of an example, the simple manual switch. It usually has two or three internal contacts and therefore two or three external connection terminals. One of these are the "common" and is always used, hence its name. The remaining one or two terminals are normally open (NO) and/or normally closed (NC) types. It is the status of the internal contacts in relation to the common contact when the switch is inoperative (i.e., in its "normal" state) that determines the designation of the appropriate terminal (and, in the case of two terminal switches, the switch itself). Thus, if a particular contact is open (not connected to the common) when at rest, it is referred to as the "normally open" contact. If it is in contact with the common, it is called a "normally closed" contact. When the switch is operated, the status of the contacts reverse, the NO contact closing, and the NC contact opening.

These designations apply to magnetically-operated reed switches and also to relays. In one version of the former, a sprung contact arm (the common) is pulled away from the NC contact (and onto the NO contact) under the influence of the magnet. When the magnet is removed, the contact status reverts to normal. In the case of the latter, a separate power supply is used to energize the relay contacts and achieve the same effect, i.e., cause the common contact to leave the NC contact and touch the NO contact. When the power source is

removed or runs down (known as the *collapsing relay technique)*, the relay contacts revert to their normal status.

It can be seen from this that according to the selection of terminals (NO or NC) by which the firing power source and detonator/initiator are connected on a given switch, an IED can be constructed so as to activate in any number of different ways. Further, two or more relays can be connected in conjunction with independent power sources so as to render interruption of an operating circuit impossible without causing them to operate (or cease to operate) and thereby allow firing current to pass to the detonator.

NONELECTRICAL/NONELECTRONIC IEDs

In addition to the explosive charge, nonelectrical/nonelectronic IEDs incorporate:

(1) a nonelectric detonator or initiator
(2) a system for firing the detonator/initiator
(3) a trap switch or timer system (often both), activation of which causes the firing system to function

The nonelectric detonator may be fired by flame and heat produced by either an attached length of commercial or improvised safety (time) fuse, an attached percussion cap (or some similar, striker-operated component), or a chemical reaction.

A spring-loaded striker, which, when released, hits the percussion cap and causes it to fire, is easily improvised or obtained commercially in a variety of forms. Acids or reactive chemicals may be contained in a glass or metal housing which incorporates some barrier. The chemical eventually corrodes or soaks through this barrier and enters the detonator cavity, creating the required heat and/or flame. Acids and heat/flame-producing chemical mixes might instead be contained in glass, soft metal, or other types of housing, and isolated with a barrier of some kind in such a manner that when the housing is crushed or broken (by the target performing some apparently harmless action), the materials are caused to mix and react. Often the housing itself provides the barrier for an acid, the assembly simply being placed on (or in) an acid-reactive mixture.

Nonelectric IEDs of the booby trap or antipersonnel type may be improvised entirely from nonmetallic components, making them extremely difficult to detect. Combination electrical and nonelectrical IEDs have also been deployed.

DEA personnel engaged in drug lab raids have encountered ultracrude (but very effective) explosive traps formed by placing containers of ether (an extremely volatile material) close to hot plates or gas torches in such a manner that when a door or window is opened, the contents spill and ignite to cause an explosion. Other potential nonexplosive traps include:

- fish hooks dangling at eye level
- punji stick devices (sharpened, often poisoned or excrement-covered wooden sticks concealed in camouflaged pits or assembled into falling, swinging, or spring-loaded systems)
- vicious dogs
- poisonous snakes

ACTIVATION/TRIGGER MECHANISMS

Included here are the mechanical, electromechanical, electric, or electronic mechanisms and systems that cause the IED to operate when some particular, predetermined conditions are met. In the U.S. and elsewhere these mechanisms are usually referred to as *fuzes.* This term is used to distinguish such mechanisms from *fuses,* which are simply a means of communicating fire. In Britain and some other countries the distinction is not always made, and the term "fuze" is taken to mean either an actuating mechanism or a length of fuse proper, depending on context.

It is in the area of *activation* that the ingenuity of the bomber or booby trapper comes into its own. Specific design

parameters are really only limited by the creativity of the designer. There are, however, three very broad categories of activation that we can use to define devices. These are *action by the target, time-delay,* and *command-fired.* The latter is any device that is fired remotely by the bomber at a specific moment.

Action implies movement, either of the device itself (directly or indirectly) or of the target in close proximity to the device. Such devices may be designed so as to react to:

- movement
- vibration
- a change in environmental conditions
- physical properties of a nearby object
- noise
- pressure
- release of pressure
- etc.

Time-delay involves the use of a mechanical, electromechanical, electronic, or chemical delay system (or a combination of any or all of these). Time-delay might be used to (1) cause the device to explode immediately upon the expiration of the delay period, or (2) to *arm* the device upon expiration of the delay period, whereupon an action-dependent trigger system takes over. Both uses may be combined in one device. There are few things that cannot be booby trapped. Thus an initial suspicion of all items, objects, and areas not known to be safe is the required mindset. Following are examples of specific mechanisms:

Acid Delay: an improvised system in which a small quantity of acid gradually eats through a barrier of some type until it contacts a chemical mixture, causing a spurt of flame. This flame may be used to fire a detonator, light a length of time fuse, ignite incendiary material, or initiate certain types of explosive directly. Acid delays are commonly assembled into a stand-alone metal or glass cylinder.

Anti-Prodder Trap: An improvised electrical device used as a trap for searchers looking for mines with a basic metal prodder or bayonet. It consists of a waterproofed assembly containing two layers of foil or mesh which form the firing contacts, insulated with a thin sheet of foam or plastic. This assembly is buried just below the surface so that when a searcher inserts a prodder to locate a buried mine, the firing contacts short out, the circuit completes, and the device is caused to fire.

Anti-Tripwire Feeler Trap: A system based around two extremely fine conductive wires which are connected together at intervals with an insulating material. Each of the wires is connected into an electrical firing circuit. When the two wires are shorted by a metallic tripwire feeler, circuit continuity occurs and the attached explosive device fires.

Battery Run-Down/Relay Device (Collapsing Relay Device): An improvised time delay device in which two power sources are usually employed. One source provides the firing power and the other is used to hold open a relay. When the relay battery runs down (which can be a matter of hours, days, or even weeks or months, depending on the size of the battery and current drain of the relay), the relay closes and allows current from the firing battery to pass through it to the detonator. This device can also be used to delay the arming of a system.

Barometric Switch: A commercial or improvised device which responds to air pressure changes. It may be improvised from an aircraft altimeter or coffee jar (which also contains the charge and firing supply), a piece of flexible rubber, and metal firing contacts. One contact is fixed a short distance above the mouth of the jar, the other is fixed to the rubber piece, which is stretched and secured across the jar mouth so as to form an airtight seal. Being free to move under the influence of the rubber, this lower contact will (when the surrounding air pressure drops below a predetermined amount) eventually rise a sufficient amount to touch the fixed contact above it, thereby completing the electrical circuit. Commercial and improvised versions have been used in aircraft luggage hold bombs. Small electronic commercial types exist which may easily be concealed in electrical and electronic equipment.

Bathroom Scales Mine: Here mechanical scales are used. Firing contacts are affixed through the dial face and to the rotating scale itself. This device is installed in a box of some kind and buried just below the surface of the ground with a simple pressure plate laid over it. Then, when an individual of the selected weight (or heavier) walks on the pressure plate, the scale rotates and the contacts touch. This completes the circuit and the device explodes. It is easily set to fire under the weight of soldier carrying equipment (for example) but not if walked on by a nontarget individual such as a child.

Biscuit (Cookie in U.S.) Bomb: A misnomer bestowed upon the device by the British press—this isn't a bomb at all but an improvised grenade launcher. It is the device that has received much publicity recently when discovered in an IRA arms cache. The design details were restricted, and pictures of the device were never shown. It is actually a clever variation of an old type of improvised recoilless "rifle" in which a central charge propels a warhead built into a large jam or margarine tin of the type used for military rations. The device is electrically fired from an onboard battery housed in a pistol-grip assembly, the trigger taking the form of a large long-actuator-arm-type of microswitch. Back pressure is absorbed by two packets of biscuits (cookies) wrapped in paper towels. The device incorporates a lamp holder arming switch and front and rear sights.

Book Booby Trap: The book booby trap may take various forms. In the most common, the book is hollowed to conceal an explosive charge, firing circuit, and delay-to-arm system. Foil firing contacts are attached to opposing pages in such a manner that they touch with the book closed. Before deployment/dispatch, insulating material (typically in the form of a piece of paper currency) is placed between the foil contacts in the manner of a bookmark. When the finder or recipient removes the insulating piece, the contacts touch and the device fires. An alternate version uses a relay and additional power source. There is no insulator/lure. Here the foil contacts *must touch* to prevent the device from exploding. When they are separated, the relay closes and the circuit is completed. Books may also be booby-trapped with a simple loop pull switch or any number of other commercial or improvised mechanisms.

Burned Out Fuse Trap: An electrically operated IED based around a mercury switch (or improvised movement switch) deployed in a pipe or other container with a protruding length of burned safety fuse. This gives the impression that the device has failed to detonate because the fuse went out. The unwary finder, believing it to be safe, moves the device and causes the real activation system to function.

Cafétière A/P Mine: The cafétière (available in a variety of sizes) is disassembled as for cleaning and an explosive charge and firing components installed. Firing contacts take the form of two adhesive alarm foil strips applied horizontally to the inside of the glass just above the level of the charge material. The lid and moveable insert assembly is then replaced and the lid itself secured with adhesive. Subsequent depression of the insert knob beyond a given point causes the metal filter/head assembly to short out the foil contacts and complete the circuit. The completed assembly might be housed in an improvised frame and buried or placed so as to operate in various other ways.

Candle Delays: The humble candle can be used in a number of IED configurations. It can be installed upright in a pile of inflammable material which ignite when the candle burns down, or a tension-release device (electrical or mechanical) can be attached to a rigidly-mounted candle via a flammable cord which will burn through (thereby releasing the tension) at a predetermined point. A safety fuse, one end of which is crimped into a nonelectric detonator, can also be wrapped around the candle. In this case, the safety fuse would be split and matches inserted to catch the flame as the candle burns down. The reduction in weight as the candle burns down can also be used to cause a counterbalanced (by the candle) mechanism to fall and complete an electrical circuit. The candle itself might also be hollowed internally and partially filled with a flame-sensitive explosive. There are dozens of other variations.

Capacitor Substitute Device: An improvised device in which the normal battery power supply is replaced with one or more capacitors. For most purposes the capacitor can be looked upon as a battery capable of instantly releasing its stored energy. Capacitors are easily installed in, for example, a tape-player bomb in such a manner that they are charged by the usual batteries. Because of this it is important to note that counterbomb measures involving the removal of batteries from tape players, etc., while offering some extra protection, will achieve nothing if a concealed power source exists. Further, a functional check (in which an item is tested for correct operation) does nothing to deter the professional bomb designer. Only complete disassembly of an item will provide total security.

Capacitor/Low Current Device: An improvised system used when the power source batteries to be used must be extremely small (i.e., watch batteries) and/or when they are unlikely to have sufficient available current to fire the detonator directly. The technique involves connecting several such batteries in series and then connecting the stack to an electrolytic capacitor. The capacitor itself is connected to one side of the detonator circuit via any trigger switch. The batteries charge the capacitor, which, when the switch is activated, releases all the stored energy instantly, thereby firing the detonator. Electrolytic capacitors can be squashed slightly to reduce/alter their profile. Capacitors can also be improvised from any number of common items, in which case they will not necessarily resemble the traditional commercial types.

Cassette Incendiary Device: So-called because the device is traditionally deployed inside a plastic audiocassette case. Typically, the timer section will be based on a simple watch delay or Memopark system. Upon completion of the electrical circuit, current flows from a battery into a cutaway bulb containing black or smokeless powder, or into an electronic gas stove lighter head. In either case, the resulting heat and flame ignites incendiary material such as pieces of firelighter. This type of device is always deployed among clothing, bedding, or other flammable materials.

Claymores: Any device loosely based on the original Claymore weapon. It is an antipersonnel device in which shrapnel material is embedded into (or placed upon) a concave-shaped explosive charge with a view to directing the blast in a specific direction. During the war in the Balkans, Bosnian irregular forces manufactured extremely large, crude (but devastatingly effective) improvised Claymores known, because of their shape, as "televisions." The vast majority of claymore-type systems are command-detonated, but many tripwire variants have been deployed.

Clothespin Switch: The clothespin may be used in conjunction with an electrical circuit as a pull switch, pressure switch, pressure release switch, time delay device, etc. The various actions are determined by varying the location of attached contacts and insulators. For example, with contacts on each jaw (and the jaws isolated with an insulator attached to a pull wire), a system suitable for trapping a door, box lid, buried mine (or for use with a tripwire) is created. If pin contacts are pressed through each jaw and a soft insulator inserted, a pressure-activated device is made. With the jaws instead held apart by a few turns of solder wrapped around the rear of the clothespin, a time-delay system of the material-fatigue type is obtained. With contacts on both jaws and opening arms, and with the switch mounted via the spring center, a combination pull and tension-release device is made. With the versatile clothespin, the booby trapper can replicate every activation mode available from commercial military trap switches.

Coffee Jar Grenade: An improvised antipersonnel grenade in which a glass jar is used to house an explosive charge, shrapnel material, and electrical firing circuit. A microswitch is installed in such a manner that its operating lever is held in the closed or "off" position by the inner wall of the jar. When thrown, the glass jar shatters and releases the operating lever, allowing firing current to flow from a battery to the electrical detonator.

Cornering Vehicle Device: A variation on the metal ball switch, used in vehicle bombs. The metal ball is contained in a flexible plastic tube. At either end of the tube are two firing contacts which connect to the bomb circuit. The ends of the tube are bent upward slightly to prevent the ball rolling

against them under normal conditions. The assembly is concealed beneath the target vehicle. When the vehicle turns a corner at any significant speed the ball is forced to the opposite end of the tube and the circuit is completed.

Corrosive Chemical Delay Actions: These are any systems based on the gradual decomposition or corrosion of some material by a chemical. This corrosive action may result ultimately in a hypergolic [1] reaction or may be used to release a mechanical striker or complete an electrical circuit. Common corrosive chemical systems include:

- cardboard and glycerine
- table tennis ball and acid
- acid and asbestos wadding
- waxed drink (milk) carton and acid
- copper cylinder, rubber/waxed disk, and acid
- glass tube, rubber/waxed card disk and acid
- rubber band and gasoline (rubber band contracts when gasoline evaporates)
- gelatin capsules (into which some reactive substance has been placed) and most liquids

Door and Wedge Trap: In this trap (often used in a room that security force personnel can be expected to search), an electrically fired IED is concealed beneath the floor. The firing contacts are likewise hidden beneath the floor and comprise one fixed and one falling type. The falling contact is attached to a short length of wood that passes up through a small hole in the floor in front of the door. The top of this wood piece is secured with a small amount of adhesive to the underside of the door wedge. When the door is subsequently opened beyond a given point it strikes the wedge, breaking it free and allowing the hidden contact to fall and complete the circuit. One aspect of this technique is that

[1] Hypergolic: igniting upon contact of components without external aid (as a spark).

even if suspicious personnel are able to examine the room before entering (via a window, for example), they are unlikely to give the wedge a second thought.

Door and Reed Switch Trap: Here a magnet is concealed in (or simply attached to the bottom of) the door in such a manner that when opened (or closed) beyond a selected point it operates a reed switch-based IED hidden beneath the floor.

Dried Seed or Bean Time Delay: Here a jar or some similar nonconducting container is equipped with a metal insert of such a diameter that it is free to move up and down within the jar. The jar lid is fitted with two firing contacts, one of which goes to the battery, the other to one of the detonator wires. Dried seeds are poured into the bottom of the jar, water added, and the lid replaced. As the seeds expand, the insert rises until eventually it touches the firing contacts, thereby completing the circuit.

Dripping Water Delays: These are improvised delay systems in which water dripping slowly from an upper container (for example) gradually fills another container incorporating a pair of firing contacts. In one version, one contact takes the form of a metal plate or dish which floats on the slowly rising water. Eventually this plate reaches another contact that has been fixed through the wall of the container and the circuit is completed. This technique can be inverted and designed so that the lower contact (most of which is insulated) passes through a loop formed in the upper contact, which is fixed. The lower contact is mounted on a wooden or plastic insulator and floats in a container of water. If a small hole is made in the lower container, the floating block (and with it the lower contact) will gradually fall. Eventually the uninsulated end of the lower contact will touch the looped end of the upper contact and complete the circuit.

Yet another variation uses the water itself to conduct current between two firing contacts when the water level reaches a certain point. In a practical assembly, salt would have to be added to the lower container in order to create a saline solution (necessary to facilitate the passage of a DC current adequate to fire a detonator). This principle can be applied

to IEDs concealed in drains, sink waste pipes, water barrels and toilet cisterns as well as purpose-made containers.

Electrochemical Cell (E Cell) Devices: These are commercial items. An E cell comprises two electrodes and electrolyte. One electrode is usually silver, the other gold. With a small constant current passing through the cell, silver is gradually plated onto, or removed from the gold electrode (according to the way the cell is connected). At a constant current flow, a specific, predictable amount of time is required for the transfer of silver to take place. In an IED, the cell will be used in conjunction with a fixed or variable resistor. The value of this resistor will determine the delay time. Delays of a year are practicable. The voltage across the cell will be very low until the transfer of silver is complete. When this happens the voltage increases sharply. This sudden increase in voltage can be used to switch a transistor and thereby complete the firing circuit. Such cells may be salvaged from high-quality vehicles in which they are used to trigger service-interval warning lights.

Electronic Travel Alarm Device: This device is the modern version of the mechanical clock timer and is based on the small, watch battery-powered type of alarm. A transistor is connected to the alarm sounder outputs in such a manner that it will switch current from an external battery to a detonator when the sounder operates, the current available at the terminals being insufficient (despite what the movie makers might think) to fire a detonator directly. Delays of up to 24 hours are possible with this device, and the transistor may be concealed inside the clock body.

