POLICE GUIDE TO BOMB SEARCH TECHNIQUES

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PROCEDURES CONTROL

In order to effectively direct all phases of action relating to a bomb threat or search, a point of overall control must be established. From this point of control, frequently referred to as the command center, all major decisions are made and directions given. Evacuation is directed, search assignments are made, requests for assistance or special equipment are coordinated, and directional leadership of the entire operation is maintained.

The command center is generally staffed by two or three highly competent controllers who possess the delegated or direct authority for major decision making in times of crises. While the elaborateness of the command center may vary from a patrol vehicle in police controlled operations to emergency centers and mobile command trucks in large industrial or military installations, three basic characteristics are essential to any command center:

—Command center personnel must have decision making authority.

—The command center must be able to communicate with operational personnel.

—The command center must be mobile.

Authority

Police agencies are normally well organized for response and handling of emergency situations. Lines of communication and command at the scene of crimes, accidents, and disasters are clearly delineated in departmental directives and understood by patrolmen, supervisors, and specialists, as well as command officers. Thus in those cases where police agencies assume control at the bomb incident scene, some degree of formal command and control will probably be built into the response.

There are, however, basic legal and policy differences between police intervention after the commission of a crime, accident, or explosion and their willingness or ability to accept a preventive or protective role in response to bomb threats. While policy differs from place to place, the typical public safety response to bomb threats might include the following actions:

Patrolman or fireman responds to the complaint and contacts the official in charge of the school, factory, store or building.

The police or fire response officer will suggest appropriate courses of action, but will not take control or make decisions.

Police or fire personnel may assist or stand by during any evacuation or search.

If a bomb or suspicious device is located, a public safety or military bomb technician will be called to the scene.

While some public safety agencies may be willing and able to assume a greater degree of responsibility for bomb threat responses, most public and private facilities will have to plan and prepare to carry out a major portion of bomb threat operations, including control and decision making.

Where police are not in control, management must establish the command center. For example, if the threat is made against a manufacturing concern, management should be represented in the command post by the president or vice-president or their representatives so that high level decision making power is available. Overall supervision of bomb threat response activities may be guided by the corporate security officer who would actually direct the operation and advise management. Another command center member should be a local law enforcement or public safety representative who would coordinate outside support and requests for assistance in addition to acting in an advisory capacity to both management and the security officer.

Mobility and Communication

Command center mobility is important to a smoothly functioning operation. The center must be able to follow the flow of the action. If extended lines of communication and control are allowed to develop, functional control diminishes.

To illustrate the principle of command center mobility and the role of communications, consider the following sequence of events in a large industrial or single occupant business facility:

- A call threatening a bombing action is received by a switchboard operator. While the operator is still on the line with the caller, the security officer is alerted by a prearranged signal and monitors the call.
- The security officer makes an evaluation of the threat and contacts the responsible management official. A decision is made to evacuate and search the threatened building.
- Together, the security officer and the decision making management representatives constitute the command center. Appropriate orders are issued to activate evacuation and search plans in the target building.
- Command center requests that the command center truck, which also contains evacuation and search equipment, be driven to the target building and parked in a predesignated location.
- The security officer alerts law enforcement or public safety agencies and medical teams, picks up his portable radio transceiver, and proceeds to the mobile command center vehicle, where he is joined by management representatives. By the time the control personnel have arrived at the vehicle, the evacuation has been started and the search teams are picking up their equipment.
- After a brief conference with the building search team supervisor, the search starts. The command center is in radio contact with the search teams.
- As the building search proceeds, the command center, radio equipped, follows the search into the building. After search teams have cleared an appropriate inside space, such as the switchboard area or an office with multiple telephones the command center moves into this area.
- Communication inside the building may be established by use of telephones if all search team members have been given lists of the telephone numbers or simply instructed to dial the switchboard. Communications with those search teams and support personnel outside the building are conducted by radio, bullhorn, or by a system of runners.

By moving with the search and maintaining communication, the command center is able to have constant contact with all phases of the search and related operations and can keep close control over all personnel and their actions. If the command center had remained in some remote location, poor control and coordination would have resulted.

INITIATION

Bomb incidents are initiated in one of three ways, and planning should provide for each possible situation.

1. Receipt of threat or warning.
2. Location of a device suspected of being a bomb.
3. Actual detonation or ignition of a bomb.

When a bomb is located without warning or detonates, the procedures to be followed are relatively simple and uncomplicated, and will be discussed in detail later in this section. On the other hand, the steps involved in the processing and evaluation of bomb threats are not as well defined, and often require decisions based upon little or no reliable data. It is, therefore, essential that personnel be trained to handle threats in a manner that will provide as much solid information as possible to assist in the evaluation of such warnings.

Written Threats

If a bomb threat is received in writing, all materials must be saved, including any envelope or container. Once the message is recognized as a bomb threat, further unnecessary handling should be avoided. Every possible effort must be made to retain evidence such as fingerprints, handwriting or typewriting, paper, and postal marks which are essential to tracing the threat and identifying the writer.

While written messages are most often associated with generalized threats and extortion attempts, a written warning of a specific device may occasionally be received and cannot be ignored. With the increasing use of voice print identification techniques to identify and convict telephone callers, there may well be an increase in the use of written warnings and calls to third parties. (See Appendix I for discussion of telephone threats)

Threat Evaluation

Once the bomb threat has been received, immediate action must be taken to analyze the threat and take appropriate response actions. To avoid dangerous delay and indecision, pre-incident planning must clearly provide for two important aspects of the evaluation:

1. Who will evaluate threats?
2. How will threats be evaluated?

Every facility which considers itself a potential bomb threat target must establish a bomb threat decision authority. Generally, this authority is vested in members of the management or supervisory staff. For each individual with primary decision authority appointed, there should be at least one alternate to act during routine and emergency absences and provide twenty-four hour coverage every day of the week. Both should be completely familiar with the scope of authority and responsibility of the assignment.

While owners, managers, or administrators may wish to avoid making difficult decisions regarding bomb threats, in most areas of the country they will find that police and fire personnel will be reluctant to accept the responsibility. As a matter of policy, most public safety agencies will gladly assist in pointing out various courses of action, but the final decision must be made by the individual responsible for the target facility.

Unfortunately, there is very little reliable information to assist in differentiating between the bomb hoax and the legitimate warning. While it has been noted that actual warnings tend to be more detailed than hoax calls, this observation remains pure speculation and is certainly not a valid measure of the seriousness of a bomb threat. It may be equally unprofitable to screen on the basis of age or sex since many legitimate bomb calls are received from females and children. The whole area of evaluation of sincerity and the basis of the content of the message or the characteristics of the caller is largely unexplored. Any assistance along these lines will have to await further research.

In the meantime, there would appear to be at least nine to eleven hoax threats for every actual or attempted bombing in the United States and estimates from specific major cities place the ratio much higher than the national average. For example, during the first six months of 1973 New York City reported a total of 6,720 threats as compared with 112 actual bombings or attempts, a ratio of about 60 to 1. Whatever the collective ratio, it is obvious that any private or public facility can be effectively immobilized if constant threats are permitted to disrupt activity over any period of time. In such cases the attacker may achieve his objectives as effectively with hoax threats as with actual bombs.

Basic bomb threat evaluation will involve assessing the credibility of the message and selecting one of three possible alternatives:

1. To take no action
2. To search without evacuation
3. To evacuate and search

Except for those facilities unable to evacuate because of their size or the critical nature of their activities, the decision making authority must simply weigh the cost of loss of productivity against the risk of injury or death to personnel. When faced with this equation, most decision makers would choose positive action and the protection of human life.

EVACUATION

At first glance, immediate and total evacuation would seem to be the most appropriate response to any bomb threat. However, there are significant economic and safety factors that <u>may</u> weigh against the evacuation response. Even where evacuation is possible and desirable, the process itself may not be as simple as it might appear.

Limitation on Total Evacuation

. Risk of Injury. As a general rule, the easiest area in which to plant a bomb is often in the shrubbery surrounding a building or in a car in a parking lot. If personnel are evacuated out of a building, they may be increasing rather than decreasing their risk of injury. In the same way, the most likely place to conceal a bomb inside is in an area to which the public has the easiest access. Therefore, any evacuation that requires personnel to move through public areas such as halls near restrooms, waiting rooms, or lobbys might increase the risk of injury during any detonation.

In the case of high-rise office or apartment buildings, the process of evacuation may require that all occupants pass the point of possible detonation. Personnel evacuated from a building in a congested downtown area could be forced to wait on streets or sidewalks where they are vulnerable to any falling glass or other debris resulting from an explosion. In either case the risk of injury may be increased by evacuation.

. Response Impairment. Total and prompt evacuation will remove workers and supervisors who might be required to make a comprehensive search or take damage control measures.

. Panic. For facilities without bomb incident plans and properly trained personnel, a sudden bomb threat evacuation may cause panic and unpredictable behavior leading to unnecessary risk of injury.

. Essential Services. Some evacuations may be precluded by the essential nature of the operations conducted by a facility. Hospitals, utilities, telephone exchanges, and police stations may fall into this category if they are providing critical public safety services that would be disrupted by evacuation.

. Loss of Production. Almost all bomb threats are directed at facilities engaged in some form of production. Whether in a manufacturing plant or a high school, total evacuation will result in loss of productivity. While the protection of life usually outweighs any economic loss, repeated threats may pyramid costs to an unacceptable level.

Thus, there are some conditions which make total evacuation an undesirable response to the bomb threat. In such cases a partial evacuation may be more appropriate.

Partial Evacuation

One alternative to total evacuation is a partial evacuation. This response is partially effective in those instances where the threat includes the specific or general location of the bomb or in those cases where a suspicious device has been located without prior warning.

Partial or selective evacuation can reduce risk of injury by removing personnel who can safely be moved out of the facility. Personnel essential to search or damage control can remain, critical services can be continued, and production loss minimized. On the other hand, partial evacuation requires a far higher degree of planning, training, supervision, and co-ordination than does a total evacuation response.

The Evacuation Process

Once a decision has been made to evacuate a building, a reason for the action must be given to the occupants. If not specifically provided for in the bomb incident plan, the individual with authority to order evacuation will decide whether or not to announce the true nature of the emergency. If there is reason to believe that occupants will panic if advised of a bomb threat, it may be necessary to order evacuation on some other pretext. It should be noted, however, that employees may resent not being advised of the actual situation and that legal considerations may also preclude evacuation under false pretenses.

If a covert evacuation is decided upon, some pretext other than a fire drill will have to be employed. During fire drills, windows and doors are closed and often locked. For a bomb evacuation doors must be left open so that rooms are readily accessible to search teams, and doors and windows should be open so that if a bomb detonates the blast will not be contained within the building thereby increasing the extent of damage. When a false explanation is required, a leaking furnace fuel line or gas main is often cited.

Considering the virtual impossibility of concealing the reason for the evacuation and the problems associated with deception, the most desirable course of action would be the establishment of a specific prearranged signal for bomb evacuations. With informed adults, the risk of panic is not great and prior training or explanation, as well as calm leadership at the scene of the evacuation, will further minimize the danger of undesirable behavior.

In any event, a system must be in effect for the transmission of the evacuation order. Even where a covert explanation for the evacuation is employed, the true nature of the emergency must be recognizable to key personnel who have specific functions to perform in the bomb evacuation, search, or damage control operation.

Where the evacuation is open, personnel can be of great assistance by removing personal property and disconnecting all electrical office machines prior to leaving the building. Since electrical equipment, even in a standby condition, produces noises which will interfere with both electronic and nonelectronic stethoscopes used during the building search, all office machines, coffee pots, fans and window air-conditioners, and fluorescent lamps, should be unplugged by evacuating occupants. Personal packages, briefcases, lunch boxes, and other student or employee property will delay the search and should, therefore, be carried out of the building by their owners whenever possible.

In addition to asking personnel to disconnect electrical equipment within the building as they depart, consideration should be given to selective termination of certain utilities at master or local control points. All nonvital utilities selected for evacuation shutdown should be indicated on a checklist as well as being permanently marked at the control or shutdown point within the building. Selective utilities shutdown can greatly increase the efficiency of the searchers by eliminating confusing background noise levels and will also contribute to damage control in the event a bomb detonates.

The building maintenance engineer or janitor should be required by the bomb incident plan to report to the command center with master keys to facilitate access to basement storage areas, electrical panels, elevator shafts, and other areas where a search will have to be made. Wherever possible maintenance personnel should be assigned to participate in the search of the facility as they are generally the most knowledgeable employees available regarding the physical layout and utilities services of the buildings in which they work.