Explosive Powders and Dusts: Aside from the obvious commercial and military explosives proper that may take the form of a powder, there are many other substances which (depending on particle size, degree of confinement, and saturation levels) can be initiated to create an explosive effect. This principle can be exploited to destroy buildings using an amount of explosive that by itself would be inadequate. Carbonaceous materials are commonly used. The usual technique is to provoke two separate but sequential explosions by surrounding a base charge of an explosive that has a high incendiary effect with the carbonaceous powder. When detonated, the powder is both scattered (saturating the surrounding atmosphere) and then ignited. Wheat flour is an alternative, as are most metal dusts. With this principle in mind, crude experiments with improvised, grenade-type devices containing dried skimmed milk powder and smokeless powder rifle propellant were made by certain foreign mercenary troops in Bosnia. It is unknown how effective (if at all) these devices would have been if deployed in anger.

Explosive Round: In this simple trap, a standard rifle round is modified to hold a nonelectric detonator and small quantity of explosive. The bullet is replaced and the round(s) left where they are likely to be found and used by enemy personnel or tested for forensic comparison purposes. When the round is fired, the primer flash fires the detonator.

Falling Weight Devices:

(1) This is an IED utilizing a vehicle or bicycle dynamo (generator) as the firing power source. The dynamo is secured to a ceiling, for example, and a weighted cord wrapped around the drive pulley. The weight is supported by a pole or some similar arrangement that is itself attached to, for example, a door. When the door is opened, the pole is dislodged and the weight falls. The cord rotates the drive pulley and the resulting electrical current fires the detonator.

(2) Here an IED is concealed inside any item that is inverted during the course of its normal use, i.e., a salt or pepper shaker. One firing contact takes the form of a metal insert installed beneath the shaker mouth, and the other is attached to a small conductive weight. When the shaker is inverted, the weight falls against the insert and completes the circuit. With some of the original contents replaced (i.e., covering the conductive weight) the shaker may be used for some time before continuity occurs.

(3) This is an improvised igniter device that can be used to fire a variety of IEDs. A typical form comprises a tube, the lower half of which contains a collar of matchbox striker material into which a heavy bolt has been installed in such a manner that it is free to move up and down. Match heads are affixed to the lower section of the bolt with adhesive so that they will rub against the striker material. The bolt is suspended within the tube by means of a safety pin passing through it and a pullwire is attached to the safety pin. When released, the bolt falls and the match heads ignite.

Fan Action Trap: In this IED (which is typically deployed in known or likely helicopter landing zones), a fan assembly is connected to a small electrical generator so that when rotated, an electrical current is produced. This system is emplaced in such a manner that the downdraft from a landing helicopter causes the fan to rotate. Because the actual charge need not be in exactly the same location as the fan/generator assembly, an upward firing shaped charge could be used in the center of the LZ (Landing Zone) to destroy the helicopter itself. Or the charge(s) might be placed in the surrounding area with a view to killing troops awaiting extraction, for example.

Flashlight Booby Trap: Another simple device in which an electrical detonator is installed in place of the bulb. A colored filter is attached to the glass to conceal the modification. When the flashlight is operated as usual the device fires. A variation sees the explosive modifications concealed inside the flashlight body.

Fusible Wire Device: This type of IED uses a commercial or improvised assembly based on a short piece of fuse wire. The wire is used to hold down a sprung contact, which, when released, completes an electrical circuit. The device is triggered by any switch system that causes an excessive current to flow through the wire. It may be used as the primary trigger in a device or as an arming switch.

Grenade/Light Bulb Bobby Trap: In this assembly the grenade fuse and firing system is removed and an electrical detonator installed. The detonator is wired to a household light bulb base which itself is attached to the grenade neck. The assembly is installed in a light socket and explodes when the light switch is turned on.

Grenade and Can Booby Trap: Here a grenade is placed part way into a can in such a manner that the can walls are holding the safety lever (spoon) in place. The grenade is attached to a pullwire and the pin removed. When the wire is tripped, the grenade is pulled free, thereby releasing the safety lever. This device is often deployed in pairs across a track with one grenade on each side of the track connected with a tripwire.

Grenade Delay Train Removal Trap: In this technique the delay train is removed from the grenade detonator so that it explodes immediately when the safety lever is released.

Grenade/Plastic Tape Delay: Here the grenade lever is taped with insulating or packaging tape and the pin removed. The grenade is then dropped into a fuel storage tank (for example). The fuel gradually dissolves the tape adhesive, allowing it to unwrap and release the safety lever.

Hacksaw Blade and Paraffin Wax Delay: This improvised switch exploits the springiness of the hacksaw blade and the temporary insulating/isolating properties of a material (such as a lump of paraffin wax) to provide a delay. The blade forms one firing contact; the second may be a nail or anything similar. The blade is attached to an insulating base in such a manner that its tendency is to spring back against the second contact. It is prevented from doing so by the wax lump. In a warm environment the wax will gradually soften and allow the blade to contact the nail, thereby completing the circuit. An ice cube can be used instead of the wax.

Holdall Bomb: An electrical IED built into the soft type of luggage such as a duffle bag. A length of very flexible tubing installed inside the holdall contains a metal ball bearing which is trapped at the upper end of the tube by a safety pin. Two firing contacts are attached to lower end of the tube. With the bag deployed on the ground, the upper part of the tube bends under the weight preventing the ball from moving. The safety pin is removed. When next the bag is lifted, the tube extends, the ball falls, and the firing circuit is completed.

Improvised Fuses: These are used to communicate fire to a primary explosive or incendiary charge or detonator. Many versions exist, and a lighted cigarette has been used in

this role on many occasions. Fuses can also be improvised by either soaking a suitable length of flammable cord, string, shoelace, etc., in some type of combustible or oxygenating substance (a solution of potassium nitrate and sugar, for example), or by using adhesive to stick substances such as black or smokeless powder to the outside of the material. An alternative is to contain the substance within an improvised fuse body. The burn rate of the fuse improvised in this manner will depend greatly upon the filler substance employed and the degree to which it is compressed. An example is the improvisation known in some places as the "JR Fuse," which is made from a length of parachute cord. The central strengthening lines are removed and one end of the remaining outer sleeve is knotted tightly. The sleeve is then filled with smokeless powder. Twirling the sleeve periodically during the filling process forces the powder to compress, ensuring a steady and extremely predictable burning rate. When almost full, the free end is knotted.

Kitchen Scales Booby Trap: This is a variation on the bathroom scales device and has been used to booby trap "lure" items or items that must be moved by the target. The circuit construction is similar to the bathroom scales device except that the contacts will usually be attached to the scale face and a moving scale arm. The face contact will be installed *after* the scales have been compressed by the lure item (i.e., with the arm contact already past the face contact). Any subsequent attempt to move the lure will allow the arm to rotate back onto the face contact and complete the circuit.

Knife Switch: An improvised device based on a metal knife (or some similar, flexible length of metal), secured edgewise to a wooden base. At either side of the blade are contacts. One wire from the firing circuit connects to the blade, the other to one or both of the contacts. The device may be designed so that tension on a pullwire causes the blade to be pulled against the contacts, or so that a release of tension causes the blade to spring back against one of the contacts, or both.

Lamp Post Booby Trap: This is an IED installed in roadside lamp posts of the type that turn on automatically at dusk. The technique would be particularly applicable to areas which are heavily patrolled by security force personnel. The detonator wires are simply tapped into the bulb supply line using snap connectors. The device explodes when the lamp turns on.

Light-Sensitive Booby Trap: Any device based on a sensor which reacts to an increase or decrease in light level. Sensors used in such devices include a light dependent resistor (LDR), a photo-transistor, or a photo-diode. Typical deployment locations include behind provocative wall posters, or in a culvert, tunnel, or drains. Infrared sensitive devices have been deployed. An improvised light-sensitive device can be made by cutting the top case section from a power transistor.

Loop Switch: A simple but dangerous switch made by stripping and forming the ends of two insulated firing wires into loops. The wires are passed through each other so that each loop rests on the insulated section of the opposite wire. The wires are then connected into a firing circuit. Any subsequent tension on or movement of either wire will cause the loops to touch and complete the circuit. The basic switch can be made safer by securing one or both of the wires with an elastic band. This requires a specific amount of tension to be applied in order to overcome the tension of the elastic band. Variations using stiffer wires, one of which is coiled into a spring shape, can be used. Here a small section of the second wire is stripped and positioned in the center of the coil. Subsequent compression of the coil will cause it to touch the inner wire and complete the circuit.

Matchbox Switch: A simple pressure switch made by wrapping wire (or affixing foil) firing contacts around the lower portion of the inner section and the upper portion of the outer section of a matchbox, which is then deployed partially open. The switch may be deployed horizontally, for example, behind an open drawer (between the drawer proper and the inside rear of the drawer housing), or vertically in an expedient frame support. In either case, pressure on the inner section forces it back into the outer section and the firing contacts touch. In a basic pressure-activated variation,

foil is applied to the inside base of the inner box section and to the underside of the top of the outer portion.

Material Fatigue Time Delay System: Any convenient material (for example, solder, elastic band, or heat-shrink tubing) which will break, weaken, stretch, or deteriorate over a given period of time, and which may therefore be used to delay the closing or opening of an electrical circuit or the actuation of a mechanical system. A typical device uses solder to hold apart the jaws of a clothespin switch. The solder stretches over a period of time, eventually allowing the jaw contacts to close and complete a circuit.

Mechanical Alarm Clock Device: The traditional clockwork alarm may be used in an IED in several ways: (1) In the first, a contact is fixed through the face of the clock in such a manner that either the hour or the minute hand will touch it at some predetermined time. For delays of up to one hour, the bomber will remove the hour hand; for delays of up to 12 hours the minute hand will be removed. Another contact will be made to the clock winder or body. When the selected hand touches the face contact, the electrical circuit is completed and the device explodes. This may also be used as a delayed arming system. (2) In the second technique, one of the ringer bells is covered with insulating tape. One firing contact is affixed to the tape. The other firing contact attaches to the striker. When the selected time is reached, the alarm activates as normal and the striker touches the bell contact, thereby completing the electrical circuit. (3) The rotating action of the alarm winder (as the alarm rings) may also be used to wind on a length of twine which is attached to a pull switch, or depress a microswitch. As with the mechanical watch system, both clock hands may be used to create a combination time delay/firing device. (4) The internal springs (which expand as they run down) might also be connected so as to form firing contacts or depress a small switch.

Mechanical Watch Delay Device: A classic improvised delay system in which a mechanical watch is modified by removing either the hour hand (for delays of up to one hour) or the minute hand (for delays of up to 12 hours). One contact is fixed through the watch face and a second contact is attached to the watch winder. These contacts lead to the firing circuit. When the selected hand reaches the face contact, an electrical circuit is completed and the IED explodes. This device is also used as a delayed arming system. Both hands can be utilized to create a combination delayed arming and firing system. The sweep hand is always removed except in the case of trip or pullwire type devices in which a very short delay is required. Here the sweep hand would be used as one firing contact and its rotation temporarily stopped by inserting a substantial insulating piece into a hole drilled through the watch glass. When this stop piece is pulled free the hand continues its rotation, touching the face contact a matter of seconds later. In the case of watches having a hacking feature, the sweep hand rotation might instead be stopped by pulling the winder out as in time adjustment, assembling into the IED circuit, and deploying in such a manner that some action on the part of the target causes the winder to be depressed again, thereby restarting the sweep.

"Memopark" Clockwork Device: The Memopark is a small, commercial timer used for alerting the carrier to the fact that his/her parking meter needs feeding, etc. The device is clockwork and is wound much like a kitchen timer. When the set time elapses, the front of the unit rotates and produces a buzzing sound. This rotating action can be used to trip a switch or make or break many other types of electrical contacts. In larger IEDs a kitchen timer proper may be used.

Mercury (Tilt) Switch: A commercial or improvised device used in car bombs, booby traps of various types, and as an antihandling device in conjunction with other triggers or switches. The switch is connected in series with the firing circuit. No current passes until the switch body is moved beyond a certain position, whereupon a blob of mercury shorts out two internal contacts and completes the circuit. This type of switch can also be deployed in a fixed horizontal position in a vehicle so as to create an acceleration or deceleration triggered device. Here, sudden acceleration or deceleration (depending on which way the switch is positioned) will cause the internal mercury blob to be thrown to the opposite end of its housing and short out the contacts.

Metal Ball Switch: An improvised mechanism found in two main forms. (1) In the first (which is often referred to as an *always switch*), a metal ball rests in a shallow cavity cut from a wooden base. The cavity is caged by two inverted, metal "U" pieces which connect to the firing circuit. If the base is moved beyond a certain point, the ball rolls out of the cavity and onto the "U" piece uprights, shorting them out and completing the circuit. (2) In its second form, the metal ball is housed in a plastic or glass tube. At one end of the tube is a cork into which wires from the firing circuit have been pressed. When the tube is rotated, the ball rolls onto the wires. This type of device is frequently used to booby-trap door handles. A variation on this is to use a conductive tube with an insulator (cork, for example) in the open end. One firing circuit wire connects directly to the tube, the other to a contact passing through the insulator.

Metal Dish and Ball Device: Here two flat-bottomed shallow metal dishes are attached to each other via a narrow insulating ring of card, plastic, or rubber. Prior to securing, a small rubber ring is affixed to the center of one of the dishes and a metal ball of suitable diameter placed on it. Each dish connects to the firing circuit. When the assembly is moved without extreme care the ball rolls off the rubber ring and shorts out the two dishes, thereby completing the electrical circuit.

Microswitches: These are commercial switches available in various forms. The subminiature type is about the size of a thumbnail. The actuating lever may be removed to reduce the profile of the switch. They may be connected in the Normally Open (NO) or Normally Closed (NC) configuration.

Mousetrap Switch: These may be used as either pressure-activated, pressure-release, pull/tripwire, or time-delay switches. In an electrical configuration, one wire connects to the spring-loaded striker bar, the other to a contact on the wooden base. Circuit continuity occurs when the striker touches the base contact. In a purely mechanical configuration, an improvised firing pin may be attached to the striker bar in such a manner that when released it strikes a base-mounted percussion cap. A shotgun blank or rimfire cartridge is often used as an initiator in this type of device. A "Magicube" nonelectric flashcube bulb may be used instead. Here the bulb is mounted so that the released striker hits the single leg of the bulb, causing it to fire. The heat generated by the bulb is sufficient to ignite a flammable material such as smokeless powder or flash powder, and can therefore be used to initiate a nonelectric detonator (by forming a small tubular collar around the bulb with card and filling it and the detonator cavity with such material). Mousetraps have frequently been used in combination electromechanical systems.

Pendulum Switch: An improvised or commercial switch in which one of the firing circuit wires is connected to a hanging pendulum which itself is mounted inside a second, circular firing contact. Movement causes the pendulum to swing against the second contact and complete the circuit. Traffic cones may readily be booby trapped using this type of system.

Piezoelectric Device: This is a device based upon a piezoelectric transducer of the type used as a sounder in many telephones. When used in "reverse," so to speak, by applying direct or indirect pressure, or even by releasing an existing applied pressure, these transducers generate a tiny electrical current. This current is sufficient to switch a transistor or thyristor. If suitably mounted, it may also be used to detect changes in air pressure. Being extremely thin (typically less than 1mm), such devices may be deployed in areas where conventional pressure or pressure-release triggers would be too obvious.

Pyrotechnic Actions and Initiators: These are any compounds, items, or products that burn and produce heat and light. They may be used to initiate incendiary devices, fire blasting caps, or initiate certain types of explosive directly. They are also used as delay systems. Typical IED pyrotechnic actions and initiators include:

- candles
- cloth wicks
- electric bulbs surrounded with inflammable material
- electric fuses (modified as per flashlight or vehicle bulbs)

- fireworks
- flares
- flashbulbs (electrical and mechanical)
- flying model rocket engines and igniters
- matches (and match scrapings)
- safety fuse (commercial or improvised)
- vehicle/flashlight bulbs (with the glass cut away, filament intact, filled with black or smokeless powder)

RC (Resistor/Capacitor) Time Delay: In this improvised delay system, a resistor is used to limit the amount of charge passing from a battery to a capacitor. The capacitor is connected to a transistor in such a manner that the transistor will not pass firing current to a detonator until the capacitor is fully charged. (See the earlier section on using the transistor as a switch.) The time it takes for the capacitor to charge can be varied from minutes to hours.

Reed Switch and Lure Booby Trap: An IED based on a commercial reed switch and magnet. The reed switch-based IED is concealed in one item, the operating magnet in another. The two items are deployed together as in, for example, a valuable looking jewel box on top of a book, or a box of rifle ammunition on top of a rifle magazine. When the jewel box is lifted (thereby removing the reed switch from the influence of the magnet), the device explodes. The reed switch may also be used as a concealed arming system. In this application, a boxed IED would contain a reed switch connected (in the NC configuration) in series with the primary firing system. With a magnet in the correct position (i.e., above the reed switch) on the outside of the IED housing, the switch would be pulled into the NO (or safe) position. Removing the magnet would allow the reed to close again and arm the device. Only the IED designer would know the required magnet-locating position.

Safety Pin Booby Trap: Here a mechanical IED is rigged to incorporate a concealed electrical firing system. The electrical circuit is completed when a safety pin is replaced with a view to neutralizing the apparent mechanical action. In a plastic or wooden-bodied device, the firing contacts may take the form of two conductive silver paint tracks which almost meet in the center of the safety pin hole. Inserting a metal safety pin will short them out and cause the device to fire. The paint tracks may be painted over with normal paint for camouflage purposes. An alternative could employ a subminiature press-to-make switch concealed inside a hole apparently intended to take a safety pin.

"Sparklets" Bulb Grenade (CO_2 Cartridge): A grenade based upon the type of carbon dioxide gas cartridge used in soda siphons or paintball guns. The bulb is discharged and the neck valve drilled out to facilitate installation of an explosive material and insertion of a length of safety fuse. The device is often deployed by catapult in which case a piece of wire coat hanger is attached to the cartridge in such a manner that the cartridge can be launched (base first) with the fuse burning.

Stapler Booby Trap: An improvised device based on the larger type of office stapler. The lower rubber base is levered off to provide access to the inner cavity area. An electrical detonator and small charge is installed along with one or two lithium coin batteries. Interconnecting wires are attached to the lower and upper metal stapler faces, turning them into firing contacts. The base is replaced. When next the stapler is used, circuit continuity occurs and the device fires.

Tape Player Booby Trap (Audio or Video): In this device, firing contacts are installed in the player in a manner that allows them to touch the tape of an installed cassette. A shorting contact is then affixed to the cassette tape material itself at some predetermined point. The tape will play quite normally until this section is reached, whereupon the electrical circuit is completed and the device explodes.

Thermal Switch: Any commercial or improvised product which reacts to an increase or decrease in temperature and indicates the change via an electronic, mechanical, or electromechanical reaction. This reaction is used to operate an IED circuit or mechanism. For example, the different expansion rates of two dissimilar metals sandwiched togeth-

er to form a bimetallic strip (as used in most thermostats) will cause it to bend when heated. This bending movement can be used to complete a circuit or operate a small switch.

Tin Lid Switch: An improvised switch made from two tin can lids. A wire from the firing circuit is affixed to each lid. A hole is punched (not drilled) through the center of each lid and the two lids then insulated from each other with a piece of writing paper. Subsequent pressure on the upper lid forces the rough edges of the punched hole through the paper, the lids touch and the electrical circuit is completed.

Vehicle Battery/Lead Sheet Mine: This device is buried just below the surface of the ground and camouflaged. It is based around a vehicle battery, lead sheet, and insulator. The firing circuit is connected so as to be completed when one end of the lead sheet is depressed (by a walking man, for example) onto one of the battery terminals, one detonator wire being attached to the other terminal, the other to the lead sheet. The other terminal is insulated so that the sheet may rest on it without shorting. Foil-covered card and similar objects may be used in place of the lead sheet.

Vibration Detector: A commercial or improvised device reacting to vibration rather than sustained movement proper and having a nonlatching action, i.e., if the vibration stops the current stops flowing. An improvised form could consist of, for example, a piece of clock spring to which a small weight is attached. This is used as a primary or secondary firing mechanism, invariably with a delay arming system due to the sensitiveness of the assembly.

VCR Alarm Trap: A device based on the type of VCR theft alarm built into a VHS cassette. A detonator is installed in place of the alarm sounder (using a transistor and additional power source, if required) and placed in the VCR. Looting enemy personnel or any other target moving the VCR will cause the device to fire.

Video Cassette/Slipcover Booby Trap: An improvised device in which a video cassette is disassembled and IED components installed. Firing contacts lead from the concealed device (one from the battery, the other to the detonator—the other detonator wire being attached directly to the battery) to the outside of the cassette. A metal foil shorting strip is attached to the *inside* mouth of the cassette case. Insulating material is used to cover the strip while the cassette is replaced in the case. When the insulation is removed, any subsequent attempt to remove the cassette will cause the strip to short out the firing contacts and the device will explode.

Vox Switch Trap: A device based on a commercial or improvised switch which operates when sound above a predetermined level occurs. Commercial devices used to start tape recorders automatically can be modified to instead pass firing current to an electric detonator. The types designed to plug into the remote start socket of tape recorders need no modification, as they simply change from an NO to NC status when activated. Other types will be installed in conjunction with a transistor as described in earlier sections.

CHAPTER THREE

Characteristics and Recognition Features of Explosive Materials

IED EXPLOSIVE AND INCENDIARY MATERIALS

The following chemicals and materials are readily available from a variety of sources. Given an appropriate context, the validity of "usage claims" made with regard to any such chemicals discovered during a security search should be carefully investigated.

Hazard Limitation*: As a matter of prudence, always wear protective clothing (goggles, gloves, dust mask as a minimum) when initially investigating any unknown material. The popular television techniques of identifying a chemical by sniffing it or rubbing it between the fingers are extremely dangerous. Even common household products and chemicals can cause sickness, nausea, or headaches if inhaled or allowed to contact the skin. Personnel likely to be charged with the removal of chemicals or chemical residues should have access to fireproof overalls and gloves, acid-proof safety goggles, and self-contained breathing apparatus. Suitable containers should be available in which to transport unknown chemicals. Oxidizers must be kept isolated from fueling agents, and adequate fire fighting equipment should be on hand.*

Aluminum Powder: A gray or silvery metallic dust which forms an explosive mixture in air and reacts with certain acids and caustic solutions to produce hydrogen. It is a material found in various improvised explosive and incendiary mixes and is added to certain explosive mixtures to increase the heat of explosion and thus the work capacity of the charge. Typical legitimate uses include cold-cast model making and paint manufacture.

Ammonium Nitrate Fertilizer: White buff crystals, prills (pellets), or powder. It can be sensitized by combining with fuel oil or certain other liquids to produce an explosive (ANFO) or mixed with TNT to produce AMATOL explosive. Ammonium nitrate is a powerful oxidizer.

"Anal" Explosive Mix: An improvised powder explosive made from ammonium nitrate and aluminum powder. It is usually deployed in a tightly sealed, taped plastic bag.

"Annie" Explosive Mix: An extremely toxic improvised explosive mixture made from ammonium nitrate and nitrobenzene. Its color is dark yellow-brown and it has an almond-like odor. Search personnel should be aware that the vapor from nitrobenzene is toxic and the material is readily absorbed through the skin. It is usually deployed in sealed plastic containers, often with a booster charge.

Aqueous Ammonia: A clear liquid, readily available in the form of household glass cleaner. It is used as a sensitizer with nitromethane.

"Backarock" Explosive Mix: An extremely toxic improvised explosive manufactured from potassium chlorate and nitrobenzene. It is yellow-brown in color and has an almond-like odor. *Note previous warnings about nitrobenzene.*

Black Powder: Recoverable from fireworks or easily manufactured from potassium nitrate, charcoal, and sulfur. It is used for fuses, incendiary devices, or, if tightly confined, as an explosive. Its burn rate is increased enormously if confined. Black powder is available in granular and pellet form—the finer the granulation, the faster the burn.

Butter: Used in the manufacture of certain chlorate-based improvised plastic explosives. Alternatives include lard, hair cream, corn oil, Vaseline, and margarine.

Calcium Carbide: Available in dark gray-black chunks. It reacts with water to produce highly flammable/explosive acetylene gas. Typical legitimate uses include a fuel in some types of lighting, and model "novelty cannons."

Calcium Hypochlorite: A white powder or tablet with a powerful smell of chlorine. It reacts with moisture or acids to

produce chlorine gas and will ignite when in contact with combustible and organic materials. Typical legitimate use is as a bleaching agent.

Carbon Disulfide: A colorless liquid with a smell like rotting radishes, poisonous and very inflammable. It is used as a solvent for yellow phosphorous in self-igniting Molotov cocktails, in industry in rubber vulcanizing and viscose rayon manufacturing processes, and as a fumigant.

"Co-Op" Explosive Mix: (Sodium chlorate/nitrobenzene improvised explosive). Has an almond-like smell and is yellow-brown in color.

"Cool Burner" Incendiary: An improvised incendiary made from potassium permanganate and granulated sugar. It is pink-red in color.

Copper Sulfate: Large blue crystals or greenish-white powder. Used with sodium chlorate, liquid ammonia, and alcohol to make TACC (tetramminecopper (II) chlorate) improvised primary explosive. Typical legitimate uses include insecticide, water purification, and coloring of lead to resemble copper.

Diesel Oil: Can be used to sensitize ammonium nitrate fertilizer to produce an explosive with a variable detonating velocity.

"Fairy Liquid": A British brand, greenish hand-washing liquid boiled and added to gasoline to make a type of improvised napalm.

Ferric Oxide (Iron rust): Used with aluminum powder and magnesium turnings/shavings to create improvised thermite.

"Fire Icing" Incendiary: A disguised improvised incendiary made from boiled sugar, water, and potassium chlorate. It is molded into the shape of cakes or sweets and colored with poster paint.

Flash Incendiary Mix: Composed of potassium permanganate and aluminum powder. It is silvery-pink in color.

Gasoline: The color of gasoline may vary from the norm if dyes are added. Liquid and vapors are both sensitive to heat, flame, sparks, and static electricity. It is used with various additives (soap or polystyrene chips, for example) to create a jelly (improvised napalm).

Glycerine: A clear, sticky, heavy liquid. It reacts with calcium hypochlorite or potassium permanganate to produce heat and flame and is used as a sore throat treatment.

Harpic (Brand) Toilet Cleaner: This commercial product can be mixed with aluminum powder to produce a general purpose explosive.

Hexamine: A white, salt-like material which can be used to make RDX explosive. It is used in compressed block form as a fuel for camping stoves and model steam engines.

Hydrogen Peroxide: This familiar product is used as a hair bleach. A 60-percent-plus concentration can be detonated.

Iodine Crystals: Dark bluish-red crystals with metallic sheen. It will react with water to generate enough heat to cause combustion of certain materials and can be used with ammonia to create an extremely sensitive explosive (ammonia tri-iodide). Crystals are recoverable (by evaporation) from tincture of iodine, which is legitimately available for use as a microbicide. This material is toxic if swallowed, inhaled, or absorbed through the skin.

Lead: A dark gray, soft metal. Small pieces of this material are used in conjunction with sodium or potassium nitrate and wood alcohol to produce improvised lead monoxide and sodium or potassium nitrite. Lead monoxide is a dark brown-orange colored solid used in the preparation of improvised lead picrate

Magnesium: A silvery metal found in powdered form or in narrow, solid strips. This is a combustible substance forming explosive mixtures with air. In powdered form it will react with water and acids to produce hydrogen. Magnesium turnings can be reworked into powder.

Moth Balls (Naphthalene): Can be crushed and mixed with potassium dichromate and ammonium nitrate to create an explosive with a detonating velocity of around 2,500 meters per second. When heated, it will produce an explosive/inflammable vapor.

Nitric Acid: A clear, colorless liquid producing reddish-yellow fumes. It causes severe skin burns and forms a dangerous reaction with many materials. An explosive reaction is obtained with metallic powders, carbides, turpentine, hydrogen sulfides, and cyanide.

Nitrobenzene: A yellow liquid with the odor of almonds. The liquid is poisonous, easily absorbed through the skin, and the vapor toxic. It is used with sodium or potassium chlorate to make explosives and incendiaries. A popular Provisional Irish Republican Army chemical.

Nitromethane (impure): A model-racing fuel available from hobby stores. It forms a powerful liquid explosive when mixed with aqueous ammonia and may also be used to sensitize other materials for use as improvised explosives.

Paraffin Oil (aka "Baby Oil"): Used with gasoline and concentrated sulfuric acid in the manufacture of sustained-burn, self-igniting Molotov cocktails. An igniter mix of sugar and chlorate is attached to the outside of the bottle so that, upon breaking, the acid contacts this mix and the chemicals ignite.

Paraffin Wax: Used in the manufacture of chlorate-based improvised cast and shaped charges.

Petroleum Jelly (Vaseline): Used as a binder with potassium chlorate to make a homemade plasticized explosive.

Picric Acid (TNP/Trinitrophenol): An explosive having similar relative effectiveness to TNT. It is used as a booster explosive or to manufacture lead picrate primary explosive. The color is lemon yellow. It combines readily with some metals to form explosive picrate salts, which are very sensitive to heat, shock and friction, and can be improvised from aspirin.

Plaster of Paris: Can be mixed with aluminum powder to form an incendiary material.

Polystyrene (Styrofoam): This is the familiar packing material. It can be added to gasoline to create a type of improvised napalm.

Potassium: A soft, white reactive metal stored under oil and reacting violently with water. Cut faces oxidize immediately on contact with air to create a gray color.

Potassium Chlorate: Available as white crystals or powder (if crushed). It is recoverable (in impure form) from matches. This is a powerful oxidizer and will generate heat/flame with sulfuric acid and organic materials. Potassium chlorate is used with a variety of fueling agents to produce improvised explosives.

Potassium Dichromate: Used in photographic processing and in some types of polish stain. It can be combined with various other chemicals (i.e., charcoal, ammonium nitrate, and aluminum powder) to form a powerful explosive.

Potassium Perchlorate: These are white crystals and are more stable than chlorate. Produces an explosive mixture with red phosphorous. (Red phosphorous does not ignite with air, although yellow and white phosphorous do.)

Potassium Permanganate: Consists of very dark purple (almost black) crystals. It is an extremely powerful oxidizer and will react with glycerine to produce heat and flame. It is explosive when in contact with hydrogen peroxide or sulfuric acid. Common uses are as a sterilizing agent and an antiseptic.

Sawdust: Used in powder form in place of charcoal in some (especially potassium chlorate-based) improvised explosives.

Smokeless Power: The propellant in small arms cartridges. Nitro-based smokeless powders are frequently used as explosive fillings in pipe bombs and the like. In such cases the material may be detonated or ignited with a safety fuse.

Soap Flakes (*pure soap, not detergent*): Used with gasoline to make improvised napalm.

Sodium Chlorate: Appears as whitish crystals and is used with nitrobenzene to make an explosive. It is also used in the manufacture of TACC improvised explosive and with sugar in various other explosive/incendiary mixes. It is commonly available as a weed killer or defoliant.

Sodium Peroxide: A yellowish-white powder turning yellowish-brown when heated. It reacts violently with water. Mixtures of sodium peroxide and combustible, organic, or easily oxidizable materials are explosive and easily ignited upon contact with water or by friction.

Sodium: A silvery, waxy metal. Exposed surfaces turn gray on contact with air. It is supplied submerged in mineral oil. Sodium is extremely dangerous and causes skin burns. It causes an extremely violent reaction with water or moisture, producing sufficient heat to cause ignition or explosion.

Sugar: Used as a fueling agent in various improvised incendiary and explosive mixes, both in granulated and fine (powder) form.

Sulfur: A yellow powder. It is an ingredient in the manufacture of improvised black powder and is mixed with potassium chlorate and other chemicals to make various types of explosive. It is sold as a laxative.

Sulfuric Acid: An oily, colorless liquid that causes severe skin burns. It is explosive when mixed with potassium permanganate or incendiary when mixed with black powder, potassium chlorate, match heads, sodium peroxide, and calcium hypochlorite. It is used in the manufacture of improvised picric acid. Concentrated sulfuric acid is itself improvised by boiling vehicle battery acid until white fumes appear.

Trichloroethane: A nonreacting hydrocarbon used with impure nitromethane (model racing fuel) to sensitize ammonium nitrate. The use of additives such as trichloroethane has been provoked by stricter controls in certain quarters on the availability of technical grade nitromethane. It is available for use as a cleaning solvent.

COMMERCIAL AND MILITARY EXPLOSIVES

The detonating velocities given here can be assumed to be typical of those attainable with optimum values for all variables such as density of loading, diameter of charge, type of detonator, etc.

Ammonium Nitrate: A powerful oxidizer. It comes as white-buff crystals, prills (pellets), or powder, and is extremely hygroscopic. Commercially, it is used where a pushing, rather than shattering explosive effect is required, and also as an additive with other compounds. When used alone, it is usually initiated with a booster charge of TNT. The confined material is capable of cooking-off if exposed to fire. Detonating velocity is approximately 8,900 fps, relative effectiveness factor (RE) 0.42. Ammonium nitrate must not be stored in copper or brass containers because of dangerous chemical reactions. Its principal uses are as a cratering charge and in quarrying.

Amatol 80/20: A mixture of ammonium nitrate and TNT. It typically appears as buff-brown blocks or pressings, and has a detonating velocity of approximately 16,000 fps, RE of 1.17.

Blasting Gelatin: A translucent, elastic, jelly-like substance, appearing in various colors. It has characteristics similar to gelatin dynamite but has a greater water resistance. It is used principally in commercial blasting projects.

C4/PE4: The standard plastic explosive in use by the British and U.S. armies. It is very stable, white, and putty-like. It is available in sheet form, and is made from 91 percent RDX and 9 percent inert plasticizer. Other plastic explosives may vary in color (black, dirty gray, light blue, yellow, dark green, etc.) and may be more or less malleable. The detonating velocity of C4 is approximately 26,400 fps, RE of 1.34. It is principally used by the military as a cutting and breaching charge.

Detonating Cord (Det Cord): A white, flexible cord, approximately .25" in diameter (available in larger diameters for specialist uses), filled with PETN. The ends are often sealed with tape in terrorist IEDs to prevent the filling from falling out. Detonating velocity is approximately 20,000 to 24,000 fps. It is used principally in explosive ring mains as a means of simultaneously detonating several charges.

Dynamite Explosives: Standard, ammonia, and gelatin (Gelignite) dynamites exist. It is granular (commonly green or brown and rubber-like in appearance), although solid types are available. Military dynamite (typically issued in .5lb, 8" x 1.25" diameter cartridges) doesn't contain nitroglycerine and is therefore far safer to handle and store than commercial types. Old commercial dynamites will sweat nitroglycerine, causing oily stains on wrappers and storage cases. In this condition it is extremely dangerous. Detonating velocity is:

(1) Military: approximately 20,000 fps, RE of 0.92
(2) Commercial: from 7,900 to 19,000 fps (depending on type), RE of 0.41 to 0.83. Dynamite explosives are principally used as a general demolition charge and for quarrying and ditching.

EGDN (Nitroglycol): Ethylene dinitrate, also known as nitroglycol and ethylene dinitrate. This is a colorless liquid manufactured in a similar fashion to nitroglycerin(e) but is less susceptible to mechanical shock. It is used in the manufacture of various gelatinous and solid explosives.

HMX: A marginally more powerful variant of RDX. It is a white solid with a powerful shattering effect.

Kinepouch/Kinestik: A commercial explosive system comprising premeasured quantities of ammonium nitrate and nitromethane. Five minutes or so before use, the liquid nitromethane is added to the ammonium nitrate to sensitize it.

Lead Azide: A primary explosive taking the form of a whitish-buff crystalline substance. It is sensitive to flame and impact and is used with lead styphnate in many types of aluminum detonators. It forms dangerous and sensitive copper azide in the presence of moisture and copper or brass.