Evacuation is often pictured as merely moving the occupants out of a facility as in a fire drill. Evacuation in response to a bomb threat, however, may be considerably more complicated. For example, in instances where the location of the bomb is known or suspected, it may be necessary to alter established routes in favor of an exit pattern that will provide the greatest protection in the event the device detonates during the evacuation. Obviously, greater supervision and control will be required for a bomb evacuation, especially if a decision has been made not to announce the purpose of the evacuation.

The personnel reaction to a bomb threat, as compared to a fire alarm, must also be considered. To the layman, the danger of an unexploded bomb is generally an unknown and highly exaggerated entity. Without proper preparation and supervision, panic can develop during a bomb evacuation, increasing the risk of secondary injury and delaying the clearing of the area. Properly trained evacuation teams, composed of supervisory or security personnel who are thoroughly familiar with the selected routes and possible hazards, can help to deter irrational behavior. These teams must be well trained and, for larger facilities, equipped with communication devices that will facilitate timely changes in evacuation routes or procedures.

Evacuation teams will normally be organized to service a specific building or, for large buildings, a clearly identifiable internal area. All possible evacuation routes should be identified and the responsible evacuation teams should have sufficient personnel to control the most complex route. Because of their primary focus on the evacuation process, the team should consist of personnel not involved in searching assignments.

The evacuation team members and supervisor should, if not uniformed security personnel, wear identifying armbands or badges. By stationing evacuation team members at hall and stairway intersections, occupants can be directed to established evacuation routes and brief explanations offered to reduce the danger of panic from rumors. The calm presence of evacuation team personnel will reduce confusion, speed evacuation, and make possible changes in routes or procedures during the evacuation process.

At a prearranged signal, evacuation team personnel will conduct a rapid patrol of their assigned areas to see that the partial or total evacuation is complete, and then report to positions outside the facility to insure that occupants remain at proper distances, usually at least 600 feet, from the building until the reentry order is received.

An important point frequently overlooked in planning evacuations is the need to select an area or areas where those being evacuated may safely and, if possible, comfortably wait until the search for the bomb has been conducted. The occupant who has to stand two hours in the wind and rain will be far less cooperative when asked to evacuate a second time. The well-developed evacuation plan will not only insure safety but will consider the comfort and morale of those being evacuated.

SEARCH

In the bomb search operation, some individual or group attempts to locate any explosive or incendiary devices that may have been emplaced by potential bombers. Since bombs may or may not look like bombs and may or may not be concealed, the thoroughness of the search and its likelihood of success will depend upon the skill of the searchers and the ingenuity of the bomber. To appreciate the variables involved, it should be noted that the searchers may be police or fire personnel, building occupants, supervisors, maintenance men or trained search teams and that the bomber may be a psychotic, an enthusiastic amateur revolutionary, a disgruntled employee, a criminal, or a highly trained professional saboteur or assassin.

To further complicate matters, it is not widely recognized that a thorough, detailed search of even a medium size building may consume from twenty-four to forty-eight hours and result in considerable disorder produced by the movement and partial dissassembly of furniture and equipment as well as the search of files and storage areas. Consequently, "thorough" searches of entire buildings or facilities are seldom conducted in response to bomb threats. Even where the "thorough" search is necessary and desirable, it cannot be conducted without prior planning and trained personnel.

The official in charge of the bomb threat response is denied the luxury of an either/or decision. The nature and extent of the search operation will depend upon the evaluation of the threat and the resources available. With no plan, uninformed occupants and no trained search teams, the manager or administrator will have little option other than to evacuate, close down and either conduct a haphazard search, or wait out the threat for a period of twenty-four to forty-eight hours. However, if prior planning and training have been accomplished, the decision maker will have a much wider range of response options and can model his reaction to meet the threat as he sees it.

CHAPTER II
GENERAL BUILDING SEARCH

Evacuation

Request that personnel be evacuated from the building in a rapid but orderly fashion. A "cover reason" such as leaking furnace fuel line, gas main leak, etc. can be used to prevent panic and to account for the opening of windows and doors. It provides a reason for leaving the building.

Schools

Do not hold a fire drill if the building is a school unless specific instructions are given over the PA system to open all windows, leave all doors open and leave lights on. Normal fire drills will result in everything being locked up tight, every room being dark, and the keys in the possession of individual teachers. Use the "cover reason" to explain why the student must leave the building.

Machines

Request that all electric typewriters, calculators, tabulators, photocopy machines, fluorescent table lamps, etc. be unplugged prior to personnel leaving the building. Most electrical office machinery, even when in a standby condition, will produce a hum, buzz, or clicking sound. This noise will compound the searching problem by producing specific distracting sounds, producing an increased and confused background sound level which will hamper stethoscope listening operations,

Keys

Request that the building maintenance engineer (janitor) and his assistants collect their master keys and stand by for your arrival. The janitor will be the only person present with master keys to the storage rooms, electrical panels, elevator shafts, etc. Other persons working in the building will also possess master keys. People such as the building superintendent, the security force, the principal, etc. will not generally have keys to the basement storage areas or the facilities areas since these are the primary concern of the janitorial or maintenance force.

The janitorial or maintenance force must have access to all rooms within the building so their keys are usually more complete.

Safety Lines

Request that the law enforcement agency establish safety lines approximately one city block around the building, evacuate this area, prevent entry to the building, and stop vehicular traffic.

Radio and TV Transmissions

All radio and TV transmissions should be stopped in the area of the suspected bomb. Examples of recommended minimum operating distance from explosive device are as follows:

Citizens Band (Walkie-talkie) (5 watts)	20 ft.
Two-way radio telephone (up to 180 watts)	60 ft.
VHF two-way mobile & fixed (up to 500 watts)	290 ft.

Two-way fixed (up to 600 watts)	315 ft.
VHF TV and FM (Channels 2-6)	3,200 ft.
(Channels 7-13)	2,300 ft.
UHF TV (Channels 14-83)	3,000 ft.
Commercial AM (up to 9,000 watts)	750 ft.
International HF (up to 100 watts)	750 ft.
(up to 500 watts)	1,700 ft.

Roof Top Inspection

Request a roof top inspection by helicopter or police if there is any history of radio controlled devices or if such devices are in any way suspected.

Information

Upon arrival at the scene, the individual in charge of the search must collect all information pertinent to the incident. Specific questions to be asked include the following:

How was notification of the bomb received?
What time was notification received?
Who received initial notification?
What has been done so far?
Has any possible target been identified?

It is essential that these questions be answered.

Example: The phone call you received had passed through several persons in all probability before it reached you. You were probably told simply that the Federal Building downtown was going to be bombed. A check with the telephone operator who took the call may reveal that the caller said, "There is a bomb in the Internal Revenue Service Offices on the second floor set to go off at one o'clock." By taking the time to talk to the person who received the call you can frequently get an indication of the target and time of detonation.

Outside Search

Start your search on the outside of the building. The easiest and safest access for the bomber would most likely be to the outside of the building at night. Start your outside search at ground level. Check piles of grass, leaves, shrubbery, etc. Look for recently disturbed earth. Check area ways, ledges, ornamental facings, man holes, trash cans, parked cars and trucks, etc. If enough search personnel are available you should consider splitting your search force, leaving a group to search the outside areas while the remainder enter the building and start the inside search. The outside check should cover at least the ground floor or as high as a bomb might be easily placed.

Facilities Area

Once inside the building, start at the bottom and work your way up. Check the facilities areas first (furnace room, electrical control areas, elevator shafts and pits, storage areas, etc.). These are generally in the basement or sub-basement. A bomb in these areas would put the building out of operation until repairs were made. This may be the object of the bombing.

Public Area

If enough search personnel are available, you should consider splitting your search force again and have one group rapidly check all public areas in the building (lobbies, halls, rest rooms, stairs, elevators, etc.). The remaining search team works up through the building.

EOD Command Post

In large buildings where EOD teams are present, a command post for EOD contact should be established in or near the building. When a search team locates a suspected item they contact the CP and EOD personnel check out the item. A "locator/sign out board" is a valuable CP item.

This board should list the following at minimum:

1. Suspected item location
2. Description of item
3. Time
4. EOD man responding

By using a board of this type, even if all EOD men are out checking items, the location of suspected items may be logged by the search team and as the EOD team members return to the CP, they can pick up a new assignment without loss of time. The search team members should mark items so they can pin-point the location of the suspected item if it is surrounded by like items. For instance, one shoe box which is ticking on a shelf of three hundred shoe boxes, one wall locker in a room of fifty lockers or one desk in a room of twenty-five desks.

IMPORTANT - Upon completion of the search, be very careful what you say. If your team did not find any devices in the search, state that "No bombs or devices were found". Do not state that the building is clear. Make your statement in front of witnesses and sign no statements of any type.

CHAPTER III
ROOM SEARCHING TECHNIQUE

The technique that follows is based on the use of a two-man searching team. There are many minor variations possible in searching a room. The following information outlines only the basic technique. The search team prior to first action, should request the assistance of someone familiar with the room, or the room's occupant, to look into the room without entering. This individual should be able to tell if the items in the room are familiar and in their right places. If something is seen that is not correct or normal for that room or occupant it should be immediately suspected.

1. First Team Action - Listening

When the two-man searching team enters the room to be searched, they should first move to opposite sides of the room, stand quietly with their eyes shut and listen for clock-work mechanism. Frequently clock-work can be quickly detected without use of special equipment. Even if no clock-work mechanism is detected the team is now aware of the background noise level within the room itself. This initial move into the room should be done with caution, to avoid any triggering devices connected to booby-traps.

Background noise or transferred sound is always a disturbing factor when conducting a building search. In searching a building a stethoscope is frequently used. A ticking sound, the source of which cannot be immediately located, is cause for some nervousness on the part of the searchers. The ticking sound may come from an unbalanced air conditioner fan several floors away or from a dripping sink down the hall.

Sound will transfer through air conditioning ducts, along water pipes and through walls, etc. One of the worst types of building to work in is one that has steam or hot water heat. This type of building will constantly thump, crack, chatter and tick due to the movement of the steam or hot water through the pipes and the expansion and contraction of the pipes as this occurs. Background noise may also be outside (traffic sound, rain, wind, etc.).

2. Second Team Action - Division of the Room and Selection of Search Height

The man in charge of the search team should look around the room and determine how the room is to be divided for searching and to what height the searching should extend. The first sweep will cover all items resting on the floor up to a selected height.

a. Dividing the Room

The room should be divided into two equal parts or as near equal as possible. This equal division should be based on the number and type of objects in the room to be searched, not on the size of the room. An imaginary line is then drawn between two objects in the room (i.e., The edge of the window on the north wall to the floor lamp on the south wall.).

b. Selection of First Searching Height

Look at the furniture or objects in the room and determine the average height of the majority of items resting on the floor. In an average room this height usually includes table or desk tops, chair backs, bookcases, windowsills, etc. Stated another way, the first searching height usually covers the items in the room up to waist height.

3. Room Search

a. First Room Searching Sweep

Now that the room has been divided and a searching height has been selected both searchers should go to one end of the room division line and start from a "back to back" position. This is the starting sweep. The searchers should walk softly, using either a "flat-foot" or "toe-and-heel" technique. Avoid walking with a "heel-jarring" movement. Scrutinize the floor carefully before moving the feet—check for ankle-high wire, and if the floor is carpeted, check for bulges and uneveness in the floor covering. Each man now starts searching his way around the room, working toward the other man, checking all items resting on the floor around the wall area of the room. In this examination, the searchers advance only two or three steps at a time, pause, face the wall and carefully scan in a horizontal sweep, all items against, in or on the wall (air conditioning ducts, baseboard heaters, built-in cupboards, etc.). If it is necessary to squat for the search, do not touch anything for support. It is advisable that the searchers pause every few feet and make an "eye closed" listening sweep. When they meet they will have completed a "wall sweep" and should then work together and check all items in the middle of the room up to the selected height. The first searching sweep is usually the most time and effort consuming. During all searching sweeps, the electronic stethoscope, when available, is used frequently on walls, furniture items, floors, etc.

b. Second Room Searching Sweep

The man in charge again looks at the furniture or objects in the room and determines the height of the second searching sweep. This height usually averages out to the area from the waist to the chin or top of the head. The searchers return to the starting point and repeat the searching technique at the second selected searching height. This sweep usually covers pictures hanging on the walls, built-in-bookcases, tall table lamps, etc. Do not lift, tilt, jar, slide, reposition or in anyway disturb any item whose contents cannot be completely observed. This includes big books, index card file boxes, radios, brief or attache cases, cigar humidors, statuettes, "sport" trophies, flower pots and most of all packages or closed boxes.

c. Third Room Searching Sweep

When the second searching sweep is completed the man in charge again determines the next searching height, usually from the chin or top of the head up to the ceiling. The third sweep is then made. This sweep usually covers high mounted air conditioning ducts, hanging light fixtures, etc.

d. Fourth Room Searching Sweep

If the room being searched has a false or suspended ceiling, the fourth sweep involves investigation of this area. Check flush or in-the-ceiling mounted light fixtures, air conditioning or ventilation ducts, sound or speaker systems, electrical wiring, structural frame members, etc. If it is necessary to climb on top of desks or chairs, in the 3rd or 4th sweep, check them carefully. Make sure they are in firm contact with the floor and if they must be moved, check for trip or pull wires attached to them.

Not all rooms will require three or four searching sweeps. The average hotel room for instance can be searched using only two searching sweeps. The first sweep, "floor to waist" will cover most of the furniture items and fixtures in the room, so the second sweep is usually extended up to the ceiling.

The room searching technique can also be used to search a convention hall, airport terminal, hotel lobby, corridors and halls in office buildings and other "open" public areas.

Restated, the basics of area searching may be listed as follows:

1. Divide the area and select a search height
2. Start from the bottom and work up
3. Start back to back and work toward each other
4. Go around the walls and then into the center of the room

If a guest speaker at a convention has been threatened, common sense would indicate searching the speakers platform and microphones first, but always return to the searching technique. Do not rely on random or spot checking of only logical target area, as the bomber may not be a "logical" person.

e. Marking of Suspect Items

The variations in configuration of an explosive device are limitless. In offices the container can vary in size from something as small as a pencil sharpener or cigarette case, flip lid "List Finder" or 3 X 5 card file box, to larger objects--dictionaries and flower pots, to more conventional sized brief cases and wrapped packages. It can even be in the pocket of a coat hung on the coat rack—this is a "must check" item. When a suspect item is found by searchers it should not be moved. A small (1/2 to 1 inch) piece of colored pressure sensitive tape should be lightly stuck to the object where it is clearly visible. Notes should also be made describing the object and its location, to be passed on to the disposal team in the event the search personnel are not allowed back into the area.

f. Marking of Searched Rooms

When searching buildings with a large number of rooms, it is recommended that each room be marked upon completion of its search so that a quick final visual check may be made to be sure that no rooms were overlooked or skipped. The best room marking system is the placement of a small piece of tape, approximately1/2inch square on the door jamb opposite the door knob. A marker placed in such a position is inconspicuous, fairly safe from accidental removal and provides a quick visual indication as to whether or not the room has been checked. Placing a tape marker in this location puts it in an area which is not normally viewed by the casual observer or by a user of the doorway.

4. Suggested Minimum Search Equipment

Each man on the searching team should have with him certain items to assist him in his searching actions. Items each searching person should have are:

1. Flashlight and light bending adapter
2. Medical or electronic stethoscope or other detection instrument
3. Small hand mirror or dental mirror
4. Rubber surgical gloves
5. Roll of colored, pressure sensitive tape

NOTE: If possible, members of search teams should wear soft soled shoes .

CHAPTER IV

SEARCH TECHNIQUES FOR STRUCTURES AND AREAS

Different types of structures and areas are a great deal like people in that no two pose the same types of problems. The physical construction features vary widely. The temperament encountered on each job is different and like humans, each type of structure or area has its own set of idiosyncrasies. Being forewarned of these idiosyncrasies or peculiarities is a step toward a smoother over-all searching operation. Here are a few of the problems which the searching team will sooner or later encounter working on different types of structures.

Outside Areas

When conducting a search of outside areas, pay particular attention to street drainage systems, manholes in the street and in the sidewalk. Thoroughly check trash receptacles, garbage cans, dumpsters, incinerators, flower boxes and pots, decorative greenery in ornamental containers, etc. Check parked cars and trucks. Mail boxes should be checked if there is a history of placement in your area. If at all possible, the search team should be accompanied by the building "outside man," the individual responsible for upkeep of the grounds. He does not have to physically take part in the search, but he can usually tell at a quick glance (even from a safe distance) if something does not appear to be as it has been or if something is out of place or has been added. Needless to say, the search should not be conducted with a "bull-in-a-china shop" attitude. Receptacles should be searched gently and carefully; manhole covers, lids and doors should be opened cautiously; vehicle doors should not be slammed after the vehicle has been examined (tremblor switches will function when jarred). Freshly disturbed soil or uneven sod should not be stepped on.

Streets and Highways

Streets down which a VIP party will pass should be thoroughly checked at each intersection, as well as along the route of travel. There are four street water drainage entrances at the intersections. No one enjoys climbing through a sewer, but be prepared to do it (with hip or knee rubber boots and coveralls). Mid-block you will also check quite a few trash cans, garbage cans, etc., and more sewer drains.

Checking highways over which the VIP party will travel is extremely tiring and frustrating. You will walk miles and miles peering into brush heaps, and tin cans, looking behind guard rail posts and scanning telephone and light poles from bottom to top. You will climb through culverts, ditches, over and under bridges, all the while realizing that the bomber could be half a mile behind you on a public highway setting up a charge under the road or a Claymore mine at the side of it.

Schools

Generally speaking, school bombings are directed against non-student areas. Find out who and/or what areas are likely targets. The big problem in schools breaks down to three areas, student lockers, the chemistry lab and the auditorium. Seemingly every other locker will be "ticking". Alarm clocks, wrist watches, leaking thermos jugs, white mice and crumpled-up note paper all make "ticking" sounds. Have the school authorities cut the locks off those lockers and check them out. (If you cut off the lock you may end up paying for it). Here again, move with caution, do not slam doors open and closed. It is well to remember that the unlocked locker is the more plausible hiding place and extreme caution should be used in opening them. There is always the possibility that a bomb will be brought to school in a briefcase, bookbag or even inside of a book. When the students are notified that the building is to be evacuated, for whatever "cover" purpose, they should also be asked to take out of the school, all books, briefcases, etc. that they brought to school with them that day. The student who is reluctant to do this should be given special attention.

The chemistry lab can be an awesome place. Each year some kid tries to make nitro or rocket fuel in the classroom, gets scared, and phones in a bomb call. The best thing to do is to get the chemistry teacher to look over the classroom lab with you. They will know 90% of the items in the lab by sight and that leaves only the 10% to worry about. Have them check the chemical storage areas also.

NOTE: If repeated "bomb scares" are received at schools in your area, recommend that the school board hold make-up classes on Saturday with all day testing given. This tends to cut down the number of "bomb scares."

Office Buildings

The biggest single problem in office buildings are desks, thousands of them locked. When the workers leave the building they lock their desks, and if you pry them open you will pay dearly, as a broken desk lock is an expensive item. Even if you locate the person who works at that desk he or she will, most likely, not choose to unlock it for you (invasion of privacy), because they have been stealing company pencils, or they have love letters from the "girlfriend," or a box of "diet busting" candy in the desk. All you can do is monitor the desk with your stethoscope or other detection instrument and move on. Here again, the unlocked desk, like the unlocked locker, should be opened with caution. There will be plenty of other items to keep you busy, such as filing cabinets, storage closets, wall lockers, etc. (Watch out for the company's security system if they deal in fashions of any type, the automotive or aircraft industry, defense contracts, or the toy industry. Electrical leads, electrical tapes, electric eyes, electrical pressure mats, electrical micro-switches, and more, will all trigger alarm bells).

Auditoriums, Amphitheaters, and Convention Halls

Here you are confronted with thousands and thousands of seats which must be checked on your hands and knees. Check for cut or unfastened seats with a bomb inserted into the cushion or back. The stage area has tons of equipment hanging over it, on it, and in the wings. Check out the speakers platform and the microphones. The area under the stage generally has crawl ways, tunnels, trapdoors, dressing rooms and storage areas. The sound system is extensive and the air conditioning system is simply unbelievable. You will find that you can walk upright through parts of it. The entire roof area of a theater frequently has one huge storage room, or facilities area and maintenance area above it. Check all hanging decorations and lighting fixtures. In all public areas, especially near elevator banks, there will be any number of cigarette butt receptacles - most of these are of pretty good size and are hollow, the top being closed by a shallow pan, with or without sand in it. They should be monitored with a stethoscope before looking inside.

Ships and Aircraft - (VIP Protection Detail)

Start from the outside and work in; start from the bottom and work up. Get divers to check the ship's hull under water. Enlist the ship's crew to conduct the inside search, as they know a lot more about their ship than you do. Start in the engine room or below and work your way up. With aircraft, check engine intakes, cowlings, wheel wells, and cargo areas outside. Inside try and get an aircrew member to search with you. In aircraft, look for small charges placed to rupture the pressure hull, cut the control cables, etc. When dealing with commercial airlines, make sure the company will take care of all damages before starting your search of luggage. Keep an airline representative with you when checking the baggage or you may get charged with theft. Have the passengers unlock their own bags if possible. This saves time and trouble. Check any unclaimed or freight baggage carefully. Almost everyone will have a clock in their luggage.

Elevator Wells and Shafts

Elevator wells are usually one to three feet deep in grease, dirt and trash and must be probed by hand because a bomb dropped in just disappears. To check elevator shafts, get on top of the car with two six volt lanterns, move the car up a floor (or part of a floor) at a time and look around the shaft. Be prepared to find nooks, closets, storage rooms, false panels, walk areas, and hundreds of empty whiskey bottles in paper bags. (The ones that haven't fallen into the elevator pit). Don't forget that as you go up the counter weights are coming down - check them too. The elevator machinery is generally located on the roof. A word of caution: Watch for strong winds in the elevator shaft. Don't stand near the edge of the car.

CHAPTER V
VEHICLE SEARCH

Searching a vehicle for an Improvised Explosive Device (IED) poses greater danger to a search team than does the search of a room or building. There are a great many ways that a device can be rigged to function in a vehicle using pressure, pull, tilt, motion, electrical, chemical, thermal and barometric activating systems. On the other hand, the search is being conducted around and throughout a very limited area compared to a room or building. A detailed search of a vehicle by a skilled team of two or three- men can take from three to five hours, depending on the size of the vehicle, complexity of remote entry procedures and the number of accessories behind, under or into which a device could be placed. There are a limited number of places that afford complete concealment in a vehicle, with the exception of recreational vehicles of course, for which the procedures used for searching a building and a vehicle must be combined. Explosive devices placed in a vehicle may be in a package, briefcase or other such container and be in plain sight of the searchers. On the other hand, since the vehicle or components within the vehicle may be used as part of the activation system of the device, components of the device can be positioned in numerous places in or around the vehicle. Any search of a vehicle other than a "hands-off" visual scan of the interior of the vehicle or the area around the vehicle looking for a packaged device should be conducted only by personnel trained in the recognition of an IED. Therefore, this chapter on vehicle search procedures will not detail device construction and operation but will only describe means of preparing a vehicle for a search and the conduct of a search.

Searching a vehicle should follow the same procedural pattern as searching a building. Start the search outside the vehicle, establishing a reasonable perimeter within which a complete device or components of a device could be found. During this area screening, emphasis should be placed on looking for wires connected to a remote timing or triggering component, trip wires or pressure plates. This is followed by a "hands-off" scan of the interior of the vehicle through the windows and windshield accompanied, if possible, by someone familiar with what would normally be in the vehicle. After this is completed, trained bomb technicians or specialists should conduct the rest of the search under, around and inside the vehicle. Entry into the vehicle's engine compartment, interior, and trunk, removal of wheel covers, and battery, and turning of ignition key and quite possibly other keys, must be done remotely. Many police and fire departments and other agencies responsible for conducting vehicle searches have designed and use a number of simple but ingenious remotely operated entry tools using levers, pulleys, hooks, pry bars, T-stands, A-frames, etc. A majority of the time taken to conduct a thorough search is expended in preparing the vehicle for a search and in setting up and operating remote entry equipment.

Background Information

A preliminary step, to be taken prior to more than a cursory scan, is to gather as much information from the owner/driver or passengers or anyone else who has cause to believe that a device has been placed in the vehicle.

1. In the case of a bomb threat received indicating that a device is in the vehicle, a careful review must be made of what was said or written. Look for a clue as to type and/or location of the device, type of triggering system, amount of explosive, etc.