Lead Styphnate: A primary explosive usually taking the form of orange or brown crystals. It is used in detonators and primers and is easily ignited by heat and static discharges.

Mercury Fulminate: A primary explosive taking the form of gray or white crystals. It is very sensitive to friction, flame, heat, and impact and is used in detonators.

Nitroglycerine: A thick, clear to yellow-brown liquid. Extremely powerful and shock-sensitive. It freezes at 56°F and is far less shock-sensitive when frozen.

Pentolite: A high-explosive made from equal amounts of TNT and PETN. Its color is light yellow. It is frequently used as the filling in grenades.

Picric Acid: A yellow, crystalline high explosive. It is similar in power/effectiveness to TNT and forms dangerous and extremely sensitive lead pictrate explosive if allowed to come into contact with lead.

RDX (Cyclonite): A white crystalline solid used as the base charge in several detonators. Its detonating velocity is around 27,440 fps. It is used as a general demolition charge and in detonators.

Semtex: A Czechoslovakian plastic explosive deriving its power from a 50/50 mixture of RDX and PETN. It is of a similar power to C4 but more prone to sweating or bleeding its plasticizer.

Tetryl: A fine, yellow, crystalline material used in detonators and as a booster explosive. Its detonating velocity is approximately 23,300 fps, RE of 1.25.

Tetrytol: A high-explosive manufactured from 75% tetryl and 25% TNT. It is used as a bursting charge in certain munitions and as a general demolition explosive. Its detonating velocity is approximately 23,000 fps, RE of 1.20.

TNT (Trinitrotoluene): Is usually formed into cylindrical or rectangular blocks, typically .25 pounds, .5 pounds, or 1 pound in weight. There are various colors and wrappings, including paper, plastic, and card with metal ends. Detonating velocity is 22,600 fps, RE of 1. It is used by the military as a breaching charge and in composition explosives.

FLAMELESS PYROTECHNIC ACTIVATION SYSTEMS

These are systems in which a simple (often binary) chemical mix (as opposed to a flame source) is used to produce heat and flame with a view to starting a fire, firing a nonelectric detonator, or initiating primary explosives. They are also known as hypergolic activation systems. Typical mixes are shown below:

- Calcium hypochlorite (HTH), brake fluid, glycerine, and certain types of hair cream
- Iodine crystals, aluminum powder, and water
- Nitric acid and metal powders
- Potassium permanganate and glycerine
- Sodium peroxide, powdered metals or sugar, and water
- Sulfuric acid, chlorates, and sugar

CHAPTER FOUR

Reaction Drills and Countermeasures

Having considered the technology of the IED, we will now look at some of the reasons such devices are deployed, likely deployment locations, and defensive measures that can be taken against them and related terrorist attacks.

WHY ARE IEDs USED?

IEDs have been used in the furtherance of many criminal, political, or ideologically motivated crimes. In the case of terrorist attacks proper, they are used as both strategic (part of an overall campaign) and tactical (having a specific purpose within that campaign) weapons. Some of the reasons they might be deployed are to:

- generate publicity
- reduce the morale of a target group
- deny the security forces or other target personnel the use of terrain, buildings, equipment, etc.
- force the target into specific areas where they can be killed by other means
- hinder police and security force reconnaissance operations
- delay IED-clearing operations
- give warning of police or security force patrols
- deter police or security force searches

- deter police or security force patrols
- cause fear and confusion among the civilian population with a view to provoking the populace into demanding that the government change or reconsider some existing policy
- destabilize a target regime
- force a change in the operating techniques of a target organization
- avenge some historical defeat or mark some important (to the group) historical event
- kill a specific individual
- destroy a specific industrial or commercial complex or center
- intimidate a target group into supporting the movement or ceasing active resistance against it

The use of IEDs allows a terrorist or extremist group to injure, kill, or cause damage with little risk of detection or capture. The publicity generated is disproportionate to the effort involved and often to the size of the group in question. Justification for attacks on soft targets can be found in an oft-quoted terrorist adage which reads, "When hungry, why hunt for a tiger when there are plenty of sheep around?" This can be expressed in less colorful terms as, "When hungry for publicity, notoriety, or revenge, why attack a hard target (with the attendant high risk of failure, capture, or death) when there are plenty of soft or undefended targets around that can be attacked with relative impunity?"

WHAT ARE THE PRINCIPLES OF BOOBY-TRAPPING?

The majority of terrorist IEDs can be classified as booby traps. In other words, they are designed to actuate when the target undertakes some apparently harmless action such as lifting a briefcase or opening a car door. The psychology of booby-trapping is worthy of consideration. Several basic

principles are always used by *successful* booby trappers. They are:

Surroundings: The surroundings will appear undisturbed, and no clues (such as bits of wire, wrappers from explosives, signs of forced entry, etc.) will be left behind. Mechanisms will be concealed, camouflaged, or designed so as to resemble some innocent item.

Obstacles: All man-made obstacles are ideal from the viewpoint of the booby trapper because sooner or later they will have to be removed. In the interim they will be bypassed and so any obvious bypass routes will be trapped also.

Lures (Bait): It is not just cats that curiosity kills. Traps will be set in obvious locations to trick the inquisitive, attached to souvenirs or items of value, and disguised as apparently mislaid or abandoned items to catch the unwary.

Attraction: An interesting, useful, or much-frequented area or location (e.g., a shady spot, a natural washing/bathing pool, a public display area, a bandstand, or a place of cover likely to be adopted by security force patrol members, etc.) will often be trapped.

Bluff and Double Bluff: Dummy traps will be used to induce carelessness in finders. Obvious trap mechanisms will be used to conceal more clever, dangerous ones. Having deployed one real device, hoax warnings will often be issued about other devices. This combination of real devices and hoaxes causes as many problems for the security forces as would the continual deployment of real devices.

Variety: Many different types of trap will be used in the same locality to cause confusion, delay incident and emergency response teams, and delay or negate the development of a standard neutralization technique (which would speed up subsequent trap neutralization operations).

HOW ARE BOOBY TRAPS DETECTED?

The vast majority of booby traps can be detected only by the extremely careful search of all suspicious areas and objects. All personnel likely to encounter such devices must be constantly aware of the threat when occupying contested areas, undertaking searches, responding to calls for assistance, returning to parked vehicles, performing routine patrols, etc. "Trap sense" will come with practice. Constant vigilance is extremely important.

What Specific Locations and Objects Should Be Suspected?

Given an appropriate context, the following are all potential trap locations and objects:

(1) Abandoned (or apparently lost) items of souvenir and/or financial or military value to the finder, and apparently lost items which can be relied upon to provoke their recovery or removal with a view to determining the legitimate owner.
(2) Items and obstacles that must be moved before a unit or patrol or other target can enter an area or pass some point. This includes natural and manmade objects, vehicles, and so on.
(3) Obvious access points such as building entrances, gates, tracks, fences, windows, etc.
(4) Installations. This includes any installation (building, bunker, storage facility, office, production plant, etc.) of strategic, tactical, political, or psychological value to the target authority. Also any installation that is likely to be searched by target personnel as a matter of course or because of a provocative phone call or tip-off. Objects within such locations should also be suspected.
(5) Open country, locations of natural cover, areas of scrub likely to be used for camouflage, shady areas, obvious

landmarks, and known patrol routes. Also consider the most obvious alternatives to locations in the above categories (which may be trapped in order to catch the more wary).
(6) Lines of communication: roads, railway lines, culverts, bridges, embankments, road cuts, junctions, checkpoints, telephone and radio links, the postal service, known/likely security force LZs, DZs, FUPs, RVs.
(7) Events/Gatherings: shows, displays, political meetings, apparent vehicle accidents, training areas, etc.
(8) The personal property and belongings (including vehicles) of specific (tactical) target individuals.

What Are the Warning Signs to Look For?

Anything that is out of the ordinary, unusual, or out of place may indicate a booby trap or a nearby command-fired device. As with all security related matters, context is important. Bearing this in mind (and remembering also that more often than not no clues will be evident), some examples are:

(1) signs of digging or repair work
(2) abandoned items that have an obvious cash or souvenir value
(3) disturbed ground and minor ground subsidence (especially after rain)
(4) spoil and debris from digging
(5) unusual marks on walls, footpaths, roads, roadside lamps, etc. (used as a warning indicator to friendly forces and sympathizers or as a timing/aiming mark for a command-fired device)
(6) unnatural marks on trees or vegetation, or branches bent or broken, etc., as above

(7) minor obstructions of all types, including vehicles, especially if blocking the only obvious access/approach route
(8) marks in surface dust or grime
(9) continuity breaks in paint work, surface grime, or vegetation
(10) patches of dead or dying (discolored) grass or vegetation
(11) open doors that one would expect to be closed
(12) closed doors that one would expect to be open
(13) the presence of wire, cord, nails, pegs, etc., that have no apparent function
(14) vehicles left unattended in unusual locations
(15) unattended luggage in likely target areas
(16) the discovery in nearby areas of chemicals and equipment of use in IED construction projects
(17) closed curtains or blinds during daylight hours in a house to which security force personnel have been called in order to investigate some alleged incident or problem
(18) single, anonymous calls to security force personnel to attend some allegedly serious incident
(19) blocked drains and drainpipes
(20) single access points, which the other side of (or the area beyond) cannot be seen
(21) an unusual absence of vehicles in a terrorist-sympathetic area
(22) all windows open in houses in a terrorist-sympathetic area
(23) an unusual absence of street troublemakers in a terrorist-sympathetic area

(24) the detection of an observer(s)
(25) the arrival of an unexpected parcel or package

WHAT SHOULD BE DONE IF A BOMB THREAT CALL IS RECEIVED?

In many attacks against civilian targets, where the main object of the exercise is publicity, a warning will often be given by phone. Ideally, the warning will be received early enough to enable evacuation of the building or area in question but too late for the security forces to disarm the device.

Codes are arranged between the security forces and various terrorist organizations in order that a genuine threat call can be quickly identified as such. This is one of the reasons why the exact wording of any threat calls received should be noted accurately on a Threat Call Card and/or electronically recorded. Such cards also have spaces for the recording of related information which will be of great value during subsequent criminal investigations. Sometimes the caller will say nothing other than the time the device is set to explode. An initial attempt should be made, however, to elicit as much related information as possible. Of course, the most important pieces of information that *must* be accurately recorded are:

- When will the device explode?
- Where is it?

A Threat Call Card is supplied (Appendix D) in a form suitable for copying. Copies should be attached to a clipboard and placed close to all outside-line phones. A simple, release-to-make switch system (which operates when the clipboard is lifted from its usual resting place) coupled to a cassette recorder (itself connected to the phone) of the type that has a remote start facility will enable automatic recording of all conversations provoking use of the Threat Call Card. The switch might also trigger an auto-dialer programmed to call a specific professional reaction agency.

In the event such a call is received, a prearranged and practiced reaction drill should be implemented. This drill will be designed so as to achieve several objectives simultaneously:

- the safe evacuation of all at-risk personnel
- the summoning of professional assistance (police and military)
- the limitation of damage

In the case of a threat call being received at commercial or business premises, for example, the call recipient should (in addition to commencing filling in the Threat Call Card immediately give some signal that alerts the appropriate security personnel to the situation. With multiline phone systems, this again could be achieved via use of an auto-dialer. The security personnel will then initiate the evacuation and alert the police and/or security forces.

Often, the easiest way to achieve a calm and controlled evacuation is to initiate an existing fire drill procedure. It is important, of course, that security personnel and senior staff members be aware of the real purpose of the evacuation. Further, personnel should not be allowed to ignore practice fire drills by virtue of their status or position. Emergency exits and stairways, elevators, etc., are ideal bomb placement locations. Thus, when evacuating as the result of a bomb threat (and assuming that the precise location of the device is unknown) a pre-evacuation check of exit routes should be made prior to the arrival of evacuees proper. This technique should be employed even if the exit route is currently in use. Should anything suspicious be discovered, personnel will be diverted to an alternate route. As each area is evacuated, all windows and doors should be opened unless air-conditioning or existing security measures prevent this. Doing so will reduce somewhat any subsequent blast damage should a device explode. Similarly, when all persons are clear of the building, mains electricity and gas supplies should be turned off also (if practicable).

Safety Perimeter

Due to the danger of injury from outward flying and

falling glass and debris caused by an explosion inside a building, evacuated personnel should be moved away from the area immediately outside the building to a safety perimeter some 100 meters distant. If the area outside the building is a public street, the police will take control of this side of the operation upon their arrival. Nominated employees should take a roll call of evacuated persons to confirm that the building is clear and all personnel accounted for.

Searches

If in-house security or threat reaction personnel are to search for IEDs or IIDs, such searches must be planned, rehearsed, and undertaken in a manner that reduces to a minimum the risk to search team members. Search areas should be given a priority rating based on the ease with which a bomber could gain access to them, public access areas obviously having the highest rating.

With a view to limiting injuries or loss of life in the event a device should explode while a search is in progress, the principle of *maximum separation* is always applied. This means that searches are arranged so as to maximize the distance between teams, and (if two-man teams are used) between each team member within a given area. Ideally, a search team will comprise just a single individual. In an effort to reduce search time, however, two-man teams will sometimes be employed, but under no circumstances will a team ever consist of more than two people.

A room search technique suitable for use by a two-man team sees the area divided into three visual segments:

(1) floor to waist level
(2) waist to eye level
(3) eye level to ceiling

The room itself is divided into two triangles created by drawing an imaginary line through the center of the room from corner to corner. Searcher 1 goes directly to the farthest corner of the room and searches in a gradually reducing triangular pattern, working from the walls inward to the center of the room. Searcher 2 starts at the center of the room and works outward in a gradually expanding triangular pattern.

WHAT SHOULD BE DONE IF A SUSPECTED IED IS DISCOVERED?

If anything suspicious is found, it must not be touched, moved, or interfered with in any way. There is NO action that an untrained individual can take to make a device safer. *If trained to do so by professionals,* a bomb blanket assembly or suitcase safety circle could be placed over or around the suspect package providing, again, that this can be achieved without actually touching or moving the item. The location of any suspicious item discovered by security personnel should be accurately recorded on an incident report (at right) and the area cleared (if not already done) pending the arrival of military or police EOD personnel. Nonsecurity personnel finding a suspect item should alert the nearest security professional and follow their instructions. If there is no one else around to take charge, then clear the immediate area and prevent persons from entering. Call the police or security forces or assign someone to do so.

Communications Safety

Security personnel communicating via radio should be aware of the fact that an IED based around an electrical detonator will, under certain circumstances, be susceptible to premature detonation caused by induced currents from nearby radio frequency (RF) signals. In many military publications a minimum safe distance of 100 feet is advised between an electrical detonator and a radio operating at between 5 and 25 watts. In reality, the actual risk will vary from zero to very high depending upon a number of related factors other than simply the power of the radio. These include the specific length and orientation of the detonator firing wires, the resistance of the IED firing circuit, the frequency, modulation mode, and power output of the radio set, the type of container housing the IED firing circuit, and the distance between the set and the IED.

SAMPLE INCIDENT REPORT

IED INCIDENT REPORT - 01/05/9 (day, month, year)

Operative name:	*J. Green*
Time:	*0950 hrs.*
Location:	*Postal sorting room, on table in front of X-ray machine*
How Discovered:	*Visual search provoked by anonymous call*
Description:	*Brown envelope, Northern Ireland postmark. Large green felt pen address*
Additional Useful Information:	*Same as device shown on news program in February*
Action Taken:	*Area cleared, device left in situ., EOD and civil police notified*

Perhaps a greater risk is that the device incorporates circuitry specifically designed to react to close-proximity radio signals. A practical safety measure, then, is to avoid transmitting from within any unsearched room, and never report an actual discovery from the immediate vicinity of the find. This latter warning should take priority over requests from search controllers for an immediate description of the item or its location to be transmitted.

SPECIFIC COUNTERMEASURES

An established reaction drill is important. More important still, however, is to try and deny the terrorist an opportunity to perpetrate a successful attack in the first place. In this section, then, we will discuss specific possible countermeasures. For a given security problem, the level of risk can be determined via the following equation:

RISK LEVEL = **V** FACTOR divided by **C**OUNTERMEASURES

Here, V Factor equals the value (in terms of financial reward, publicity, prestige, overall effect, importance, significance, etc.) to the likely perpetrator(s) of a successful operation.

We can see from the above equation that step one in a good security program is to identify the *specific* source of the threat such as a small extremist group with limited resources or an international terrorist group with foreign government support. This being done, suitable countermeasures can be implemented. If we have correctly estimated the V Factor, the selected countermeasure will have the desired effect or, at the least, will be the best countermeasure we can offer. It will be noticed, of course, that the V Factor is a variable: its value changes constantly. The terrorist group that has recently lost several operatives to security force initiatives, for example, is very likely to re-evaluate the worth of a given operation in the light of those losses (and feeling the need to restore its status) and might accept a higher level of risk than usual.

General security measures implemented without any consideration having first been given to the specifics of the threat will

frequently achieve little other than to waste time and annoy people. Countermeasures should be re-evaluated, altered, updated, changed, introduced, discontinued, and replaced on a regular basis. If they are not, it is simply a matter of time before the terrorist notices an oversight or loophole, or learns a routine and exploits it.

The following countermeasures include techniques applicable to low-, medium-, and high-level corporate or private situations and do not appear in any specific order of importance. Implementation of a given countermeasure will depend, of course, upon it being deemed *contextually appropriate.*

The Very First Question to Ask, Then, Is "Am I A Target?"

The answer is definitely "Yes." Given the right (or wrong) set of circumstances, someone, somewhere will contemplate killing or kidnapping you. This is not necessarily because you are you, but because you have been perceived by the would-be perpetrator as being supportive of some religious, political, philosophical, or ideological movement or organization to which he is opposed. The odds of you actually becoming a victim, however, will vary enormously according to where exactly in the world you happen to be and the amount of attention you draw to yourself (or have drawn to you) as compared to other potential targets of a similar value.