2. Is the car locked? If it is and keys are not available, procure lock picking equipment.

3. Has the car been parked in a secure area under surveillance by guards or attendants? If this is the case and there is absolutely no chance of anyone having placed a device in the vehicle, the device may be on the route of travel.

4. When was the vehicle driven last, where to and from, why and by whom. A device could have been placed in the vehicle while it was unattended for as short a time as five minutes, particularly in an area where raising the hood, or opening the trunk lid or doors would attract little attention.

5. Who was to be using the vehicle next? A passenger or the driver could be the target or someone or something at the vehicle's destination could be the target.

6. What route was to be followed on the next trip? The route to be taken could have areas where a device could be planted to be activated by the vehicle running over it or command detonated at a certain spot. The roadway could have rough spots, pot holes, etc. that could severely jar or bounce the car, flexing shock absorbers or suspension springs; or steep grades or sharp turns which would cause the vehicle to change it's normally level attitude; or routes through mountainous terrain during which atmospheric changes or temperature changes could occur.

7. When, where and by whom was the vehicle last worked on and/or inspected by a mechanic, driver or inspector? Just because no one has had access to the vehicle in the past 24 hours does not preclude the use of a timing delay mechanism in the device.

8. When, where and why were the fuel tank, crankcase, transmission, brake fluid and radiator levels checked and topped off? Chemicals or devices could be introduced into these tanks and components during a "routine" check.

Area Around Vehicle

Look for evidence of soil tampering, shoe or tire impressions, mud, dirt or snow knocked loose from the underside of the vehicle and impressions in the ground left by a lever or a jack. Look for fresh pieces of broken glass, paper, tape, string, wire and empty packages or bags. Probe for pressure release devices beneath tires. A length of welding rod with a dowel or file handle driven on to one end makes a good probe, Look for pressure plates in front of or to the rear of all four tires. If the ground is dry be especially observant for patches or drops of oil or other automotive fluids on the ground under or near the vehicle. Try to determine by the vehicle tire impressions or fluid droppings under the vehicle whether it may have been moved, any distance, in any direction.

Exterior of Vehicle

Look for any fresh signs of forced entry and for hand or fingerprints around all door, hood, trunk and hatch latches as well as the gas tank cap, hub caps or wheel covers.

Interior of Vehicle

Thoroughly scan the interior of the vehicle through all the windows and windshield. A flashlight should be used to illuminate the front floor up to the fire wall and pedals and switches which may be on the floor.

Underparts

The underside of the vehicle should be examined without moving the vehicle. If there is insufficient clearance to allow a searcher to get under the vehicle, an inspection mirror should be used. Don't skimp on the size of this inspection mirror. A mirror with a surface area of six square feet has been found to be ideal. The underside of the vehicle should be divided into search or scan segments, each portion being carefully examined before the mirror is moved to view another segment. Even the most familiar undercarriage looks unfamiliar when viewed upside down. Start at the front of the vehicle, going from one side to the other and then move rearward - a major portion of car bombs have been found in the engine compartment.

Immobilize Vehicle

Position two jacks at both the front and rear of the vehicle (bumper engagement) or two jacks on each side of the vehicle (jack contact points). Operate all four jacks simultaneously until there is a firm and uniform engagement by each jack--stop at this point! The vehicle should now be stabilized to a degree where it will not cant or tilt when weight is applied to either side.

Remove Wheel Covers

Wheel covers should be pried or pulled off remotely. This can be accomplished by rigging a fulcrum and flat tipped lever operated by a pull line to pry the covers off or by the use of three or more flat tipped hooks on the end of a pull line.

Access to Engine Compartment

The hood should be unlatched and raised remotely. If the primary latch can be disengaged from the outside the vehicle, it should be done by the use of a hook on a pull line. If this latch is operated from inside the vehicle, entry must be gained to the interior through the door on the driver's side. (See - Access to Interior). The latch release mechanism can then be operated by a directly attached pull line or an improvised lever set-up. With the primary latch disengaged the hood will now spring up to be engaged by the secondary or safety latch. The engine compartment should be examined around the partly open hood using a flashlight and a thin strip of plastic to sweep for pull wires attached to the hood. Nylon tape should now be attached to each side of the hood, or the tape can be placed completely over the hood from side to side, sticky side up across the hood and then twisted at both ends so the sticky side can be attached to the fenders on both sides. A pull line should now be tied to one or both ends of the tape. A small amount of slack should be left in the tape to allow the hood to raise a fraction of an inch when the safety latch is disengaged to insure that the latch stays disengaged. The safety latch should now be disengaged and the hood, because of the hood counterbalance spring system, will move up slightly against the restraint of the tape. The hood should be blocked open so that it cannot accidentally relatch. At this point the pull line(s) should be pulled, from the opposite side from where it is attached to the tape, peeling the tape off of the fender. The hood will move to its full open position. This means of opening the hood is only one of many methods that have been used.

Disconnect Battery

A bomb in a vehicle can be designed to function when an electrical component in the vehicle is activated. Thus the power supply must be disconnected. But there is a possibility that collapsing power supply could also trigger the device. Disconnecting the battery must therefore be done remotely.

1. At ground - Attach one clamp of a jumper cable to the battery ground cable at the ground point and the other end to a suitable ground. Disconnect the battery ground cable, with the jumper cable attached, from the battery ground point. Use a pull line to disconnect the jumper cable clamp from the ground it is clamped onto.

2. At battery post - Loosen one cable clamp at a battery post. Keep a good contact between the loosened clamp

by inserting a nail between the clamp and post. Work the clamp up the post slightly and hook the forked end (spike puller) of a pinch bar under the clamp. Attach a pull line to the upright end of the pinch bar. From a safe distance apply a smooth steady pull on the line until the clamp clears the post. These are only two tested means of disconnecting the battery. Other methods may be more appropriate depending on the make and model of the vehicle.

Access to Interior

Opening the vehicles doors, hatch or tailgate could activate a device, consequently these actions must be performed remotely. Initial access should be gained through the entry farthest from the expected or normal location of the target individual.

1. Push button latch - a lever can be constructed from a 16-inch screwdriver and a strong (20 to 30 pound pull) horseshoe magnet. The screwdriver handle must be modified so the magnet can straddle the handle, and attach to the car door. The flat side of the tip of the screwdriver is placed against the push button and the magnet, which acts as a fulcrum, is attached to the car door. A pull line attached to a screw eye in the end of the screw driver handle allows the operator to function the lever remotely. Pulling the handle end of the screwdriver outward forces the tip of the blade in against the push button unlatching the door, continual pulling pulls the door open. Another method is to tape the shank of a screwdriver onto the door handle with the blade taped to the button, Pulling on the handle forces the button in.

2. Pull latch - Most pull latches can be operated by a flat tipped, padded gang hook taped to the door handle and attached to a pull line. In some cases an improvised lever system must be used.

Remove Rear Seat

Most rear seats are removed from the seat bed by lifting up and pulling forward on the seat. Two grapple hooks attached to pull lines are required. Hook a grapple hook under the left and right front corners of the seat. The rear windows are then cranked down slightly and a line is passed out each window. Pull on both of these lines simultaneously from the rear of the car.

Gain Access to Trunk

Attach one end of a length of nylon tape to the trunk lid and the other end to the bumper or body. There should be about an inch of slack in this tape between the lid and the body. Attach a pull line to the tape at this slack point. Unlock the trunk lock. In most instances turning the key withdraws the lock bolt and allows the lid to disengage and the trunk lid, because of counter balance springs, will move upward, and the nylon tape will restrain it at this point. The interior of the trunk should now be examined around the partly opened lid using a flashlight and a thin strip of plastic to sweep for pull wires attached to the lid. The pull line can now be used to remove the tape and the lid will rise of its own accord. Keys may be turned remotely by gripping the bow with a vise-jaw pliers and using a pull line.

Move the Vehicle

Disengage all of the jacks carefully. Attach a tow cable to the vehicle and tow the vehicle a sufficient distance to insure the wheels and drive shaft make a number of revolutions. This may function any device attached to the wheels or drive shaft. Lock or otherwise immobilize the steering wheel. Place portable ramps in front of or to the rear of both wheels on one side. Tow the vehicle up onto these ramps. Repeat this procedure with the ramps on the opposite side. Raise both front wheels by the use of the ramps and repeat with the rear wheels. This side to side and front to rear tilting may activate a device triggered by a tilt or antimovement switch.

Start the Engine

Remove the battery from the engine compartment and move it a safe distance from the vehicle. Using the necessary number of booster cables hook the battery up again, making the hook-up to the battery last. A collapsing circuit switch may have partly armed a device which would function when electrical power was supplied again. Clamp a pair of vice jaw pliers onto the ignition key and insert the key into the ignition switch. Attach a pull line to the pliers. Depending on the vehicle, it may be necessary to pump the accelerator prior to starting the engine. It may also be necessary to place a weight on the accelerator to depress it slightly, this again depends on the vehicle. Turn the ignition key on with the pull line to start the engine. Allow the engine to run until normal operating temperatures are reached. In most cases the buttons, switches and levers on the dashboard which operate the lights, horn, air-conditioning, heater, power seats, windows, radio or tape deck, vents, etc. can be pushed, pulled or turned with remote lines or improvised levers. All of these components should be checked remotely for operability.

Check the Fuel Tank

Checking the tank interior can be a most difficult operation because access to the interior of modern gas tanks is thwarted by baffles etc., in the filler tube. If there is a strong possibility that a device has been placed in the tank through the filler pipe, attempts should be made to "fish" it out of the pipe. If the device is believed to be gelatin capsules filled with a chemical that reacts violently with water then the tank should be removed. If a gelatin capsule has been used the delay time can be as short as 20 minutes at an ambient temperature of 26° C. (77° F.). The delay increases as the temperature drops.

No attempt has been made to point out the hundreds of places that a bomb can be placed. The trained bomb specialist or technician knows where to look—which quite literally means-everyplace.

VEHICLE SEARCH CHECKLIST
(Not RV or Mobile home)

TYPE:
Make Model Body type Doors Year

LICENSE NO.: State:

VEHICLE LOCATION:
Describe here. Sketch on reverse.

TARGET LOCATION IN VEHICLE:

DATE: DAY: TIME:

1.________________Background information from owner/driver

2.________________Check of area around vehicle

3.________________Hands off exterior scan

_____________For forced entry

_____________Finger or hand prints

4._______________Hands off interior scan

_____________Seats

_____________Floor

_____________Door pockets

_____________Sun visors

5._______________Underparts

_____________Left front engine compartment and suspension

_____________Right front engine compartment and suspension

_____________Left rear engine compartment

_____________Right rear engine compartment

_____________Transmission

_____________Drive shaft

_____________Emission control system

_____________Muffler, resonator, tail pipe

VEHICLE SEARCH CHECKLIST
(Not RV or Mobile home)
(Continued)

__________________Differential

__________________Rear axle and suspension

6. _________________________Immobilize vehicle

7. _________________________Remove wheel covers-remotely

8. Raise hood—remotely

__________Check at safety catch level

____ _____Check entire compartment

__________Take samples of all fluids for analysis

9. ________________________Disconnect battery—remotely

10. ________________________Gain access to interior—remotely

11. ________________________Remove rear seat—remotely

12. ________________________Gain access to trunk--remotely

_________Check entire trunk area

13. ________________________Move vehicle—remotely

14. ________________________Start the engine—remotely

_________Operate horn, lights, brakes, heater, air conditioner, power seats, radio/tapes, CB, etc.

15. Check fuel tank

Signature of person in charge

Signature of assistant

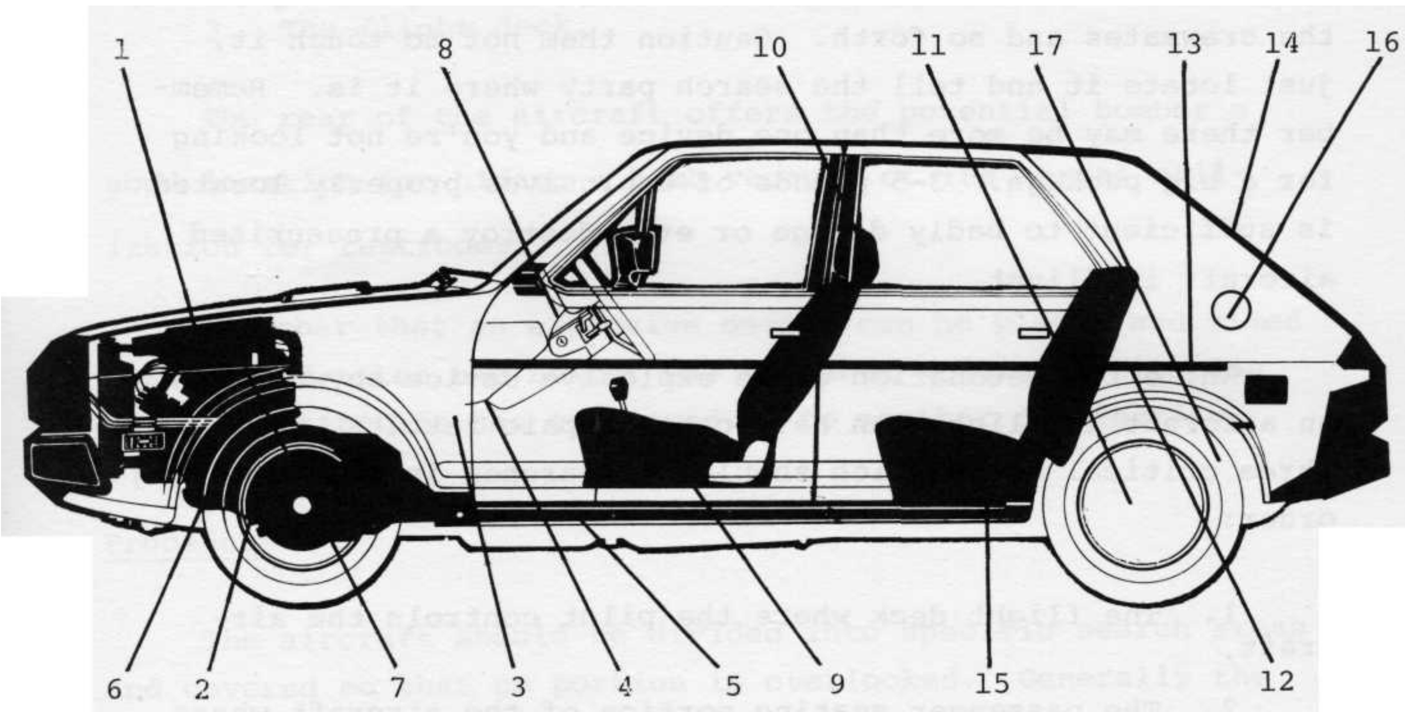
Time search started________________Time search completed

IF NO DEVICE OR EXPLOSIVES WERE FOUND - DO NOT INFORM ANYONE THAT THERE WAS NO DEVICE OR EXPLOSIVES IN THE VEHICLE. SIMPLY STATE THAT NO DEVICE OR EXPLOSIVES WERE FOUND IN THE VEHICLE.

POSSIBLE LOCATIONS OF

AUTOMOBILE BOMBS

1. On engine block - wired to coil and ground (Elec.).
2. On suspension - connected to hood latch (Pull-Elec.).
3. On fire wall - wired to starter and ground (Elec.).
4. Under dash - connected to mouse trap under accelerator (Press)
5. Under transmission - wired to coil and ground (Elec.).
6. On steering gear box - connected to tie rod (Pull-Elec).
7. On manifold - thermostat switch on manifold (Thermo-Elec.).
8. Glove compartment - connected to door (Pull-Elec).
9. Under driver's seat (Pressure-Elec).
10. Against right rear door - tilt switch (Tilt-Elec)
11. On differential - connected to wheel lug nut (Pull-Elec).
12. Attached to shock absorber - flash cube (Elec).
13. In trunk over gas tank (Time-Elec.).
14. In trunk - connected to lid (Pull-Elec).
15. Incendiary under back seat (Chemical).
16. Incendiary in gas tank filler pipe (Chemical).
17. Under right rear wheel - charge under gas tank (Press-Elec).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CHAPTER VI
AIRCRAFT SEARCH

Prior to entering the aircraft to search, enlist the help of a crew familiar with the aircraft, or better still one that has been working that flight if they are available. Go through the aircraft and look for anything that is out of place, unusual, not there before, doesn't belong to any of the crewmates and so forth. Caution them not to touch it, just locate it and tell the search party where it is. Remember there may be more than one device and you're not looking for a big package. 3-5 pounds of explosives properly located is sufficient to badly damage or even destroy a pressurized aircraft in flight.

While the detonation of an explosive device anywhere on an aircraft in flight can have catastrophic results, there are three critical areas which should be searched in the following order:

1. The flight deck where the pilot controls the aircraft.

2. The passenger seating portion of the aircraft where the seating is over the fuel cells. This is normally under the passenger floor opposite the aircraft wings.

3. The rear of the aircraft which contains restrooms and storage closets and on most aircrafts--other than wide bodies—side galleys.

No matter how much redundancy is built into an aircraft with the dual controls it all comes together in the nose and tail where the various control systems are located. The loss of the control systems through an explosion in these areas therefore can be critical. An explosive device placed either in or under a seat in the portion of an aircraft over the fuel cells could detonate down through the passenger floor and into the fuel cells thereby causing a fire or detonation that would cause the loss of the aircraft. When time is a factor these areas should be searched first in the following order:

1. The rear of aircraft.
2. The passenger seating over the fuel cells.
3. The flight deck.

The rear of the aircraft offers the potential bomber a good location for hiding a bomb vecause of its normal utilization for restrooms.

Remember that an explosive device can be placed and timed to go off after the bomber has deplaned at his destination and the aircraft has continued on to another destination.

Procedure

The aircraft should be divided into specific search areas and covered so that no portion is overlooked. Generally the aircraft might be considered as having two separate and distinct search areas, inside search pattern and outside search pattern. We will go over each separately and in detail.

Unless the potential bomber is an employee of the airline, the airport, a catering service or employed by some other legitimate company servicing the airport his opportunities for planting a bomb are better inside the aircraft as a passenger than outside on the flight line where he might be observed. With this in mind we will cover the inside search pattern first, We must remember that there is always a possibility that the bomb has been placed in check baggage and was not found during the pre-boarding spot check of check baggage conducted as part of airport security programs for some airlines. All checked baggage is not examined every time at all airports within the continental limits of the United States. All checked baggage therefore will have to be offloaded and examined one at a time by physical hand search. Detection devices for finding explosives and/or bomb dogs should be used when available.

Inside Aircraft Search

The inside of the aircraft should be generally divided into five areas for search.

1. Flight deck
2. The passenger compartment
3. The galleys
4. The restrooms
5. The baggage storage areas

Those areas which are generally available to the passengers should be searched first in the following recommended order:

1. Restrooms (rear ones first)
2. Passenger seating areas
3. Baggage or coat storage areas in the main portion of the aircraft available to the flying passengers
4. Galleys
5. Flight deck. Although the flight deck is listed last this is not because it is not vital, but because there is more official traffic here and it would be more difficult to place a device in this area without being discovered.

Restrooms

Search everywhere—in the towel racks, behind the drawers, under the sink, behind any inspection panels (a screwdriver is most useful as most inspection panels are held in place with press and turn or release spring screws).
Look in the overhead, take the drawers out and look inside/under the counter with a flashlight, feeling in those areas which one cannot see into. A sticky bomb can be attached anywhere. Don't forget the waste disposal container; check among the used towels and so forth.

Passenger Compartment

Check under the passenger seats, in the seats, in the backing, in the flotation cushions which are normally part of the lower portion of each seat, in the overhead storage racks, and in the storage areas designed for lifeboats and emergency equipment normally found in the ceiling. Check the first aid kits, boxes supposedly containing emergency rations, and flashlights or signaling devices. Check coat pockets and handbags, hat boxes, cigar boxes; if it's there check it.

Inside Passenger Baggage Areas

Check garment bags inside of the hanging clothing section, the pocket shaving kits, and inside shoes, briefcases, suit-cases; take nothing for granted.

Food Galleys

Search this area carefully as there are numerous metal food and beverage containers to check in addition to the cabinets and cupboards in the galley itself. Check the emergency slide bundle on the galley door (don't forget those on the other doors). Always remember that the bomb you're looking for doesn't have to be any larger than a three to five pounder to take the aircraft out of the sky. Many food containers have a shelf inside on the top or bottom which is used to hold dry ice. It is narrower than those shelves on which the food trays are placed. The dry ice packages are slipped into these areas to protect the freshness of the food. Pull these giant ice packages out and look behind them. Plastic explosives and dynamite will fit nicely therein. This an easily overlooked area the flight stewardesses do not normally bother with.

Flight Deck Including the Electrical Bay

This is the brain, the very nervous system of the aircraft and should be checked thoroughly. Again check behind inspection panels, in flight bags, first aid kits, seating, thermos jugs and so forth. Many aircrafts have a trap door in the flight deck which leads down a service ladder into the electrical bay. Check the packages here, tools, cigar boxes, thermos bottles. Look for taped repairs and determine if anything has been added: an extra wire that looks out of place, or a bulge in the wrapping on certain equipment (a thermite time pencil could raise hell in such a location).

Outside the Craft Search Wheel Wells

Start with all wheel wells and check thoroughly. It will be necessary to get up into the wheel wells of larger aircraft. Look for sticky bombs, magnetically held packages, tool boxes and so forth. Anything that doesn't look like it belongs there. Unless our bomber is ground crew he wouldn't have much time. Have ground mechanics who work the aircraft describe what should be up in the wheel well. Have a volunteer familiar with the aircraft check for anything that should not be there.

Direct the volunteer to tell you where it is, leaving it undisturbed.

Inspection and Service Panels

Open all inspection and service panels. A screwdriver will assist considerably with depression turn or release spring screws. Some aircraft use recessed handles which pull out and turn to open.

Engines

Look for foreign objects in turbos. The bomber might not use explosives. Anything that can be sucked into the engine will really chew up the insides.

Baggage Compartments

Most aircrafts have containerized storage pods. They must be offloaded. Check inside the aircraft carefully, looking for indications of lining having been removed. Check inside inspection and maintenance panels. Feel carefully in those areas you cannot physically look into. Check under the shelves.

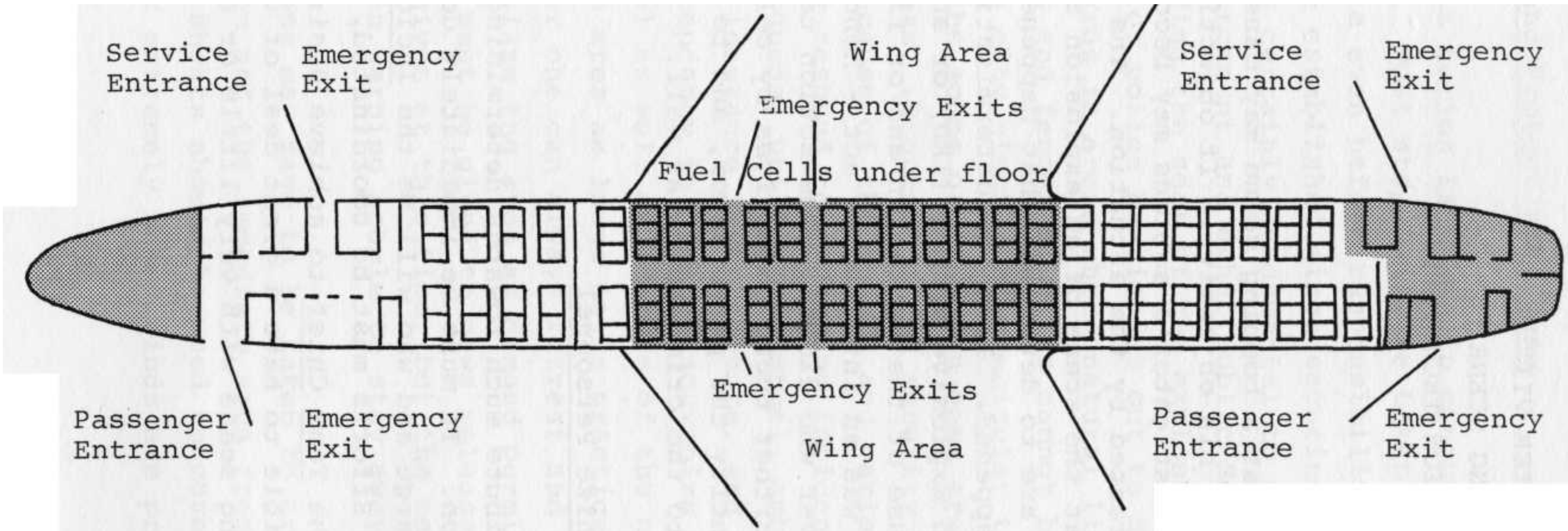
Once the baggage has been unloaded from the containers check the containers themselves in addition to the luggage and packages.