In any threat assessment program it is important to remember that it is not how you see yourself, but how the likely perpetrator(s) see you. For example, you might consider the claim that you are supportive of American foreign policy to be ridiculous, but by traveling overseas on an American airline you are in fact indicating such support to many extremist groups. Similarly, although you might actually think that the "Winbani" government should "give back" the occupied territories to the "Remolinians" and grant them an independent homeland, by using the services of a "Winbani" owned financial group you are sending out exactly the opposite message. Indeed, in the eyes of many terrorist group operatives, simply drinking at a bar that is also used by off-duty military personnel is enough of a sign of your support for the soldiers (and therefore the policies of the regime that employs them) to justify your death.

In the case of kidnap for ransom, remember that "rich" is a subjective term. Besides, it will not usually be your apparent personal worth that attracts such an attack but the funds or concessions likely to be forthcoming from your employer or government in order to secure your safe return.

Threat Assessment Questions

To assess the threat level attendant to a specific situation many questions will need to be asked. Typical, sample questions include:

(1) Have other individuals in my position been victims of terrorist attacks recently? If so, what form did the attacks take, where and when were they perpetrated, and was there any prior warning or threat?
(2) Is the company I work for one of a group that has been attacked previously by virtue of its involvement with some controversial product, resource, or technique?
(3) Does that provocative involvement still exist?
(4) What form did the attack(s) take? How and when were they perpetrated? Was a warning or threat issued prior to the attack?
(5) Does the date of my impending business trip abroad coincide with any terrorist-significant anniversary?
(6) Has the airline I intend to use been attacked before?
(7) How good are the security forces in the country in question? What is the attitude of the government in that country toward foreign nationals?

(8) If a firebomb were planted in one of our stores, how long could it remain undiscovered?
(9) Do we have adequate fire-fighting equipment on hand in the store to control a fire that broke out during opening hours?

And so on. During the assessment, if any questions set the alarm bells ringing, then refine the exercise by determining what options are available by way of a countermeasure. Implement those that are the most practicable for your situation.

ACCESS SECURITY

Good access security will not only deny the terrorist the opportunity to enter a given area and actually plant a device successfully but will also prevent the theft of uniforms, equipment, identification papers, or information, etc., that would be of use to him in subsequent operations. The following measures are possible:

High-quality locks installed and updated regularly:
Technology advances at an alarming rate, and a high-tech lock today may turn out to be a low-tech risk in twelve months' time. Many books are published on lock picking/lock defeat techniques. The launch of a new lock system is invariably followed by a new technique to defeat it.

High-quality alarm system installed and tested regularly:
Like locks, alarm technology is constantly updated, but like locks, many alarms are simply installed and then forgotten. Stay abreast of current technology.

Locks (especially padlocks in little-used areas) checked regularly:
This is done to confirm that they are, indeed, the original and not a substitute.

Roof and wall areas (especially in little-used areas and locations in which stored goods/equipment would provide camouflage) checked regularly for surreptitious entries or entry attempts:

Anti-climb paint should be used on drainpipes and other roof-access points.

Only security personnel with proven track records employed; references required and checked

Random spot checks made to confirm continued efficiency/loyalty/integrity of employed security personnel

Personnel access security measures employed, both for employees entering unauthorized areas and nonemployees entering the premises:

Note that many electronic access cards on which the relevant information is recorded on a magnetic strip can be electronically copied. Check that this is not the case with the cards you use. Likewise, although infinitely more difficult, the so called "Smart Card" can also be duplicated/copied/read.

Noncounterfeitable photo ID cards/badges used:

Given the motivation, resources, and time, there are few things that cannot be counterfeited. ID cards and badges most certainly can. Use only cards or badges that will require some considerable amount of time and effort to be put into its illegal reproduction. Many passes and ID cards in use today are so basic that they could be counterfeited by a child in minutes. Many aircraft transit passenger boarding passes fall into this category, as do the visitor passes issued at several military bases.

Carrying/wearing of cards/badges enforced rigidly:

This requirement must extend to the most senior personnel. Security staff are doing no one a favor by overlooking a "forgotten" card. The mindset established must be such that a person seen *without* a badge or

card immediately sets the metaphorical alarm bells ringing. It cannot be overemphasized that asking someone you know to show an ID card is important. The object here, however, is not to prove who they are, but to prove that the card itself is safe.

One combined access/exit point only for highly restricted areas:

Quite simply, it must not be possible for the situation to arise where someone can enter or exit a secure area without the designated security officer knowing and/or the event being recorded manually or electronically. This is most easily accomplished by having only one entrance/exit.

Area purpose signs nonspecific and unlikely to be deduced by unauthorized personnel:

This is an excellent way of defeating the efforts of an intruder as, even assuming they can obtain access, they are immediately faced with the problem of where to go to find material/information/data of value. This is of use during working hours (when any employees approached and asked directions would immediately become suspicious) and out of hours (when the intruder would be required to spend an inordinate amount of time inside the premises, thereby risking capture by police/security personnel alerted by a silent alarm).

Vehicles unable to enter underground/roof car park areas without being subjected to search/driver check

Pedestrians unable to access car parking areas without passing ID check

In outside storage areas, least valuable products/materials stored nearest to perimeter walls or fences and most valuable nearest to center

In high-risk situations, valuable materials should be stored inside additional, central compound

Such areas well illuminated at night and video observation and recording equipment (producing high-quality images!) in use. Video observation system installed at home. Dummy cameras not used:

The electronic emanations from genuine, working video cameras are readily detectable on commercial or expedient equipment (an FM radio, for example). The professional criminal or terrorist will always test for this type of bluff.

Vehicle parking immediately outside building prohibited and prevented by use of barriers

Outside rubbish bins and dumpsters not located close to building walls. Bins emptied frequently and overspill not allowed. In domestic situations, rubbish bin(s) stored in locked cupboard or located away from property:

Such areas are ideal bomb concealment locations.

In shopping precincts, reception areas and public rest areas, etc., litter bins are of the transparent type (wire mesh or clear plastic) and emptied frequently. Overspill is not allowed to accumulate

In such areas seats, display plants, advertising displays, etc., of such a type as to prevent the concealment of a device. Checks made frequently to confirm "clean" status

Washroom towel dispensers, toilet cisterns (tanks) and supply storage cupboards sealed or locked and checked frequently to confirm secure status

Additional security measures applied to fuel or material storage containers that are likely to amplify the effects of any nearby explosion or fire

Legitimacy codes used on all mail:

These are prearranged letter or number sequences (used on the outside of mail items as an identifier) which are known only to the sender and recipient. Such codes are changed frequently.

Letterbox flaps are sealed and mail collected in person (or by third party) from sorting office rather than being delivered to home or office:

All major sorting offices will have equipment on hand for the checking of suspicious parcels and letters. It is far safer for any such items to be discovered at the sorting office than at your home. This technique also denies the terrorist the opportunity to introduce mail into your home under the guise of a genuine postal delivery.

Incoming deliveries from company suppliers checked against invoices/orders during the initial delivery (unloading) process

No unattended deliveries (i.e., groceries) allowed at home

Childrens' toys and garden furniture or equipment not left out overnight

Vehicle always parked in a secure area

Parking of unknown vehicles outside home not allowed

No untidy vegetation or hedges permitted to grow immediately next to outside walls business and domestic premises

Window boxes not used

No wall-climbing vines or trellis work for other plants

Descriptions/photographs of temporary employees or contract personnel (including those arriving for home-based improvement or construction work, etc.) obtained prior to arrival of said personnel

ELECTRONIC AND PHYSICAL COUNTERSURVEILLANCE

The vast majority of terrorist attacks are preceded by a prolonged period of observation, undertaken with a view to determining target habits and likely attack locations, etc. Good electronic and physical countersurveillance, then, will defeat these efforts and make it extremely hard for the would-be perpetrator to plan attacks or IED deployment projects based on accurate target movement and security measure details. The following measures should be implemented:

Regular but random countersurveillance sweeps undertaken with only need-to-know personnel aware of dates and times

If in-house sweep team not employed, supervising personnel familiar with current techniques and equipment:

The supervising personnel must be at least as knowledgeable as the employed team, preferably more. Where this is not the case the whole exercise is pointless, as the quality of work cannot even be determined, let alone relied upon.

If in-house team not employed, only reputable group with proven track record used:

Again, as with many security companies, far too many countersurveillance agencies employ operatives who have little, if any training. Beware of "one man and his dog" operations.

Adequate access security techniques initiated immediately subsequent to sweep:

Much like a balance sheet, a countersurveillance report reflects a given moment in time. Good access security will delay, if not negate totally, successful subsequent electronic intrusion.

Telephone instruments, wall socket covers, line junction box covers, fuse box covers, adapter plugs, and all similar items secured against tampering/substitution (subsequent to sweep) with noncounterfeitable tamper indicator seals of the type used on video cassettes:

In combination with other techniques, this is one of the most effective (and certainly the most cost efficient) methods of deflecting attempted in-house electronic penetration.

Seals described above regularly checked for signs of tampering:

This is important because it will alert you quickly to an attempted disassembly, and also because the seals will not deter a professional violator if he knows that breaking them will give him access to valuable information for even a short but determinable length of time.

During sensitive discussions/meetings at which teleconference facilities are not required, all telephones, FAX machines, and MODEMs unplugged from wall sockets for duration of meeting:

Doing this renders any instrument-emplaced devices carrying audio down the line totally inoperative.

No sensitive material ever sent via the phone lines in clear (i.e., unscrambled) form:

Many cable and satellite television companies consider their programs valuable enough to scramble in order that they may not be received (without great effort) by nonauthorized viewer. Is your information of any less value?

Anti TEMPEST measures implemented:

TEMPEST (referring here to the reception, recombining, and decoding of information-carrying and related radio frequency signals emanating from computer VDUs, etc.) surveillance techniques can be defeated by purchasing only internally screened electronic equipment or by retro-fitting screening material to existing equipment. In cases involving highly restricted information, a TEMPEST-proof room or area consisting of a metal screened operating area may be established, all incoming and outgoing cables and line wires being screened also. Computer and related equipment for use in sensitive or valuable projects should conform to British Government standard NACSIM 5100A or NATO standard AMSG 720.

Computer passwords of adequate complexity:

Many, many publications exist which list thousands of common passwords. Similarly, software is readily available which will actually test the password barrier against often-used passwords. A two-tier password system should be used whenever the system permits. Passwords should *never* be proper names, nicknames, Social Security or phone numbers. The password(s) must have no logical, sensible, or determinable relationship to any other existing name, letter or number sequence, or the position of keys on a standard QWERTY keyboard, regardless of how remote the chances of some unauthorized person determining that sequence might appear. Passwords should always comprise the maximum allowable number of alphanumeric characters allowed by the system, and this total should ideally be at least eight characters long. None of these numbers or letters should be sequential. The system should not display the entered password on screen. Only two attempts at entering a valid password should be allowed by the system before an automatic shut out. In high-security scenarios the system will be monitored 24 hours a day. Modem links will be kept to an essential minimum, and calls to the system from remote modems will be allowed only from nominated telephone numbers. A requirement that the calling number be entered (which will be checked by the system prior to log on proper) should be implemented.

Computer passwords not scribbled on notepads or inside drawers/cupboards:

A mindset which equates a computer password with the keys to the safe or armory should be instilled amongst

personnel. It is within the ability of all but those with learning difficulties (which should preclude them from such positions anyway) to learn and remember an eight character alphanumeric sequence in a day or two.

Computer passwords changed frequently:

This is added insurance against unauthorized access.

No user logs or other computer-related material thrown into trash bins in unshredded form:

Your trash is the surveillance operative's filing cabinet. Material that has been thrown away is a popular source of information relating to computer passwords, log-on sequences, counterterrorist intelligence, informant identity, and so on. Shred such material and dispose of in two separate containers at the least. Shred using a cross cutting type of shredder to negate the risk of reassembly. Incinerate in-house where practicable and certainly in high-risk situations.

No sensitive material left out or in unlocked desks overnight:

Discourage personnel from looking upon the official end of their working day as a signal to abandon whatever they were doing in mid-stream. Instead, encourage them to see it as the point at which they replace and resecure all sensitive or valuable material. If necessary, allow personnel to finish 15 minutes or so earlier to accomplish the securing process. Existing material of a high commercial or security value should carry a signature requirement anyway. This means that such material is signed for when withdrawn for examination and returned to its place of safekeeping before the end of the working day. Material actually generated during the day should be handed in for safekeeping in a designated area and a signature (this time from the receiving officer) obtained.

References required from contract cleaning, repair, catering personnel, etc., and said references checked:

The infiltration of contract cleaning, repair, and catering teams by surveillance and terrorist operatives or the bribing of cleaning team personnel to secure certain items or plant certain devices are popular techniques.

No contract personnel (in previous item) allowed to work without supervision from in-house personnel

Control or monitoring of construction projects maintained with a view to defeating attempts to actually install devices in structure of building:

In high-level operations an attempt will be made to either emplace surveillance devices during construction or litter the structure with passive devices (i.e., diodes) which will trigger/confuse detection equipment used subsequently. It is also possible that a long term delay IED (or IEDs) may be concealed within the fabric of a new structure.

Restaurants and clubs, etc., visited on an irregular, unpredictable basis

No unique clothing worn or luggage carried habitually

Routes to and from often-visited locations varied frequently

Times of departure from, and arrival at, often-visited locations varied frequently

Close family members or trusted business associates told of the estimated time of arrival at a given location with a view to them initiating an emergency reaction program if arrival is delayed significantly without explanation

No political or religious slogans displayed on clothing or vehicle bumper stickers

Business trips overseas booked in alternate name

Times and dates of impending trips told only to those with a definite need to know

When driving, no stops made to help apparently stranded motorists or to pick up hitch hikers

When traveling by train, empty compartments avoided

No political or religious comments or views offered to strangers during the course of casual conversation

Telephone answered in noninformative manner such as, "Hello," rather than with name or position, i.e., "Mr. Smith, Head of Marketing"

In restaurants, broadcast calls to come to the phone or move a car ignored:

These are common techniques used to confirm the identity of a target and/or place him in a more vulnerable position for attack.

No overt signs of wealth worn when traveling overseas

Internally-opaqued envelopes of the type incorporating security slits (to indicate signs of tampering or opening) used for all mail

VEHICLE SEARCHES (SECURITY CHECKPOINTS)

Search area designed so as to prevent successful crash through:

Symbolic road blocks (such as empty oil drums or simply a sign) are only of use where a temporary VCP (Vehicle Checkpoint) is to be established immediately without warning, and even here road spike strips should be employed as a minimum whenever possible. For permanent checkpoints, barriers which channel the vehicle into a specific point should be of such a type that to drive into them at speed would disable the vehicle.

Two person search team employed:
This saves time and (by virtue of the fact that the amount of vehicle to be covered by each person is reduced) lessens the likelihood of areas being overlooked or examined carelessly.

Search team rotated frequently:
Boredom will cause the search team members to become complacent if a shift is overly long. Frequent rotation ensures fresh and alert personnel.

Concealed support personnel covering search area in the event occupants of stopped vehicle attempt to use weapons and/or crash through:
Where contextually appropriate, this gives the search team members proper greater confidence and allows them to concentrate on the job in hand.

Driver required to turn off engine and exit vehicle:
In high-risk areas, both driver and passengers will be separated and, while covered by armed support personnel, questioned as to the purpose of the journey.

Each search team member allocated one half of vehicle—each half resulting from an imaginary line drawn lengthwise through the vehicle from front to rear:
This guarantees that each team member knows exactly which component parts and areas he is responsible for and negates the risk of one man assuming another had checked "such and such."

Each search team member dressed appropriately for underbody searches:
Underbody searches cannot be conducted properly without search personnel actually "getting their hands dirty." The natural desire not to ruin a smart uniform will, although on a subconscious level, cause a searcher to back off from the task at hand. Overalls and gloves must, at least, be available, even if not

worn all the time. Use wheeled mirrors for initial or cursory underbody checks only.

Portable explosive sniffing equipment employed during search:
Although such equipment may not sniff out all types of explosives or explosives which have been particularly well concealed, such devices will facilitate examination of many areas which are inaccessible (short of mechanical disassembly). Detectors are available which will detect hydrogenous material through the metal bodywork of a vehicle.

Disassembly bay/area available into which vehicle may be driven for partial disassembly if the initial search provokes suspicion or if intelligence reports have identified a specific vehicle as being worthy of special attention:
Many vehicular hiding places can be accessed only via disassembly. As this is time consuming, a dedicated search area ensures that the primary VCP does not become logjammed.

External vehicle search commenced with a hands-off check, supported by mirrors, for:

- obvious signs of tampering
- hanging or attached wires or packages
- items on, behind, or in front of wheels
- items resting on exhaust components
- items inside the vehicle

Security check search then continued to include:
- rear of bumper
- rear of radiator grill
- rear of headlights
- engine compartment
- windshield washer fluid reservoir
- air filter housing
- firewall area
- exhaust manifold area

- front and rear axles
- steering, suspension, and braking linkage areas
- wheel wells (remove hubcaps)
- exhaust pipe/front muffler area
- rocker panels
- central muffler box
- rear suspension/braking component area
- rear wheel arch area
- gas tank area
- valance areas (underbody area beneath bumpers)
- rear wheel trims (to be removed)
- inside of rear bumper
- trunk
- spare wheel to be removed (whether trunk or underside mounted)

Internal search areas include:

- glovebox
- steering wheel and column
- under-dashboard area
- pedal area and carpets
- under-seat area
- transmission tunnel area
- rear seat cushion lifted out, folded down; rear seats in station wagons raised
- space between rear seat upright and trunk area
- headlining
- interior lights and ashtrays
- seat backs, cushions, and covers
- door panels popped off studs at bottom and lifted to facilitate examination of internal door area

VCP cards issued to all cleared motorists, explaining the need for such security measures and apologizing for the inconvenience:

These cards should carry a telephone number (answered by machine) which may be called anonymously to report suspected terrorist/criminal activity. The issuing of such cards goes some way toward reassuring the drivers of stopped vehicles that the searches are necessary and not simply a display or abuse of authority. If only one person out of a thousand actually calls the number and reports an incident, the effort is justified.