Remember you are not looking for a big package. A cigar box sized device will do a lot of damage in a pressurized and confined area.

LEAST RISK BOMB LOCATION

In 1978 the FAA conducted a series of tests to determine the best (least risk) location in a modern transport aircraft for the crew to place a bomb discovered in-flight. According to FAA officials, findings indicated "that there is every likelihood that an aircraft can be landed safely and that injuries to passengers will be minimal in the event of an in-flight explosion, provided the flight crew follows the procedures now being developed for handling explosives discovered aboard an airline." See table below for least risk locations of various aircraft.

DC-8	Right Rear Galley Service Door
DC-9	Tail Cone - as far up on cone as possible
DC-10	With lower galley - on Galley Service Door Without - Left or Right Rear Passenger Door
L-1011	On Galley Service Door under Passenger Floor
B-707	Left Rear Passenger Door or Right Rear Galley Service Door
B-727	Mid-Galley Service Door
B-737	Left Rear Passenger Door or Right Rear Galley Service Door
B-747	Left or Right Rear Passenger Door



Three critical areas which should be searched with particular care due to their critical performance factors in relation to the aircraft.

CHAPTER VII
BOMBING SCENE
INVESTIGATION TECHNIQUES

Investigative Objectives

The chaos and confusion at a bombing scene may cause the investigator to lose sight of his objective. If objectives are not established, the investigator's actions may become reactions to the pressures created by the situation. The objectives of the investigator at the scene of an explosion after properly securing the area are to determine what happened, and secondly, how and why it happened. If these determinations indicate that an Improvised Explosive Device (IED) or an incendiary device was the cause of the explosion and/or fire, then it is assumed that it was an intentional act - hence, the next objective is to discover who did it. The action taken at the scene will, ideally, further these objectives by collecting sufficient evidence to identify the perpetrator, and to link the individual or individuals to the crime scene as well.

Establish Control and Organize Personnel

This phase will contribute much towards determining the success of the investigation. It must be immediately determined what agency is in charge and who will be the Incident Investigation Team Chief. Efforts must be coordinated, controlled, and directed by the Team Chief to achieve desired results. It is quite possible to have a great deal of unorganized activity at the bombing scene with very little or no actual accomplishment.

Secure and Protect the Scene

This action is taken in conjunction with establishing control. Most steps will be taken as a normal investigative procedure even before responsibility for control of the scene has been established since securing and protecting a crime scene is certainly fundamental to all searches conducted by Law Enforcement and other Public Safety officials. The area surrounding the seat of the explosion should be cordoned off by rope or police barricades out to distances ranging from fifty yards in areas where natural lines of demarcation such as roads and fences or walls cannot be crossed over, to as far as a city block where vehicular traffic can be detoured around the scene or if an an open area, out to as far as 300 meters. Protection and security of the scene is complicated because of the number and variety of agencies which normally respond to a bombing incident; this includes firemen, rescue squads, utility personnel, ambulance drivers, property owners, insurance investigators, and ordinary sightseers (who have a tendency to pick up souvenirs which may be valuable evidence) as well as members of the news media. With this in mind, an area as large as is practical should be secured at the onset for one can always retreat and establish new boundaries to normalize the area as demand permits. At this point some thought must be given to news releases - not much information can be given at this time, but the media can be requested to assist in warning people to stay away from the scene.

Steps may have to be taken to protect the seat of the explosion and the immediate area from the elements. Tarps or plastic sheets should be used to cover these areas if rain, snow, or extremely heavy winds are predicted or actually occurring.

Safety At and Around the Scene

Practically everyone at a bombing scene has a desire to go to the seat of the explosion. Unless there are victims inside, or some other compelling reason to enter the inside area, personnel responding to the scene should refrain from entering and prevent others from doing so until given permission to do so by the Team Chief.

A bombing scene is an extremely unsafe area, to those immediately involved in the investigation and to other individuals who have a legitimate (or not too legitimate) reason for being at the scene. There is always the possibility that one or more IEDs may still be present in the area; or that unconsumed explosives may be in the still smoldering debris; downed power lines, and fractured gas and water mains are a hazard; structural damage to the building which may cause subsequent collapse of portions of the building must be considered. The Team Chief must insure at this point that all utilities such as gas, electricity, water, etc. be properly disconnected or shut off by persons authorized or properly trained to do so. No one should enter the area around the seat of the explosion until the Team Chief has declared the area safe enough to start the investigative procedures.

Organizing Scene Search

The success of any scene search rests mainly on control of the scene. Like so many crimes that occur in public, confusion can adversely effect the efforts of the investigator. Bombing incidents are usually well noted by the general public which present certain problems to the Interview Teams. In addition, because of the damage done at the scene, the group that gathers may be apprehensive, insecure, hostile, and somewhat more unruly than crowds which normally gather at incident sites such as bank robberies, automobile accidents, or street homicides. The number of people with vested interest in the bombing scene, as previously mentioned, will also be milling about trying to do their thing. Confusion may also be precipitated by news coverage and the number of other law enforcement and public safety officials responding to the scene. The investigator cannot eliminate the causes of confusion but when the investigative operation is properly organized this will eliminate the deleterious effects of confusion. The Team Chief is responsible for news releases.

The Team Chief must assign specific tasks to his men as they arrive at the scene. Certain tasks must be accomplished and they will be assigned to those men who have the skills to execute the task. There must be:

1. Seat Search Team (referred to as the inside team)
2. Perimeter Search Team (referred to as the outside team)
3. Interview Teams - Inside and Outside
4. Photographic/Sketch Team
5. Evidence Team

Note: The inside team could cover the seat of the explosion out to 50 yards; the outside team from the established perimeter inward.

The Team Chief will also insure that certain equipment is available. There must be:

1. Safety equipment, hard hats, safety shoes, flashlights, etc.

2. Scene search equipment, rubber or plastic gloves, shovels, sifting screens, magnets, etc.

3. Evidence gathering and packaging equipment to include clean, unused, wide brushes.

4. Cameras, sketch pads, tape measures, etc.

5. Communications equipment - between teams.

6. Security equipment such as tarps, spotlights, identification and warning signs, etc.

7. Tape recorders for interviews with witnesses.

Command Post

A command post should be set up at the time the search is being organized. The first input should be the compilation of available information from those who are already at the scene. As more investigators arrive, the control and coordination function becomes more critical. If several agencies are involved, it may not be possible to maintain a single unified command of all activities. It is, however, essential that the functions of the various agencies be coordinated. The command post is where information is mutually exchanged so that each participating agency is aware of each other's activities. An outside team interviewer may have discovered something of importance to the Seat Team; the Photographic Team may see something that the sketch artist can put on paper in more detail; the sketch artist may see something that the Photographic Team can film in greater detail; an IED technician can make his expertise available to both search teams to suggest that the type and composition of the device, indicating what they should keep an eye out for. The Command Post should be located in an area which is readily accessible to the bombing scene without being so close that its presence would cause undue traffic through or close to the site of the explosion which would of course destroy or contaminate valuable evidence. Questions as to the progress of the investigation will all be funneled into the Command Post, especially questions from the news media. The Team Leader will keep his teams, the news media, and members of other investigative agencies informed of progress which will relieve boredom and boost the morale of all the personnel involved.

Organizing the Team Effort

A systematic approach must be used. Specific areas must be assigned to each team. Personnel on the Seat Search Team should not wander out into the area assigned to the Perimeter Search Team and pick up debris. They could contaminate these items due to the fact that they may have already handled items at the seat of the explosion which were contaminated with explosive residue. It is expected of course, that all search team personnel will be wearing plastic or rubber gloves. The Photographic Team should systematically cover all the area and if there is more than one team available, they should determine who is to work in the different areas. Items which could be bomb components or items that are to be secured as evidence should be photographed, if possible, before they are moved. In this particular respect, the artist who is making sketches of the scene should place on an initial overall sketch of the scene, the location of these items. These items on this initial sketch will later be identified with the aid of the Evidence Team as to what they are and their location by a number or letter call-out or keying system. The sketch artist should procure, if possible, architects or engineer blueprints of the building and area so that he can transfer the initial item and location data to this more accurate detail drawing of the scene - everything should be related to the seat of the explosion by distances and direction in feet or inches (or centimeters). Interview Teams should agree between themselves who is going to be interviewed by which team so as not to irritate the witnesses with having to answer the same questions asked by different team members over and over again. Probably the most important team is the Evidence Team, who are responsible for tagging, packaging, and preserving evidence to insure chain of custody of items removed from the scene and to avoid contamination of various items. This is of course basic to all investigations involving crime scenes.

Individual Team Procedures

a. Seat Search Team - After the blast area has been declared safe to enter, this team determines the location of the seat of the explosion. It is always a good procedure to have someone with them who is familiar with the layout of the area, such as the owner, tenant, a building custodian or security personnel, etc. Without touching anything, the team members survey the site; this close survey holds true whether the blast is inside or outside of a building or some other structure. Pictures are taken and sketches are made. The team members then proceed to move large movable items away from the seat of the explosion placing them in an examination and evidence tagging area located a reasonably short distance away from the site. All of these items should be placed on a tarp, drop cloths, or large sheets of plastic so as not to contaminate any of the ground or area around the blast site. Smaller pieces of debris are placed in large plastic bags and placed in the examination area. Portions of the building itself such as pieces of wall, ceiling, floor, doors, window frames, glass, etc. will also be removed with judicious care. If a Forensic Laboratory member is available at the scene, his advice should be sought as to which pieces of structure might be reasonably expected to be contaminated with the explosive compound residue. Fixtures such as overhead lighting fixtures, wall switches, sink, or other bathroom fixtures, wall switches, sink, or other bathroom fixtures, heating or air conditioning ducts, etc. should be removed or if that isn't feasible, generous swabbings should be take Each swab is placed in a small screw cap glass vial and suitably labeled as to what it came from and where the item was located. After these larger pieces have been removed from the immediate blast site area, a very careful sweep-up is carried out, debris on ceiling, walls, built-in-book cases, fireplace mantelpiece, counter tops, etc. are carefully swept, with soft brushes, into suitable, clean unused containers. The floor is then carefully swept and all of this fine debris is picked up by dustpans and carefully placed in a suitable container. The arduous and time consuming task of sifting this dirt, dust and fine debris begins. The sifting screens should at least be as small as 20 mesh (ordinary window-screen). They should be supported at least waist high and be large enough so that at least four men can conduct sifting and examination operations together. This sifting should be well away and down-wind from the examination and evidence tagging area where the other items removed from the site have been gathered. This sifting of small debris is extremely important for it is during this operation that portions of the explosive device may be found. Small bar magnets should be passed over the sifting screens during sifting operations to pick up small bits of metal which could be parts of the IED. The larger items which are to be examined later are of value to the laboratory chemist. They will be swabbed and packaged for analysis in order to determine the type of explosive used. Portions of the explosive device, found by sifting operations, can also be identified and provide investigative leads after being examined by IED techniques. If it is necessary that portions of the structure be moved, do so but don't bulldoze it all in to a pile 20 feet away. The Incident Investigation Team Chief should have for consultation, if available, a member of a Forensic Lab and an IED design technician.

These men will initially work with the Seat Search Team but should be available to all the other Teams as needed. Communication should be maintained between the Team Chief and the Seat Search Team and the Perimeter Search Team at all times. If the seat of the explosion was outside of a structure - in an open area, such as a lawn, parking lot, driveway, road, etc. - samples of soil or sweepings should be taken the blast hole and also from a similar area 20 to 30 meters away. This allows a basis for laboratory comparison. An ordinary garden bulb planter can be used to lift plugs of soil from both areas - if in open ground - and can be dropped, untouched into evidence cans and tightly sealed. Labeling of these items is very important, noting especially where the samples were taken. On a hard surface, sweepings should be taken, from the blast site and from another area a short distance away by separate brooms or brushes.

A phenomenon of the detonation of an explosive charge should be noted here. A high explosive can have a detonation rate up to 27,000 feet per second and will develop a blast shock wave traveling approximately 13,000 miles per hour or 9,060 ft. per second (somewhat faster than a speeding bullet). This shock front of compressed air moving away from the explosion is only a fraction of an inch thick and anything in front gets moved. As the shock front moves outward away from the explosion, a vacuum is created behind it. As the surrounding air rushes into this vacuum (which causes the loud noise) a suction or negative pressure phase takes place. Many light objects which are pushed outward by the blast phase are then sucked back in toward the seat of the explosion during this negative pressure phase. Investigators seeing much light weight small debris very close to the seat of the explosion are apt to conclude that only a small explosive charge was used and may try to develop entirely false leads as to what was used and how much.