Nearby blast ditch or sandbag shelter available (permanent-entry vehicle checkpoints) in the event a proxy[1] *or suicide bombing attack is made*

If random vehicle checks are being made with a view to defeating vehicle bombs, vehicles are selected on the basis of some (although rule-of-thumb) predetermined factor rather than entirely at random:

For example, given two identical vehicles, it might make sense to stop the one which (by virtue of its ride height and tire appearance) seems to be the most heavily loaded. Likewise, the vehicle containing a female and child can be considered in most situations less of a threat than the one containing two adult males.

PERSONAL VEHICULAR SECURITY

High-quality alarm should be fitted

Vehicle always parked in secure area

Garage alarmed to same standard as house

Search always undertaken in the event vehicle has been left unattended in insecure area:

As an expedient, the security stickers described in the

[1] Technique in which an innocent motorist is forced to drive a bomb-rigged vehicle into a checkpoint, having time only to shout a warning and run short distance from vehicle before device explodes.

section on access security can be used to seal door, hood, and hood joints. Such tell-tales will alert you to the fact that an attempt to access the vehicle has been made.

Photographs of engine compartment and vehicle underside taken for subsequent comparison purposes by security-force personnel not familiar with the layout (called in the event an initial personal check causes suspicion)

Interior of vehicle kept free of litter, papers, boxes, and other items that might be used to conceal a device

LUGGAGE SCREENING

Screening machine manned only by skilled operators and tested regularly to confirm its ability to identify the likely nature of the items revealed on the screen by virtue of their color

Machine regularly tested to confirm continued full-specification operation and continued operation of any auto alarm

Operators rotated frequently to avoid fatigue. Antidistraction technique measures implemented:

Typical primary luggage screening methods at the majority of international airports (at which friends and relatives of departing travelers are separated from the screening machine by only a token barrier) are vulnerable to distraction techniques initiated by nearby persons. Usually, causing the screen watcher(s) to turn away for even a couple of seconds will, by virtue of the quantity of luggage passing through the tunnel at any one time, cause the contents of a bag to be overlooked.

Flow of luggage controlled to enable operator to absorb image adequately

LUGGAGE STATUS INDICATORS

Indicators used to enable other personnel to determine immediately traveler/visitor status (searched, unsearched, carrying potential risk items)

Indicators noncounterfeitable

Status indicator duplicated on traveler's/visitor's ticket/pass

Checks made on aircraft prior to boarding that status indicators match

LUGGAGE-EMPLACED IED ISOLATION FLOW CHART

Luggage and traveler/visitor physically checked?
Yes: proceed
No: risk exists; initiate physical search program

Electronic/electrical or other risk items discovered?
No: luggage allowed to enter system
Yes: passenger and luggage isolated for special search

Explosive vapor/hydrogenous material or X-ray checks made?
Yes: proceed
No: risk exists; initiate checks

Test negative/suspicions not aroused?
Yes: proceed
No: summon support personnel

Traveler/visitor interviewed by experienced personnel to confirm level of threat, if any?
Yes: proceed
No: risk exists; initiate interview procedure

Still suspicious?
No: proceed
Yes: disassemble suspect items/hold for further interview

Internal components checked by qualified personnel for concealed/disguised explosive charge and/or firing chain components. Still suspicious?

Yes: initiate usual detention procedures and investigate further
No: luggage allowed to enter system

Number of bags checked-in on aircraft cross referenced against number actually loaded, and running total maintained (by forwarding totals to personnel at next leg) through various stages of multi-leg flights?

Yes: proceed
No: risk exists

Passengers required to identify luggage on ramp prior to loading OR bag/passenger reconciliations made prior to bags being loaded via bar code tagging system or similar proven method?

Confirmation made that bag owner actually boards aircraft?

Yes: proceed
No: risk exists

Reaction program prepared for implementation in the event a passenger/luggage discrepancy occurs at any leg?

Yes: proceed
No: risk exists

PHYSICAL EXAMINATIONS OF ELECTRONIC AND ELECTRICAL EQUIPMENT

Trained personnel only engaged on such searches

Personnel tested regularly to confirm continued ability to locate concealed devices and notice unusual modifications

Disassembly team available in the event an external examination provokes suspicion

Noncounterfeitable security stickers used to seal disassembled items:

This technique should be followed by later external examination of disassembled items (to prevent the subsequent insertion of explosives and/or firing chain components).

Items internally sniffed with hand unit for presence of explosive-suggestive vapors:

A probe head should be available which facilitates at least partial access into small areas.

Sniffer unit tested regularly to confirm continued sensitivity to manufacturer's specifications

Specifications of newly available machines obtained and compared with those of existing equipment with a view to upgrading

Search area covered by armed personnel armed with weapons suitable for use in crowded areas

Damage limitation measures (with a view to rapid, safe containment of a carrier with little or no risk to other passengers) implemented and rehearsed in the event explosive material/weapons detected

Examiner able to identify electronic components correctly

Examiner able to distinguish nonstandard and nonoriginal component additions to standard radio/cassette/camera circuits

Examiner aware that a function test does not in itself prove or achieve anything:

It should be remembered that the mere fact that a radio, cassette player, razor, camera, or similar item *appears* to operate normally when tested is no guarantee that it is not concealing a terrorist IED. Conversely, an item that doesn't work deserves no more attention than one that does. Terrorist devices have been deployed housed in (for example) calculators and walkman radios, which continued to work even when the batteries were removed. This was because concealed batteries (part of the timing/firing circuit) had been installed. A check resulting in the discovery of this type of device would, obviously, be cause for alarm. Overconfidence in devices that do not exhibit these qualities, however, will lead only to a sense of false security. Assume a given item doesn't function. The owner offers, quite reasonably, the most likely cause as being dead batteries. Are suitable replacement batteries or a PSU (power supply unit) available with which the unit can be retested, and does such a retest policy exist in the first place? Even if these questions *can* be answered in the affirmative and the item is retested, what if it still doesn't function? The owner now suggests (again, quite reasonably) that an internal electronic fault must have developed. Are qualified personnel on hand to disassemble and check the item and locate a legitimate fault?

Examiner able to identify improvised batteries

Examiner able to identify improvised capacitors:
These may be used in place of batteries to provide timing and/or firing power for an IED.

METAL DETECTOR SEARCHES (WHOLE BODY UNITS)

High-quality, state of the art unit employed:
Sensitivity specifications should be regularly compared with that of newly available equipment with a view to upgrading.

Unit regularly (30 minute minimum) checked to confirm continued full specification operation:
Implementing this degree of checking adds only seconds to the hourly workload of operators or other staff members. It can easily be accomplished simply by having an operator in possession of a suitable test item pass

through the frame. Do not rely solely on self-test facilities built in to a machine, as these can also develop faults.

Operators trained in use of detector equipment to high standard

Unit sensitivity not reduced to increase volume at times of high-traffic density:
Doing so is an admission that security is of less importance than profit and/or convenience.

Persons passing through search frame required to do so at a speed and frequency within the parameters recommended by the manufacturers:
Rushing people through search frames may earn you the thanks of management personnel and alleviate complaints of delays from passengers or visitors, but it will also give the terrorist or criminal a window of opportunity through which those same staff members, travelers, or visitors might be killed.

Area covered by suitably armed support personnel in case the carrier of a detected weapon or explosive device attempts to employ it as a means of escape

ALL items removed from pockets of persons triggering the alarm:
Objects calculated to trigger the detector may be used deliberately to divert attention away from other prohibited items.

ALL such items physically checked:
The practice of having the searchee place items in a tray, and then retake the metal test, *without* checking exactly *what* items were removed, is dangerous, although quite common. It renders the whole exercise redundant. Assign an additional person to check removed pocket contents, if required.

Passenger now subjected to a localized (hand held) metal detector check

Such persons then required to clear whole body scan again before retrieving pocket contents:

This is simply insurance against an operative missing some concealed item with the hand-held check.

"Sorry for the inconvenience" cards issued:

Such cards (carrying a simple apology for any delays and an explanation of why searches are necessary) really do help with public relations. A telephone number may be included which passengers may call with suggestions for improvements in the security arrangements.

METAL DETECTOR SEARCHES (LOCALIZED/HAND-HELD UNITS)

Unit employed of a high quality, and its specification regularly compared to that of newly available units with a view to upgrading

Operator highly trained in use of unit

Search encompasses all of searchee's body and (as applicable) possessions:

Body searches to include footwear and crotch area. Not searching an area of the body thoroughly for fear of causing embarrassment gives yet another window of opportunity to the terrorist who will play on this understandable concern to avoid annoying travelers. Similarly, not searching areas which have proven in the past to provoke detection signals by virtue of their legitimate construction is dangerous. In the case of footwear, for example, it may well be the metal nails and (especially in the case of women's high-heeled shoes) internal support rods that are triggering the unit, or it could just as easily be a concealed detonator. Thus all such signals should be investigated.

Searchee possessions which are obviously metallic or have some metallic content are physically checked:

Innocent metal/metallic items can be used as a cover for various explosive components and other contraband items. The foil insert and metalized boxes of cigarette packets are just two common examples. These items are hardly ever physically examined by detector operators after they have been isolated as the source of a signal. New, unopened cigarette packets are never, to the best of my knowledge, opened. Doing so would, of course, provoke no end of passenger/visitor complaints.

Search speed and distance from searchee's body are within the parameters specified by the manufacturer:

The recommended operating technique for all detection equipment must be followed in order that the equipment can perform properly.

Unit checked regularly to confirm continued sensitivity

Facilities on hand for physical examination of persons triggering detector circuit by virtue of metallic surgical implants

Facilities on hand for the X-ray of plaster-casted limbs triggering the detector circuit due to concealed metallic splints/pins, etc.

ADDITIONAL STORE/SHOP SECURITY (ANTI-WEAPON DEPLOYMENT/ANTI-BOMB EMPLACEMENT)

Initial search of shopper and bags at entrance includes use of hand-held metal detectors

Customers' existing shopping bags labeled and left in secure, blast-proofed area close to entrance

Thorough search of nonsurrenderable bags (i.e., handbags containing money, purses)

Customers issued identification tag keyed to surrendered bags which must itself be surrendered upon reclaiming bags upon leaving the store

Baskets/carts provided for carrying of in-store purchases

Video observation/recording in use

Separated entrance and exit points

Bomb blankets available to contain discovered devices

Adequate fire-fighting equipment on hand

Antiblast curtains or shatter-resistant film in front of (or attached to) windows

One or two example display items left open and remainder of the displayed stock kept sealed:
This enables rapid and simple checking for concealed devices to be made.

Pre-closing search for concealed devices undertaken

Conclusion

Despite the publicity (which is, after all, the main reason why many terrorist IEDs are deployed), the dangers posed by acts of terrorism to the average American citizen are small. Even in the U.K., with its history of IRA/PIRA/INLA bombings and attacks, the number of yearly suicides exceeds that of the number of people—civilians, police, or soldiers—that are killed by terrorists. Once we start looking at statistics involving the number of deaths in (for example) car accidents compared to the number of deaths at the hands of terrorists, the odds of anyone not obviously involved in a particular confrontation becoming the victim of a terrorist attack pale into insignificance.

The fact that the risk is small, however, does not mean it should be discounted. Who knows what new extremist groups will emerge in the future, and who can guess what their motivations and therefore their targets might be? Further, it is surprisingly easy to find oneself suddenly bumped up into a much higher risk group than the average citizen by virtue of a job change, a marriage, a house move, a poorly timed visit to some other country, or an unexpected government decision to apply sanctions or military pressure to some foreign regime which has sympathizers here at home.

The most likely exposure to terrorism is via an IED. The terrorist IED (which, if we are honest, can be defined as any IED which has not been planted by the guys on our side) might be found almost anywhere: under or in your car, in your garden, or on the shelves of a shop. It might come through the mail or be left on your doorstep. It might be left in a phone booth, in a trash can, in a drain, a culvert, or in an abandoned briefcase, and so on. A device is likely to be camouflaged and/or concealed so that, except in very rare instances, you will not immediately know what it is.

In 19th century London you may have come across a large round object with a burning fuse sticking out of it: the classic anarchist's bomb. Leaflets were issued during the period telling people not to touch such objects if they found them. Obviously an inquisitive lot, the Victorians. You might, instead, have found a stack of small barrels of gunpowder or a more sophisticated device based around a clockwork mechanism. In any event, it would be apparent to all finders just what the objects were.

From the terrorist/anarchist point of view, early IEDs were difficult to move and deploy without causing suspicion. Even the development of dynamite didn't really facilitate the construction of particularly small or easily concealed devices. This is not to say that the terrorist/anarchist of those days was without ingenuity or cunning, or was any less callous about killing or injuring persons unrelated in any real way to the source of his grievance. It was simply that the technology available at that time was limited.

Today, however, with a wealth of sophisticated electronic circuitry and powerful explosives like C4 (PE4) and the famous SEMTEX available, extremely small, silent, inconspicuous, yet very deadly devices can be constructed with ease.

SEMTEX, by the way, is not the super explosive that the media claim it to be. It is powerful all right, but no more so than the standard British or American military plastic explosives. SEMTEX is actually a mix of two other explosives: PETN (pentaerythrite tetranitrate) and RDX (cyclotrimethylene or cyclonite). PETN is the usual filling in British and U.S. army det cord, and RDX is really PE4 or C4 without the plasticizer. In C4 the RDX is mixed with about 9 percent inert plasticizing material. The relative effectiveness of PE4 and SEMTEX is similar (see Chapter 3), but SEMTEX tends to bleed more. In other words, it sweats its plasticizers, thereby losing some of its plastic quality. C4, on the other hand, bleeds hardly at all, even under poor conditions. Thus, in reality, C4 is preferable to SEMTEX. The reason that many terrorists have used SEMTEX is because it was manufactured in Czechoslovakia in vast quantities and distributed to international terrorist groups via the old Soviet/Eastern Bloc regime.

It is often asked why, if SEMTEX is so powerful, do the IRA (for example) use bombs weighing literally thousands of pounds? Firstly, the really huge bombs referred to in media reports are based on improvised explosives rather than SEMTEX or its equivalent. For example, a popular improvised explosive in Ireland is made from nitrate-rich fertilizer sensitized with fuel oil, known as ANFO explosive. In a highly rural area such as Ireland, both of these components are plentiful and can be obtained, stored, and moved quite legally. Moves were made to more rigorously control the sale of ammonium nitrate fertilizer in Northern Ireland, and at the time of this writing, a small but vociferous lobby in England is calling for ammonium nitrate fertilizer to be made subject to the same controls as explosives proper. As there are some 4,000 other readily available products and materials from which an explosive may be improvised (most of which can be purchased from the local variety store, hardware store, or gardening center), it is open to debate how effective in curbing the deployment of IEDs any such legislation would be.

By using material such as ammonium nitrate or any number of other "nonexplosives," the terrorist is able to create large bombs very cheaply and with little, if any, risk of arousing suspicion. However, as the power available from such material is but a small percentage of that available from commercial or military high explosives proper, it must be used in far greater quantities to achieve a given effect. This places some constraints on just where such devices can be deployed and (in the case of any bomb weighing more than several scores of pounds) usually means a vehicle bomb of some description. As the terrorist will have to deploy this vehicle bomb far enough away from the target to avoid being detected while still having a hope of achieving the desired effect, the weight of such devices is invariably huge. If security measures prevent an operative deploying a carefully placed 1-pound charge inside a target building, a 100-pound device in a vehicle in the street outside will be the obvious alternative.

Seemingly excessive amounts of explosive will also be used in a particular attack if (1) the explosive material itself is starting to deteriorate because of prolonged storage and must be used or abandoned, or (2) simply because the attack is being perpetrated with a view toward publicity only, rather than with the intention of destroying some particular tactical target, i.e., a strategic rather than a tactical device.

As an indicator of the power of C4/PE4/SEMTEX, a quarter-pound charge of such an explosive will completely destroy a typical large car or destroy (or at least render structurally unsafe, depending on its placement) the average brick house. A2-ounce charge will prove more than adequate for the majority of antipersonnel booby trap devices. The power of commercial or military plastic explosives, then, being such that even a very small quantity will kill or cripple, means that modern IEDs may be camouflaged as almost any innocent looking object and concealed in the most unlikely of locations. This is why they are often overlooked. They are also overlooked because the searcher or searchers haven't got a clue what they're doing, are poorly trained, or are careless.

Devices, as we have seen, may be designed to fire in any number of ways. Although not discussed in detail in earlier chapters by virtue of its unique status, the most obvious technique is command detonation. This means that the device is actually fired by the terrorist himself, often upon receipt of a signal from an observer (or series of observers, if the distances involved are great) when the target reaches a predetermined point. When this happens, a signal is given and the switch thrown. The explosion is instantaneous. Such a bomb may be connected to the firing switch by wire or it may operate by radio control. Simple radio-controlled bombs are easy to make but dangerous to deploy because of the risk from stray radio signals. Such signals may cause the device to fire prematurely.

Equipment is also available to security force personnel (and to the public, via certain outlets) which sets up blocking radio signals to prevent those from the bomber's transmitter getting through or cause the device to fire prematurely (in some case while it is still in the hands of the bomber). An improvised version of such equipment takes the form of a

radio-alarm pager and a high-power RF amplifier. The principle of operation here is that an attempt to attach an electrical detonator-based IED to a vehicle thus equipped will trigger the pager alarm and cause the amplified radio signal to be transmitted. At such close range and with a high power signal, the RF currents induced into the detonator are sufficient to cause it to fire prematurely. However, because various measures can be taken by the experienced bomb designer to lessen (or negate totally in most circumstances) the risk of premature detonation due to induced currents, total reliance must never be placed in such systems. So, having seen that IEDs may be concealed in almost any innocent-looking object, any or all of which may be designed to explode at a given time and/or when moved in some manner or when activated by the bomber himself, how do we recognize them? And what do we do if we find one?

The answer to the first question is that we probably won't recognize a device for what it is immediately. An exception would be the cassette incendiary that we might find concealed among clothing in a shop, or a vehicle bomb that we might find in a small plastic box secured with magnets to the bottom of our car. For the most part, though, all that we will have to go on is suspicion. Suspicion is a double-edged weapon. Used intelligently it saves lives. Used indiscriminately and with poor judgment it wastes time and can provoke the "boy who cried wolf" syndrome. *Context*, then, is all important. Don't assume every unidentified item you come across is an IED. On the other hand, don't ignore anything that *could* be a device. A middle ground between paranoia and complacency needs to be found. Intelligent, contextually-appropriate decisions will need to be made on the basis of your suspicions.

So, you open a phone booth door and find a shopping bag sitting there. Do you automatically assume it is a terrorist bomb? No. Do you discount the possibility totally and kick the bag aside or rifle through it for valuables with the intention of finding some ID (so you can return the bag to the owner, of course)? No. Does the thought that it *might* be a bomb cross your mind and start you thinking about your best course of action? Yes.

You might think this is obvious, but watch the TV next time the cops are searching for a bomb. Watch how some guy's search technique seems to be based on the theory that all bombs sport a sign to that effect written in big fluorescent letters. Pray they never actually find a booby trapped device. It's almost as if they know there is no pull wire, pressure-release switch, light-activated system or other trap mechanism attached to the bomb they're looking for. This suggests one of two things: (1) either they planted it, or (2) they don't expect to find a bomb anyway. The latter being the most likely, why bother looking in the first place? Successfully dealing with IEDs and related acts of terrorism calls for an all-or-nothing approach. There's no such thing as being "a bit careful." You either are or you aren't.

So, you've started thinking. But on what are you going to base your decisions and actions? Well, all we can really consider at this stage is the context of your discovery. For example:

- Is the phone booth (or wherever you find a suspicious item) near a government building?
- Is it near a military base?
- Is it near any other place that could conceivably be a terrorist target?
- Have the press been reporting other incidents recently in which bombs were planted in the same sorts of places?
- Are there people nearby to whom the bag might belong?

Now, this doesn't mean that a terrorist taking the shopping-bag bomb somewhere else has not had a change of heart or spotted a nearby policeman and abandoned the bag in a hurry so that it ends up in place that cannot be sensibly linked to any logical target. Such bombs have been found in the past in very unlikely places. As a basis for suspicion, however, and in the absence of other indicators, context is a good place to start.

Okay, another example. You're visiting the local shopping center at mid day and you see an abandoned shopping bag under a seat. Would it be reasonable to automatically assume that it is concealing a terrorist device? No. Although without actually checking, it cannot be said that the bag doesn't contain an IED, nevertheless (in the absence of other indicators), how likely is that to be the case? It is more probable that some innocent shopper has mislaid it.

We can turn that around, of course, and say that you now recall the newspapers' report of an incident last month in which a bomb was discovered in similar circumstances. An aggrieved ex-employee of the center had apparently sent a warning letter. Yes, now that you think about it, the type of bag does seem familiar. So, what about your level of suspicion now? It's increased, right? Right. But wait a minute. If anything was wrong, surely someone else would have noticed it and done something, right? Wrong. Instead of thinking along those lines, try:

- What if you are the first person on the scene after the bomb was planted?
- What if everyone else who noticed it and related it to the newspaper reports thought the same thing?
- What if while you're walking away and justifying your lack of action, the onboard delay system is eating away at the time the EOD team could have been using to contain the device or clear the center?

In the absence of other information or indicators, then, intelligent, contextually appropriate reasoning is the only thing that can shape your decision. Factors to be considered will include things like: How long has the package been there? If practicable and applicable, make a few quick inquiries of nearby shop staff or other people in the center. Had they noticed the bag? Did they see anyone leave it there? If during the course of these inquiries someone comes and claims the bag or even steals it—so be it, it's not your problem. If you are a civilian and can attract the attention of a nearby policeman or security officer, do so. Let him have the responsibility for subsequent measures. It's partly what he gets paid for.

So, now we've arrived at, "I really think it might it be a bomb. What should I do?" The bottom line here is that if you *really* (after consideration of all factors) suspect that some item might be a bomb and you cannot quickly make your concerns known to a police officer or other security professional, then use the nearest phone to call the police or your local army base or ask someone else to do so. If *you* are the security professional, take charge: clear the area, assign others to keep the area clear, and notify the authorities. The police or army will not be angry with you if it turns out to be an innocent item. You can probably, however, expect a degree of investigation, as there are, sadly, a few lunatics out there who like to make hoax calls. In any event, a few very basic rules should be remembered:

- Never touch or move an item you suspect
- If practicable, prevent others from moving the object
- If practicable, clear and cordon off the area
- If the item has been discovered at your place of work, take control and prevent others from entering the area. Assign someone to get the manager or senior staff member, but don't wait for his/her arrival before implementing initial damage limitation measures
- Call the police or assign someone else to call them
- If you feel genuinely worried, or find an item so obviously a terrorist device that there can be no doubt, hit the nearest fire alarm button

Now, if you find a device stuck to the bottom of your car or a suspicious package hidden among clothing in a shop, it will not be hard to take control and initiate the required measures. If you find a device in a public place, however, it will obviously be harder. Hence the "*if practicable*" clause. If trying to clear or cordon off an area is likely to provoke panic or encourage the usual idiots to mess with the suspect item (in other words, do more harm than good), walk away and explain your concerns to the nearest police officer or security guard. You can do no more.

APPENDIX A

Letter/Package Bomb Precautions Flowchart

Assuming the letter/parcel is not expected and X-ray or explosive scanning facilities are not available, follow this procedure:

(1) Check postmark and external details. Suspicions aroused?
No: continue
Yes: call police

(2) Check gently for elasticity and/or the presence of sprung components. If the size and shape of the package implies a book or papers, but a gentle bending test indicates a lack of springiness or (in the case of a simple envelope) the presence of a sprung bar or such is felt, treat the package with caution. Suspicious?
No: continue
Yes: call police

(3) Check the envelope carefully for greasy marks and odors. Suspicious?
No: proceed
Yes: call police

(4) Check letter/package with small metal detector. Suspicious?
No: proceed
Yes: call police

(5) Spray envelope with X-ray spray (electronic component freezer spray

will suffice as an expedient). Anything unusual rendered visible?
No: proceed
Yes: call police
Note that the use of this spray is discouraged by some people due to concerns that the spray liquid might reduce the tensile strength of the envelope sufficiently to allow the internal firing components to function. I am of the opinion that if the envelope material were so thin, and/or the actuating mechanism so designed to be held only by the envelope itself, then the presence of the mechanism would be readily determinable by an external physical check of the envelope anyway.

(6) Open letter/package carefully by cutting off a thin strip from the top. Try to get an idea of the contents *before* pulling them free. Suspicious?
No: continue
Yes: call police

(7) Carefully withdraw the contents part way. If the contents are of such a type that withdrawing them completely will allow covers or flaps to spring open, abandon and call the police.

(8) If, while attempting to withdraw the contents, resistance is felt, stop, abandon, and call the police.
Remember that intelligent, context-sensitive interpretation of these and all security measures is essential.

APPENDIX B

IED Component Recognition Guide

POWER SOURCES

(1) Batteries may or may not have an external wrapper, label, or printed legend that indicates their purpose.

(2) NiCad battery packs of the type used in portable telephones, computers, radio-controlled models, and video cameras frequently do not have any external indicators of their presence. Similarly, standard-looking (cylindrical, flashlight-type batteries, etc.) are available in a plain case.

(3) The battery terminals will not always be readily apparent. Terminals may sometimes take the form of a small socket or a small plug.

(4) Most batteries can be disassembled and the internal cells removed and disguised. Flat, circular lithium batteries may be disguised as a stack of coins.

(5) The internal picture (when viewed with an X-ray system) of a battery pack will comprise a series of closely interconnected cells. These may be square, rectangular, or circular. In the case of some NiCad packs, a small current-limiting resistor may also be present. Single-cell batteries and flat-

pack batteries of the type used in Polaroid cameras may be easily disguised and may present a confusing X-ray image.

(6) Capacitors (especially electrolytic capacitors) are easily used in place of batteries proper in the firing circuit of an IED. Removing a battery pack power source from electrical or electronic equipment is not, therefore, any guarantee that a potential terrorist device has been rendered safe.

(7) Batteries and capacitors may be easily improvised. Improvised batteries may consist of any number of small or large plates or disks of dissimilar metals, separated by an electrolyte-impregnated substance. Connection to the circuit is by the first and last plates of the stack. An alternative design uses the plates of dissimilar metals suspended in an insulating container which contains the electrolyte in solution. Improvised capacitors may be made from plates or sheets of conductive material (copper, foil, etc.) sandwiched between plates or sheets of nonconducting material (glass, plastic, etc.). The ultimate value of the capacitor can be calculated by means of an equation relating to the size, type, and number of the conductive material and the size, type and dielectric strength of the nonconducting material.

(8) Several metal-cased batteries may be compressed in a vice to two-thirds or even half their original width or thickness without affecting their performance. This makes it possible for the terrorist to conceal such power sources in areas that would otherwise be too small.

TIMING DEVICES

(1) Timing devices may take many forms. They may be electrical, mechanical, electronic, chemical, electrochemical, electromechanical, and so on. Of the integrated circuit family, the 555-type timer is the one most often found.

(2) Extremely small integrated circuit (IC) devices exist which (if cleverly concealed among the usual circuitry of an item of electronic/electrical equipment) will only be located through a careful physical check.

(3) Electrochemical timers may take the form of a small button-shaped component similar to a watch or hearing aid battery.

SWITCHES AND SENSORS

(1) IED switches may be extremely sophisticated or unbelievably crude. The crudity or sophistication of a switch, however, is no indicator of its effectiveness.

(2) The switches that are difficult for even the practiced professional to locate are, again, those which take the form of commercial electronic devices. This is because they are easy to conceal among the legitimate circuitry of commercial equipment.

DETONATORS

(1) Detonators (blasting caps) may be electrical or nonelectrical. The only real difference between the two is the presence of two connecting wires exiting the detonator at its top.
(2) Detonators may be metal, card, plastic, or even glass-bodied.
(3) Typical (average) detonator dimensions are .25" x 2.25", but detonators as small as 10mm long and 5mm in diameter do exist.
(4) Detonators may also be compressed slightly to reduce/alter their profile.
(5) Detonators may also be improvised. In this case they may not, necessarily, be cylindrical.
(6) In an IED configuration, nonelectrical detonators may be crimped to a short length of time fuse or have some type of spark/flame-producing device or mechanism attached to the open end. Nonelectric detonators may also be modified to operate electrically through the attachment of a smokeless/black powder-filled bulb or flying model rocket engine igniter.
(7) Electrical detonators will be attached indirectly to a power source. Typically, one of the detonator wires will connect directly to the power source, the other to some switch, sensor, timing device, or relay.
(8) Electrical detonators (or nonelectrical detonators modified so as to fire electrically) can easily be installed in an IED so as to fire if any interconnecting wire is cut.

(9) Detonators may be easily concealed inside metal pens, for example, or disguised as legitimate circuit components.
(10) A detonator and very small booster charge of explosive may be hidden in one object, the main explosive charge in another. The close proximity of the two items will be sufficient to detonate the main charge. In other words, the detonator may not always be physically connected to the main charge.

CIRCUIT INTERCONNECTIONS

IED circuit interconnections may be accomplished by means other than traditional hard-wiring. The most likely alternative is conductive silver paint. This is a solution of pure silver which may be painted onto a surface with a fine brush or drawing pen. When dry, the resulting track may be painted over for concealment purposes. Interconnections might also be made by foil of the type used in window alarm circuits.

IMPROVISED EXPLOSIVES

(1) Explosives may be improvised from many commonly available materials. Many books exist which detail manufacturing processes.
(2) Many commercial explosives, or their improvised equivalents, may be disguised to defeat searches. Certain types of explosive can be rolled so thin that they resemble filo pastry. This makes them extremely difficult to detect.
(3) On the subject of pastry, certain explosives can actually be mixed with

eggs and flour and cooked into forms resembling innocent foodstuffs.

(4) Explosive material may also be cast into decorative objects (statuettes or wall masks, for example). Such items may also be painted and glazed.

(5) Other types of explosive may be made into a solution. Many items, especially rolled up newspapers, may then be soaked in the solution. Upon drying, the newspaper can be detonated with a standard cap.

(6) Several types of explosive-making chemical may be transported separately and recombined on site, as it were, to produce the explosive proper. Operatives should be aware of the relevant chemicals (see Chapter 3), especially those which are in common use for quite legitimate purposes, and note their presence during searches. The subsequent arrival (in the luggage of a completely different passenger, for example) of related chemical products should provoke additional investigation.

(7) Certain truly liquid explosives exist, which, being cap-sensitive (i.e., they will detonate only when initiated with a detonator), may be transported safely in, for example, a beer or medicine bottle.

(8) Flexible, solid, explosive foams (FSEFs) exist that may take various forms. Broadly speaking, any shape that might be produced by aerosol shaving foam is possible. A physical appearance similar to expanded is typical.

APPENDIX C

X-Ray Detection and Analysis Quick Reference Chart

MONOCHROME/GRAY-SCALE MONITOR

(1) Is there a slim mid-gray or black cylindrical or oval tube shape visible? [1]

(2) Are there any dark blobs or patches visible on the tube?

(3) Are there thin mid-gray or black lines, narrow strips, or lines of a varying thickness connecting to it? [2]

(4) Aside from the cylinder, are there any indistinct or fuzzy areas of a pale gray or mid-gray color? [3]

(5) Are there any small rectangular, round, or cylindrical shapes (singly or in small groups or stacks) which are mid-gray with black or darker outlines, centers, or patches? [4]

If suspicious, isolate the package, clear and cordon off the area, and notify the police or security forces.

[1] Possibly indicating a detonator.
[2] Possibly indicating wire, foil, or conductive metal paint interconnections.
[3] Possibly indicating explosive.
[4] Possibly indicating a battery or batteries

COLOR X-RAY INDICATORS

Typical color X-ray systems will give the following indications:

(1) Low-density organic materials (such as drugs, explosives, liquids, plastics, fabrics, paper, foodstuffs) will display as shades of orange.

(2) Medium-density organic and inorganic materials (such as dense plastics and light metal alloys) will display as shades of green.

(3) Dense inorganic materials (such as dense metals and glass) will display as shades of blue to black

Operators should be aware that "camouflage" techniques exist which will defeat color X-ray systems, and many innocent items resemble in form and color potential threat items.

APPENDIX D

Threat Call Card

KEEP NEAR TELEPHONE
QUESTIONS TO ASK

When will the bomb explode? ______________________

What will make it explode? ______________________

Where is it? ______________________

What does it look like? ______________________

What sort of bomb is it? ______________________

Did you plant it? ______________________

Why? ______________________

Code word given by caller: ______________________

Wording of threat (if not tape recorded): ______________________

Time: ______________ **Date:** ______________________

Voice Features and Language
(Circle as appropriate)

Male	Female	Accent
Muffled	Familiar*	Definitely
Known*	Disguised	Calm
Angry	Whispered	Slurred
Crying	Laughing	Nasal
Stuttering	Lisping	Rapid
Slow	Soft	Loud
Coughing	Educated	Obscene
Taped Message	Incoherent	Cracking
Raspy	Excited	Young
Old	Other*	Obviously
Disguised Electronically		Obviously

Reading from script.
*Details: ______________________________

____

____

____

____

Background Sounds and Noises
(Circle as appropriate)

Factory/Office/Traffic/Voices/Music/Restaurant/Farm/
Plant/Aircraft/Trains/Static/Sports/Children/P.A./Other*
*Details: ______________________________

____

____

____

Threat Reported to: _____________________
Your Name: _____________________________
Your Position/Rank: _____________________
Your Phone Number: _____________________

APPENDIX E

Hand Clearance Sequence Reference Chart

The following information is only for the benefit of contract military personnel or for security personnel operating in a paramilitary role. Such personnel, by virtue of the environment in which they are operating, may occasionally be unable to exercise the infinitely more preferable "don't touch, call the security forces" principles applicable elsewhere. This is because such personnel themselves will actually *be* part of what passes for security forces.

This state of affairs was found by the author to be prevalent in certain areas of the former Yugoslavia during a period of employment there as an instructor/advisor in 1993. Foreign volunteers and conscript indigenous personnel alike frequently found themselves in mined and booby trapped areas that had to be cleared before operations could continue. With no prior exposure to such devices, a trial and error system of disarming or neutralizing was the only available option. Needless to say, casualties were high.

Casualties among friendly forces were also caused because of a failure on the part of the more inexperienced personnel engaged in offensive booby trap and mine operations to accurately (or even inaccurately!) record the location of emplaced traps and the applicable technique(s) for neutralizing or disarming them. An absence of such information also renders post-war clearance by international government or government-sponsored agencies more hazardous. With these factors in mind, Appendix F briefly covers offensive operations.

Hand clearance involves the location, neutralizing, removal, and disposal of traps without damage. *All sequences* *start with an examination of the device from all possible angles with a view to determining the type of firing device(s) present.* Likely sequences include:

Traps with an accessible firing device connected by fuse or det cord to the charge:

(1) cut or disconnect fuse or det cord between the device and the charge, then
(2) remove the charge a sufficient distance away to negate risk of sympathetic detonation, then
(3) neutralize the device proper, remove it, and remove any detonator firing assembly, then
(4) remove any detonators from the charge, dispose of charge and device

Traps with an accessible firing device connected directly to the charge:

(1) neutralize the device, then
(2) remove the device from the charge, then
(3) remove any detonator, dispose of device and charge

Traps with accessible fuse or det cord connections but with inaccessible firing devices or firing devices without obvious safety features:

(1) cut or disconnect fuse or det cord between charge and device, then
(2) remove charge to sufficient distance to negate risk of sympathetic detonation, then
(3) activate the device remotely, then
(4) remove any detonator from charge, dispose of charge and detonator

Completely inaccessible traps will be marked and disposed of by other means.

No traps will be hand cleared when other options can be selected.