A necessary fact to consider at all explosions is that fires may be started by the explosion and must be put out by fire department personnel. The breaking up of the building and the hosing down of the area will of course destroy much valuable evidence as pertains to the collection of samples of debris and swabbings. However, if fighting the fire can be concentrated on the structure itself, the Perimeter Team may still be able to collect usable samples of soil and debris for laboratory analysis.

b. Perimeter Team - The area surrounding the explosion site is divided into sections. These sections can be marked out by lines or tapes. The search begins at a point determined by the Team Chief depending on adjacent structures and material barriers surrounding the site. Every square foot of ground must be scanned and anything and everything which could have come from the blast site must be collected and placed in proper evidence containers. Roofs, windowsills, gutters, trees, shrubbery, and storm drains must be carefully searched. As each section is cleared, the lines or tapes can be moved to delineate the boundaries of the next section to be searched. Any number of search patterns can be developed though a pattern starting at the maximum perimeter distance and roughly circular divided into segments like slices of a pie is sure to cover a maximum of surface area - the Strip, Spiral, Grid, or a variation of the Grid, and the Quadrant search pattern, can also be used depending on terrain and obstacles. This large area search is time consuming, boring, and tiresome, and team members should be rotated or changed almost hourly. This search may take one or two days depending on the area. Each item deemed worthy of collecting for later examination should be photographed before removal and should be noted in a sketch with location and distance from the seat of the explosion.

There will be many occasions when a careful perimeter search and an explosion seat search cannot be conducted over a period of several hours. Vehicles and such in a main traffic artery must be picked up and trucked intact to a building such as a warehouse or to a parking lot or open field and thus examined. Here again, the surface upon which these items are placed should be covered by tarps, etc. to avoid contamination by other compounds. Unfortunately, much explosion seat evidence is lost in these cases. It should be noted, at this point, that the Team Chief should formulate plans during the first day of searching for evidence, for personnel to guard the area around the seat of the explosion and critical portions surrounding the seat during the hours of darkness. Floodlights can be used to illuminate the area as an aid to keeping the area under surveillance.

c. Interview Teams - Two teams should be assigned to interview witnesses or possible witnesses - one team near the explosion seat and the other team working inward from the Perimeter Search Team. Ordinary interview techniques familiar to all law enforcement personnel will be employed with some specific questions concerning loudness of explosion, color of smoke, brilliance of flash, peculiar odor, etc.; questions which are compatible to investigating any type of unexplained explosions. As in normal procedures, license plates of all cars in the vicinity should be noted; questions concerning people seen with packages, etc. should naturally be asked. A tape of interviews should be made with permission, of course, of the interviewee. These tapes can later be analyzed by Psychological Stress Evaluator (PSE) techniques. Communications should be maintained with the Team Leader during the conduct of these interviews as needed to keep the Team Leader informed of possible leads. As was noted before, there will be ample people to interview at the scene of an explosion because the curious and sightseers will flock to the scene with only a handful being able to contribute anything of real value to the interviewer.

d. Photographic/Sketch Team - A most important asset for court presentations are good photographs and clear understandable sketches. The still photographer should be one of the first persons free to move around the seat of the explosion after the Team Leader declares it safe to do so. Everything should be photographed at the seat before anything is touched or moved. Every frame shot should be identified, by frame number, in a log either by the photographer or someone assigned to assist him in this recording activity. If another photographer is available, he should be assigned to work with the Perimeter Team. Overall shots should be taken first of the whole area to be covered by the Perimeter Team. Later items deemed of sufficient value to the investigation found by the Perimeter Team, should be photographed before being picked up. Photos from the air are valuable to show extent of damage. Again, a log must be kept of each frame shot. If there is only one photographer available to the investigators, then Perimeter Team activities will have to be delayed until the seat area has been completely photographed. Motion pictures of the area prove invaluable in identifying witnesses, sightseers and others attracted to the incident and may prove helpful in placing the perpetrator at the spot if he is lingering around to admire his handiwork. The motion picture cameraman is just about the first man working along with the Team Leader, if a good record of the immediate scene following the explosion is to be recorded. It must be kept in mind though that a motion picture camera panning the people surrounding the scene at the outset can sweep the area clear of people including possible useful witnesses and guilty parties quicker than a pointed shotgun. The sketch artists should initially rough out interior and exterior sketches of the scene. Before the inside team moves anything, items should be sketched in and identified and their distance from the seat noted on the sketch. Then the artist works with the outside team, indicating the areas as they are searched and noting on the sketch the location of items which are picked up for later examination and their distance from the seat. The primary purpose of the Photographic/Sketch Teams, as in the investigation of all incidents by Law Enforcement agencies, is to preserve for study and verification and perhaps later presentation in court those flighting kaleidoscopic scenes encountered at a scene of mass confusion for which the mind is unable to cope and recall at some future date.

e. Evidence Team - Ideally, evidence collected at the scene should be identified and packaged by as few individuals as possible. Consideration of the chain of custody is often overlooked during the confusion which normally accompanies the investigation of an explosion. This confusion can be further complicated by the number of searchers and different agencies involved. It is absolutely amazing as to the number of different ways that Public Safety Officials, at all levels of command, have in collecting, identifying, packaging, and maintaining control of evidence and samples collected at the scene of an explosion. Everything from plastic refrigerator bags and sandwich bags, plastic, glass and tin containers - sealable or not, tin foil, shopping bags, newspaper, and even "just some old paper bags picked up at the scene", plastic lawn bags, garbage bags, and Saran Wrap; even garbage and trash cans found at the scene have been used. The contents of these containers are sometimes identified with stick-on labels, grease pencil, and of course, recognized evidence labels of all kinds used by various Law Enforcement agencies. In some cases chain of custody can be noted on these "official tags"; at other times, someone signs a slip of paper, transferring control of

"63 assorted packages of evidence collected at
____________on____________from____________to Mr.____________."

Not hardly too good for presentation in court. The way evidence is collected, packaged, and identified is just as important as what was collected. It also makes the Forensic Laboratory job a lot easier if this Evidence Team does their job right. It is advisable to have one Evidence Team Chief even though there may have to be more than one evidence team operating in the area. A log must show what it is, where it came from, and in some cases, when it was picked up. The log should also refer each item to call-out number or key letters on the Sketch artist drawings of the scene, and if possible to the photographers frame number log. The use of notes on evidence tags and logs will facilitate the establishment of the chain of custody and assist in keeping track of the number of items retained as evidence. Here again, a member of the Forensic Laboratory and a bomb technician should assist in the identification and labeling and advise and assist the Team Leader in determining what absolutely must be kept. The Forensic Chemist from the laboratory should supervise the taking of swabbings from items too large to take to the laboratory. The packaging of samples to be sent to the laboratory must consider the four following points - samples from different areas must not come in contact with each other - this of course includes samples of soil or debris picked up as control samples; inside searchers should not touch anything in the outside search area - it is of course advisable, as noted before, that the searchers wear plastic or rubber gloves; samples and swabbings must be packed in airtight containers; if plastic bags are used, they should be of the self-press sealing bag or a heat sealing instrument should be available, and large items can be packaged in garbage or lawn bags taking care not to poke holes in the bag.

Packaging:

(1) Volatile liquids in sealable, airtight glass containers.

(2) Solids in clean unused paint cans of suitable size - rap the lid on with a block of wood and a hammer - tape the edge of the lid.

(3) Acids in sealable glass vials with screw tops.

(4) Soil in clean unused paint cans of one quart size - rap the lid on with a block of wood and a hammer - tape the lid edge.

(5) Wire and other bomb components (suspected) such as batteries, clockworks, mousetraps, clothespins, switches, in sealable plastic bags and then into one-gallon unusued paint cans - sealed as noted above.

(6) Bulky items - small cardboard boxes up to 3,000 cubic inches (10 x 10 x 30 inches) sealed with nylon tape should be used and then placed in garbage or trash bags. If unusual shaped metal items must be packaged, cover the sharp edges with clean tape before placing in bags to avoid breaking the bags and allowing explosive residue to be compromised.

(7) Swabbings taken with Q-tips or like collecting devices in glass screw top vials and then into clean unused paint cans, sealing instruction as noted above. Most large items that cannot be packaged will be swabbed. The Forensic Laboratory really cannot use doors, window frames, air conditioners, car hoods, trunk decks, tile walls, concrete blocks, counter tops, etc., but can accept pillows, carpeting, drapes, sections of floor and wall panels, the suspect's clothing, etc. Use good judgment and the advice of the Forensic chemist at the scene as to what should be packaged. But most important of all--keep track of everything--keep a good labeling and logging system. It is not necessary here to discuss clothing samples or automobile samples, these are covered by contemporary investigative procedures.

The main thing that the Evidence Team must keep in mind is the identification and separation of samples to maintain evidential integrity and to avoid contamination and/or the loss of contamination.

Laboratory Criteria in Packaging and Shipping Samples for Laboratory Examination

Several problem areas involving the collection and submission of evidence for examination by Forensic Laboratories have been identified. These problem areas include proper collection and preservation of evidence, splitting of evidence between laboratories and postal requirements regarding registered or certified mail.

In the area of evidence collection and packaging, two major problems have been encountered: possible cross-contamination of exhibits in bomb cases and loss of possible latent fingerprints in arson and firebomb cases.

When evidence containing known dynamite or dynamite wrappers is submitted, it must be suitably packaged or vapors from the explosive can contaminate any other exhibits in the same container. Dynamite samples or wrappers should be packaged in sealed glass jars or metal cans. If plastic bags must be used, the evidence should be packaged in a separate shipping container from the other items submitted. In general, it is good practice to submit any evidence connecting the suspect with the incident, e.g. clothes, hand swabs, etc., in a box separate from the debris collected at the crime scene. This will preclude any possible contamination of the items from the subject by materials from the crime scene. Other evidence collected at a crime scene should be packaged in a container of suitable size and type for the exhibit, e.g. a few hairs should be placed in a small box or envelope, not in a large plastic bag.

A serious problem is encountered when fingerprint examinations are requested on arson or Molotov cocktail evidence. If the sample is packaged in a vapor tight container to preserve volatile vapors, latent print impressions are rapidly lost. This problem may be surmounted in an instance where an unbroken or partially burned Molotov cocktail is recovered by a modification of the packaging procedure. The bottle should be handled carefully to avoid disturbance of any fingerprint impressions present. The wick portion should be removed and placed in a sealed glass jar or metal can and suitably labeled. Any liquid present in the device should be removed and a small sample, about one ounce, placed in a tightly sealed container. The neck portion of the bottle should be sealed with tape and the bottle placed in a paper bag for shipment to the laboratory. This procedure will lessen loss of latent fingerprint impressions on the bottle.

For other types of debris collected at a fire scene, sealable vapor-tight containers should be used. If the evidence is such that it cannot be placed in cans or jars, e.g. size or shape, it may be packaged in self-sealing plastic bags. The top of the bag should then be sealed with tape to prevent opening in transit. The bag containing the evidence should then be placed inside a second bag similarly sealed. This procedure will reduce the loss of volatile flammable liquids which readily diffuse through thin plastic. Thin plastic bags, e.g. sandwich bags, dry cleaner bags, etc. are virtually useless in arson evidence packaging and should be used only in extreme emergencies. If such plastic is used, several layers should be employed.

Some confusion regarding the proper techniques and materials for the collection and packaging of hand swabs in explosive incidents still remains. Samples for explosive residue should be collected on <u>wooden shafted</u> cotton swabs rather than plastic although plastic swabs will suffice when wooden shafted swabs are unavailable. Acetone is used to wet the swabs for testing purposes. The hand swab samples are collected only from the palm and finger areas of the hands. Each test sample is placed in a labeled small screw cap glass vial. Plastic bags should not be used as explosive vapors are readily lost through the plastic and the samples may be subject to cross-contamination from other items in the same shipping container.

Another major problem area involves requests for laboratory examination of physical evidence when the evidence is submitted to more than one laboratory. The involvement of several laboratories in a single case poses jurisdictional and operational problems and may make effective comparisons between items impossible

When a portion of the evidence in a case has been sent to the laboratory "A" of another agency, City, State or Federal, the letter of transmittal to laboratory "B" should indicate the nature of the other evidence submitted, the examinations requested, and to whom sent.