IMPORTANT HAND CLEARANCE NOTES

(1) Always check for possible electrical initiation *before* cutting a slack tripwire. Remember, monofilament wires can be used to hold open an electrical circuit.
(2) *Never cut a taut tripwire.* Use nonconductive cutters when cutting any wire to negate the risk of momentarily completing an electrical circuit.
(3) When pulling a tripwire device, place the grapnel behind and close to the wire, but do not allow it to actually touch the wire until you are behind cover.
(4) Be aware that alternate firing devices may be concealed *inside* explosive charges.
(5) Treat individual sections of a trap/IED with care, as any or all of them may incorporate separate firing or actuation systems.
(6) Replace each safety device (or insert/apply an expedient safety device) in every apparent mechanism.
(7) *Disconnect a battery before replacing a safety pin.* Devices may easily be set to operate when a metal pin completes an electrical circuit. Nonconductive pins will negate this risk.
(8) When presented with a clear choice, cut det cord or safety fuse connections in preference to power supply connections. *But note warnings in numbers ten and eleven, below.*

(9) When severing electrical leads (which will only be done when it has been established beyond a doubt that it is safe to do so), always remove a section rather than just make a cut.

(10) Be aware that a taut length of det cord might be connected to a pull or tension release switch (as per a taut tripwire).

(11) Be aware that a length of det cord or safety fuse may be a dummy concealing an electric wire. Test det cord or safety fuse for metal content before cutting (if suspicious).

(12) After initial pulling of device (performed with a view to avoid triggering antihandling circuitry, etc.), incorporate as many periods of unattended observation as possible into the subsequent disarming procedure.

APPENDIX F

Offensive Operations

The following operations are for the benefit of contract military personnel only.

PLANNING BOOBY TRAP OPERATIONS

Before implementing a booby trap operation, an outline plan will be made based on:

(1) what is to be done, when, where
(2) by whom
(3) coordination of the booby trap operation(s) with the overall tactical plan
(4) effects required (i.e., enemy morale reduction, destruction of equipment, media publicity but no loss of life, etc.)
(5) availability of resources
(6) known habits of enemy/target
(7) enemy security measures likely to be encountered
(8) enemy ability to deal with traps

PRE OP BRIEFING

A preoperation briefing (based on the outline plan) will be given to all involved personnel. The briefing will specify:

(1) the purpose of the operation
(2) its starting and finishing times
(3) control measures and safety precautions

(4) organization of teams and allocation of specific tasks
(5) materials and tools available
(6) who is to record the location of the traps
(7) who is to arm the traps
(8) what action will be taken in the event of enemy contact
(9) marking and protection of traps while friendly troops are still in the area
(10) known enemy policies and habits

REHEARSAL

Whenever practicable, a rehearsal will be undertaken before the operation proper with a view to revealing potential problems and familiarizing personnel with equipment, devices, and control and safety measures.

INSPECTION OF MECHANISMS

Firing devices, circuits, and all related equipment must be checked and tested for correct functioning before use. Electrical detonators must be tested by removing the shunt (or untwisting the wire ends) and attaching to a blasting continuity meter or similar low-voltage tester. Testing electric detonators with improvised testers based on higher powered batteries may cause a detonator to fire.

SETTING TRAPS

Mechanical Traps will be set in the following manner:

(1) Lay the charge
(2) Fix the firing device in place
(3) Prepare for the connection of the charge to the firing device by either:
  a) fixing a coupling base assembly to the detonator, or
  b) connecting the fuse to the firing device and crimping a detonator to the other end (detonator and charge kept separated), or
  c) connecting a length of det cord to the firing device detonator and another length to the charge (both lengths to be kept separated until arming is required)

Electrical Traps

(1) Lay the charge
(2) Check *nonexplosive* circuit operation to confirm that *no* current flows when the arming switch and trap switch are in the "off" state, *and* that *no* current flows when the arming switch alone is then moved to "on." Confirm that current does flow with the arming switch on and the trap switch activated. This is most easily achieved by connecting a bulb (of a type that has similar current/voltage requirements to the detonator) in place of the detonator and activating the trap momentarily. Return any arming switches and the trap switch proper to off, reset any timer system, remove battery(ies), and discharge any capacitors.
(3) Prepare for the connection of the charge to the firing device by replacing the bulb with a detonator, or
(4) Replace the bulb with a detonator and attach a length of det cord to it, then install the knotted end of another length of det cord in the charge. Both lengths should be kept separate.

ARMING TRAPS

Mechanical Action

(1) Remove safety devices [1]
(2) Insert the detonator into the charge or connect the two lengths of det cord with tape or det clips
(3) Camouflage the fuse or det cord as required

Electrical Action[2]

(1) Install battery(ies)
(2) Place arming switch (if used) in "on" position.
(3) Insert detonator into charge or connect two lengths of det cord.

MARKING

If friendly personnel are likely to encounter the booby traps, they will be marked in some covert manner. A small pile of stones, a certain piece of graffiti on a nearby wall, a tree branch bent in a certain way, etc., can all be used as expedient markers.

RECORDING

The precise location and actuating principles of all traps will be recorded. A suitable form for these records follows in Appendix G.

[1] Note that when using detonation cord or fuse interconnections, the safety devices should be removed last. There may be other situations in which it is safer to remove a safety device first. The individual will decide which technique he feels affords him the greatest margin of safety.

[2] The laying and arming of electrical devices will often be combined into a single process in which the trap is assembled in its entirety *less* the batteries. A check is then made with a low voltage (blasting) continuity meter to ensure that *no* continuity exists. The batteries are then installed.

APPENDIX G

Sample Booby Trap Placement Record

Page 1 of (No.)

TECHNICAL RECORD OF TRAPS LAID AT __________(LOCATION)

MAPS: (identify map(s) from which following information is drawn).

GENERAL DETAILS

(1) Boundaries of Area Trapped (map references):
(2) Laying Team:
(3) Authority:
(4) Laying Started:
(5) Laying Completed:
(6) Total Number of Traps:
(7) Trap Positions:
a)
b)
c)
d)
e)

SPECIFIC DETAILS

(1) Position (marked as "A" in appendied diagram)
a) firing device (type)
b) set for (type of actuation)
c) location and type of charge
(2) Triggered by (specific details on how device is triggered)
(3) Neutralized by (specific details of how to neutralize the device, or, if no facility for neutralization exists, how the device should be dealt with in the event it has to be recovered or rendered safe by friendly personnel:
(Appended diagram will take the form of a simple sketch, as viewed from above, of the location of the trap(s) in relation to its surroundings.)

Glossary

Actuate: To cause a device to function as designed.

Activation Energy: The minimum amount of energy required to initiate a reaction in a chemical system.

Adiabatic Heating: In thermodynamics, an effect in which no heat enters or leaves the system. Adiabatic *compression* of a gas causes heating, adiabatic *expansion* causes cooling.

Ampoule: A small glass container holding (in this context) acid or a liquid chemical.

AN: Ammonium nitrate.

AP: Ammonium perchlorate.

Arming: The changing from a safe condition to a state of readiness for initiation.

Base Charge: In a compound (composite) detonator, the amount of secondary high explosive present.

Battery: A cell or series of cells supplying direct electrical current.

Blasting Cap: Known also as a detonator or cap. A small explosive device used to initiate detonation in explosive charges.

Blasting Machine: A handle-operated, impulse-type generator-based device used to fire electrical detonators.

Booster: Explosive material placed between the initiator and final (main) charge.

Bridge wire: The electrical filament inside an electric detonator which heats to incandescence when a current is passed through it, thereby initiating a primary explosive in contact with it.

Brisance: From the French word "brisor." The shattering capability of an explosive.

Cap: (1) Another name for a detonator. (2) Another name for a primer.

Capacitor: A component from which a stored electrical charge can be released instantly.

CC: Conducting Composition. An explosive or ignitable material capable of conducting electricity in such a manner that the passage of current causes it to heat and ignite/initiate, thereby rendering the use of a bridge wire unnecessary.

Combustion: Exothermic oxidation reaction, the combination of substances with oxygen (usually accompanied by flame, smoke, or sparks), with the oxygen being supplied by the atmosphere or from within the material itself.

Continuity (as in electrical continuity): An unbroken path or route along which current can flow.

Coupling Base: A commercial military attachment containing a percussion cap that is screwed to, or permanently attached to, a switch to activate a fuse or detonator. Known variously as a fixed base, standard base, or sometimes just "base."

Crimper: A hand tool used to attach nonelectric detonators to a safety fuse.

DATB: A military high explosive having a calculated Power Index Rating of 132 and an ignition temperature of 305°C.

Dautriche Test: An old (but still used) test technique for determining the detonation velocity of an explosive. The explosive is packed at the required density of loading in a steel tube and a firing detonator installed. Two additional detonators are positioned in the tube at right angles to the firing detonator. These detonators are a measured distance apart and are connected by a length of det cord with a known velocity of detonation. The central area of the cord is positioned on a plastic plate and the exact center of the cord marked thereon. When the explosive is detonated, the detonation wave fires each detonator in turn, thereby detonating the cord from opposite directions. Where the two waves meet, an indentation is made in the plastic plate and the distance between the center of the cord (E) and the indentation (F) is measured. The time taken for the detonating wave to travel from the first horizontal detonator (A) via the cord to F must be equal to the time taken for the wave to travel from A to the second detonator (B) via the explosive under test, and then from B to F via the cord. The velocity of the explosive is thus given as:

$$D_1 = \frac{D_2 L}{2EF}$$

Deflagration: An ultrafast burning phenomenon.

Detonator: See Blasting Cap.

Detonation: An ultrafast explosive decomposition wherein a heat-liberating chemical reaction maintains a shock front in the explosive material.

Delay: Any device designed to produce a time lag between initial actuation and the arming of a device or detonation of the main charge.

Disarming: Making an IED completely safe by removing or disconnecting the component parts.

Double-Base (propellant): A propellant containing nitroglycerine as well as nitrocellulose.

EBC: Electric Blasting Cap (electric detonator).

EBW: Exploding Bridge Wire. A detonator design wherein a short-duration high-tension pulse causes the bridge wire to vaporize, thereby creating a shock wave which directly detonates a surrounding charge of secondary high explosive. No primary explosive is therefore needed in the detonator.

EED: Electro-Explosive Device.

Energized Propellants: Propellants containing a significant amount of RDX.

EOD: Explosive Ordnance Disposal.

Exothermic: An exothermic reaction is a chemical reaction in which heat is liberated, the products being known as exothermic compounds.

Exploder: A button- or switch-operated battery and capacitor-based device used to fire electrical detonators.

Explosiveness: The speed and/or the extent to which an explosive releases its energy when subjected to a specific stimulus.

Explosive Power: The work capacity of a high explosive calculated on the basis of the heat and gas generated compared to that of a standard explosive or by tests such as the lead block test.

FAE: Fuel Air Explosive. A powerful implosion type of device in which the effects of an external (in relation to the fuel)

explosive charge and internal (in relation to the fuel) igniter mixture combine to distribute and then initiate a combustible substance. The fuels used in such devices include gasoline, other liquid hydrocarbons, and naphthalene, and gases such as acetylene and ethylene oxide.

Fallhammer Test: A test used to establish the relative sensitivity of an explosive to mechanical impact.

Firing Device: A device designed to actuate a fuse or detonator and thereby the main charge.

First Fire: An incendiary/pyrotechnic composition used to ignite a subsequent charge itself or the main charge.

Flash: A flame of short duration used to ignite or initiate a flash-sensitive charge or material.

Grain: In the context of propellants, a piece of the propellant material itself, often of a specific geometric shape regardless of its size. Thus, one stick of solid propellant of the type used in an anti-tank rocket would be termed a grain.

HE: High Explosive.

HMX: Tetramethylene tetranitramine or Octogen. A higher performance variant of the secondary high explosive RDX.

HNS: Hexanitrostilbene—a military secondary high explosive.

IED: Improvised Explosive Device.

IID: Improvised Incendiary Device.

Lead Block Test: Also known as the Trauzl Test. A test to determine the power of an explosive involving a 20cm x 20cm diameter lead block in which there is a 2.5cm wide axial hole. A 10g charge of test explosive with a specified detonator installed is inserted in the hole and the hole sealed with sand. When the charge is detonated, the net increase in the diameter of the hole is taken as the measure of explosive power.

Letter Bomb: An IED designed to be sent through the mail and activate when opened by the recipient. Mechanical, electrical, and chemical letter bombs have been deployed.

Munroe Effect: A localized concentration of shock wave energy at the target, achieved by specific charge shape and/or distance of the charge at point of detonation from the target.

Neutralizing: Rendering a device safe to handle. Not to be confused with *disarming*.

Normally Open (as in a normally open switch or circuit): Indicating the status of the switch or circuit before it is activated, i.e., a normally open switch will close when activated, and conversely, a normally closed switch will open when activated. Most switches may be connected in either configuration.

Oxidation: The combination of an element with oxygen.

PETN (Pentaerythritol Tetranitrate): A secondary high explosive commonly used in detonating cord.

PBX (Plastic Bonded Explosive): Explosive material mixed with a plastic bonding agent and thus forming both (1) the body (and often other component parts), and (2) the explosive charge in a given explosive device (typically a mine). This technique renders the device difficult (impossible if no other metal components are used) to detect with a conventional mine (metal) detector. PBX devices can be improvised with relative ease.

Pipe Bomb: A basic terrorist IED (Improvised Explosive Device) made from commercial or improvised explosive

material (sometimes match heads) packed inside a length of gas or water pipe and sealed with screw-on end caps. It is activated by a time fuse or an electrical detonator or initiator. Radio-controlled pipe bombs have been deployed.

Primer: A small (usually metal) housing filled with impact/stab-sensitive and flame-producing chemicals used to ignite the propellant in (for example) small arms cartridges. Also called a cap.

Primary Explosive: An explosive easily initiated by a small stimulus.

Propellant: An explosive intended to propel a projectile or do other work by burning and thereby producing expanding high-pressure gases.

RADHAZ (Radio Frequency Hazard): The risk of premature initiation of an EED by radio frequency radiation.

RCED: Radio-Controlled Explosive Device.

RDX: Also known as Cyclonite and trimethylenetrinitramine. Extremely widely used secondary high explosive both by itself and mixed with other explosives.

Relay: An electronic or electromechanical switch.

Resistor: A semiconductor used to limit current flow in several types of electronic IEDs.

Ring Mains: A military term referring to a main, or primary ring of det cord, linking together other det cord-connected explosive charges in a manner that enables them to be fired simultaneously and with a high degree of reliability.

Rotter Test: An English variation of the Fallhammer test.

RSP: Render Safe Procedure.

Secondary Explosive: An explosive requiring a substantial stimulus to detonate (i.e., when struck by a detonating wave) but not when ignited or heated.

Sensitiveness: Sensitivity. An indication of the ease (relative to a standard) with which a given explosive can be initiated or ignited with a particular stimulus.

Shaped Charge: Any type of explosive charge formed or cast into a specific shape to obtain a localized concentration of shock-wave energy.

Shock Front: In this context, an explosion-provoked change, at supersonic speed, in the pressure and other parameters of a given medium.

Shock Wave: A term used to describe a shock front and its related phenomenon.

Single-Base (propellant): A propellant in which nitrocellulose is the only explosive ingredient.

Slack (as in slack tripwire): A wire completely without tension that can be cut without causing any movement at either end.

Spall(ing): Debris or fragments thrown from the rear of a solid object when the front of it is subjected to a detonation shock wave or impact.

Spark Test: A test used to determine an explosive's susceptibility to initiation by electrical discharge.

Stabilizer: A material or substance added to reduce (sometimes prevent completely) auto catalytic decomposition of an explosive.

Standoff: The distance between a target and the explosive charge at the point of detonation. Frequently there is an optimum distance for a desired effect.

Stoichiometric: In this context, a reactive chemical compound in which the balance of the reactive chemicals is calculated to be such that they all react.

Switch: A mechanical, electronic, or electromechanical assembly incorporating components which change position or status when activated. It is not necessarily a commercial product.

TAAC: Tetrammine copper (II) chlorate, an improvised primary explosive.

Taut (as in taut tripwire): A tripwire that is under a degree of tension so that it cannot be cut or touched without causing some movement at either end.

Temperature of Ignition: The temperature required to ignite an explosive under specific conditions.

Tetryl: A secondary high explosive often used as a booster charge.

Thermate: A term often used to describe any of the fillings in an incendiary bomb.

Thermite: A mix of powdered metal (usually aluminum) and a metal oxide (usually iron oxide), which provides an intensely hot, gasless reaction.

Thyristor: Also called a Silicon Controlled Rectifier (SCR). It is a semiconductor device which may be used in IEDs in place of the transistor.

TNT: Trinitrotoluene. A secondary high explosive.

TPU: Timer Power Unit. The term given to a (usually) improvised bomb initiation system incorporating both timing and firing current capabilities.

Transistor: A semiconductor component available in many different forms and used in many IEDs as an electronic switch.

Triple-Base (propellant): A propellant containing nitrocellulose, nitroglycerine, and (usually in large measure) nitroguanidine.

VCP: Vehicle Check Point.

Velocity of Detonation: The speed that a detonation wave travels through the explosive.

There are no longer any safe havens from terrorists. From Northern Ireland to the Middle East, in Europe, Asia, and now increasingly in the United States, numerous groups are resorting to violence to make their aims known. And their medium of expression is often the Improvised Explosive Device (IED). That is why it is imperative for Special Forces, contract military personnel, law enforcement officers, corporate security personnel, and interested civilians to have the information presented in this book.

The *Terrorist Explosive Sourcebook* explains in detail the ingredients and techniques involved in the preparation and deployment of IEDs and booby traps, as well as appropriate counterbomb and counterterrorist measures. Also included are these invaluable charts and guides:

- Letter/Package Bomb Precautions Flowchart
- IED Component Recognition Guide
- X-ray Detection/Analysis Quick Reference Chart
- Threat Call Card
- Hand Clearance Sequence Reference Chart
- Offensive Operations
- Sample Booby Trap Placement Record

Stephen Turner is a counterterrorism expert with real-world experience with improvised explosive devices. He teaches courses on counterterrorism and IED awareness.

This book is *for information purposes only.*

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