If re-examination or additional examinations of evidence previously examined by another laboratory are requested, two requirements are imposed. The submitting agency must include with the transmittal letter, or separately submit, a copy of the laboratory report of the previous examiner and a letter authorizing the examination by the second laboratory. This is necessary to avoid possible conflict with the other laboratory and to alert the second laboratory to any changes which may have occurred to the evidence as a result of the prior examination.

Postal requirements have recently been tightened to prohibit the attachment of letters on the outside of registered or certified packages. This has been the principal method of submission of evidence to many laboratories and has posed some problems. The submitter should utilize three copies of the letter of transmittal. One copy is placed on the inside of the evidence container, a second copy is affixed to the outside of the sealed container but under the outer wrapping. This allows the evidence technician to properly receive and log the case without the necessity of opening the sealed container. A third copy submitted separately will serve to notify the laboratory that evidence is being submitted and should it not be received in a reasonable time, the submitter can be alerted.

Conclusion

As far as the men on the scene are concerned, picking up, screening, locating, and getting first hand reports of what has happened is their main concern. Reconstructing the before-blast-layout is nice but to a good team, not essential except to perhaps assist the bomb technician to determine the size of the explosive charge. Sifting and sifting may produce results as far as bomb components are concerned but unless a bomb technician is present to examine the siftings at the scene or at a Forensic Laboratory, more than one sifting is a waste of time. The bomb scene is much like a jigsaw puzzle--but it can't be put together at the scene. When the laboratory finds out what the explosive charge was; when the technician determines what it was made of; when the interviews bring some leads; when the photographs give a clue as to the charge; and when the interviews are analyzed, a picture might start to emerge.

CHAPTER VIII

BLAST, PRESSURE EFFECTS

The purpose of this information is to provide Public Safety Officials with a general understanding of the effects and hazards associated with the explosion of an Improvised Explosive Device (IED). It will also enable the determinations of peak blast pressure and its effects upon persons or structures. It includes graphs for use in determining incident pressure, reflected pressure, dynamic pressure, peak wind velocity and shock front velocity for a variety of explosives. The information furnished is based on tests conducted under controlled conditions. When the uncontrolled conditions of an IED incident are encountered the pressure and distance figures given must be considered as approximations, and not absolute pressures or precise minimum distances.

BLAST SHOCK WAVE

Basically, the effects of blast pressure are caused by the blast shock wave, which is a sudden increase and subsequent decrease in air pressure, occurring when an explosive detonates.

The blast shock wave is similar to a sound wave and travels through the air in the same manner. It can be visualized as the outside surface of a ball for an air burst, and the outside surface of a half ball for a surface burst. This layer of compressed air moving outward has an extremely sharp front less than one-thousandth of an inch thick, called a shock front, in which the pressure rises abruptly to a peak pressure. The shock front, the high pressure area behind it, and the following low pressure area, form a complete blast shock wave, as shown in figure 1.

The increased pressure associated with the shock front is normally the primary cause of damage and injury.

The blast shock wave can travel as fast as 13,000 miles per hour (19,060 fps) initially, then slows down and stabilizes at approximately 750 miles per hour. As the blast shock wave travels out from the explosion, its pressures decrease until they finally degenerate into sound waves.

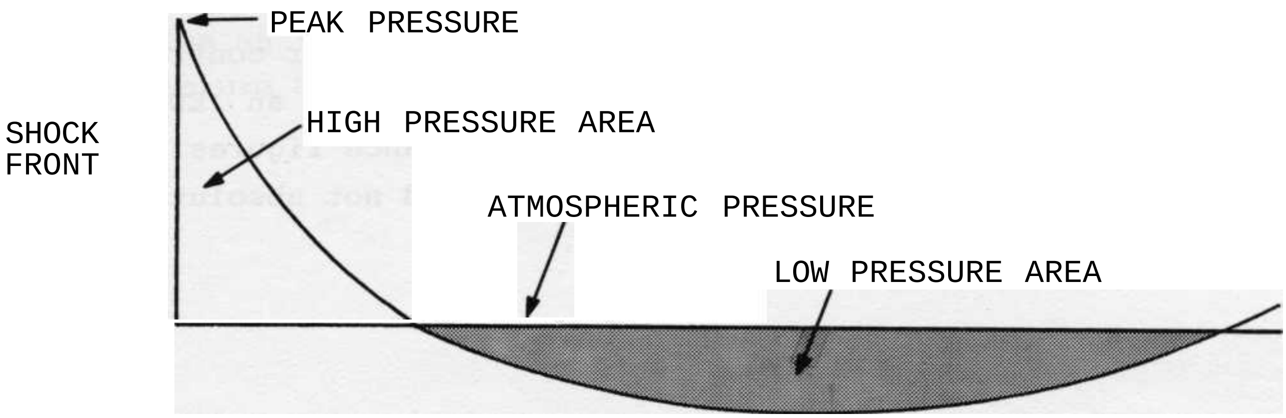


Figure 1. Blast Shock Wave

BLAST PRESSURES AND FRAGMENTATION

An explosion releases energy producing blast pressure. When blast pressure is confined, as in a pipe bomb, it ruptures the pipe and imparts velocity to the resulting fragments. The remainder of the energy then produces the blast shock wave. Both the fragments and the blast pressure can cause serious injury or death.

Blast Pressure

The blast pressure, in the form of a high pressure shock front, moves radially in all directions from the point of the explosion and, like sound waves, will flow over and around a barrier. Also, as the blast wave collides with surfaces, these surfaces reflect and reinforce the initial pressure. All of these characteristics must be considered in providing suitable protection. Following are the types of blast pressures and the conditions under which they are encountered.

Incident pressure

This is the pressure level at right angles (90 degrees) to the direction of travel of the blast shock front. A person seeking shelter behind a barrier, wall, building, etc., which is in the line of travel of a blast shock front, would be exposed to incident pressure. See figure 2.

Dynamic pressure

This is the pressure resulting from the high wind velocity and increased density of the air behind a blast shock front. A person standing in the open, in the line of travel of a blast shock wave, would be exposed to dynamic pressure. Additionally, he would be exposed to incident pressure.

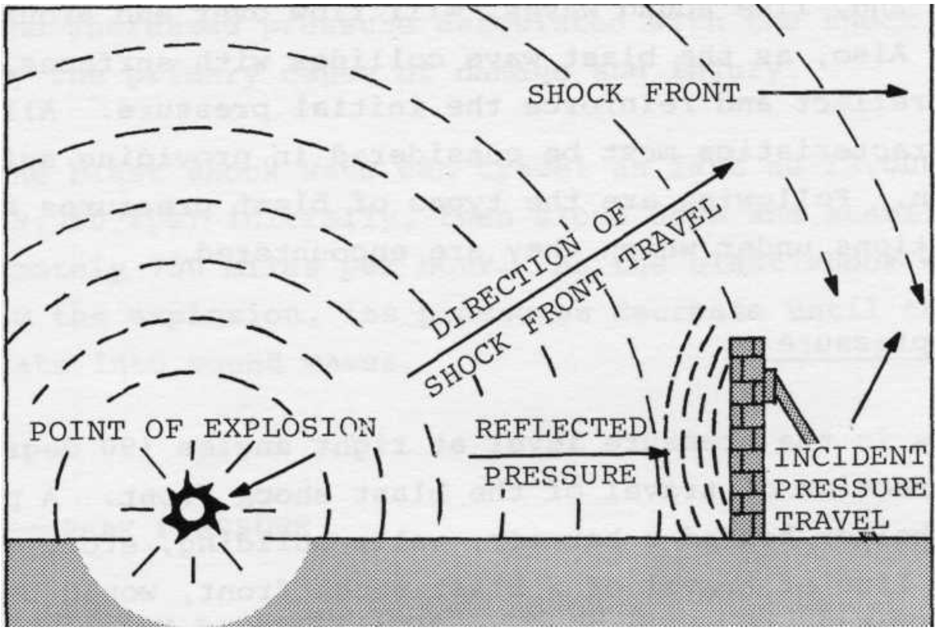
Reflected pressure

This is a rapid build up of pressure that occurs when a shock front strikes a flat surface in its line of travel. A person standing near a barrier or wall facing an explosion would be exposed to reflected pressure. See figure 3.

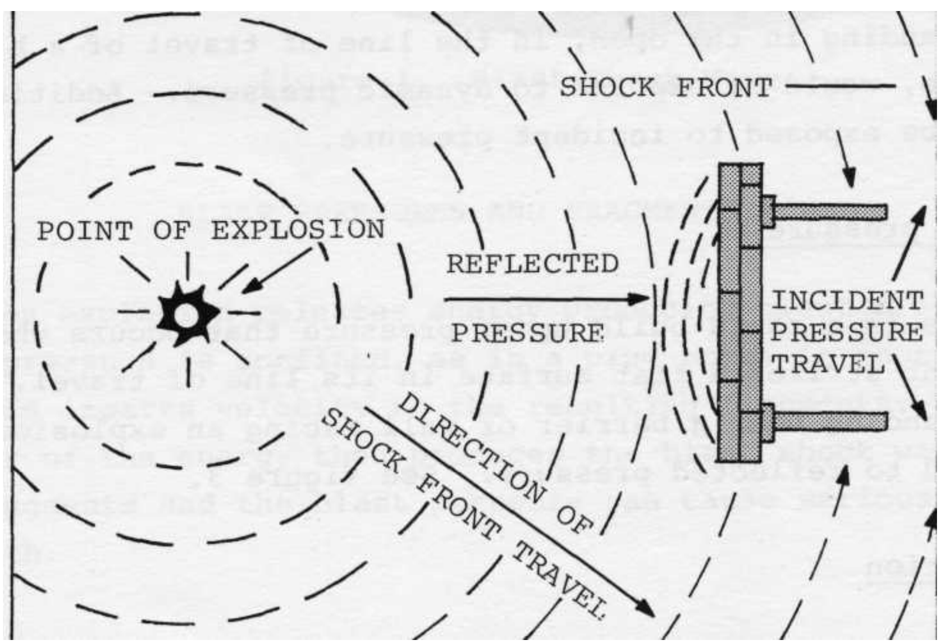
Fragmentation

Primary fragments

These are fragments of the IED container whether it be a

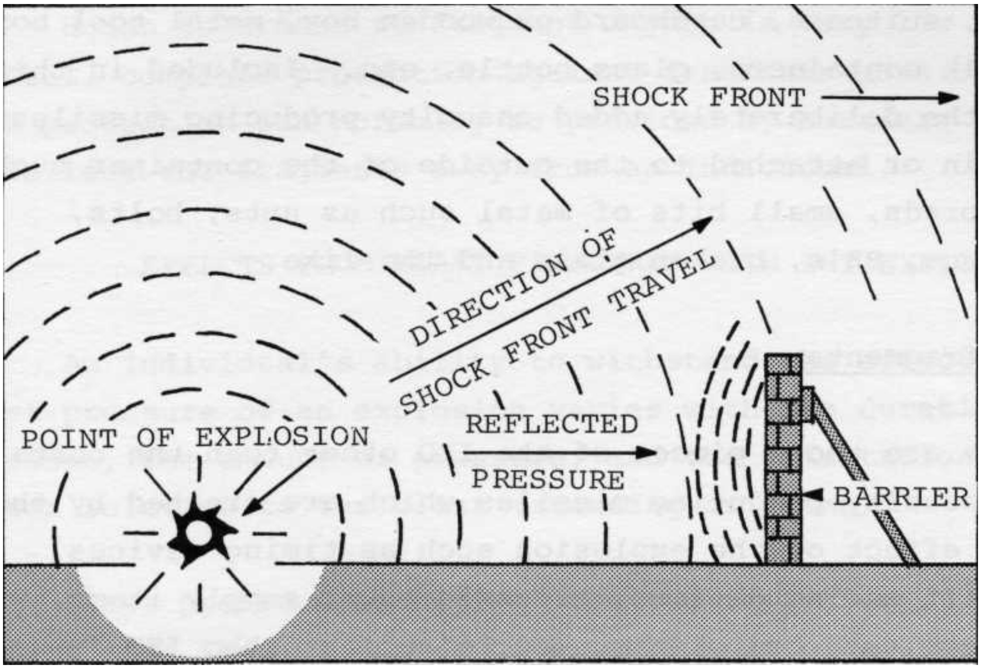


SIDE VIEW

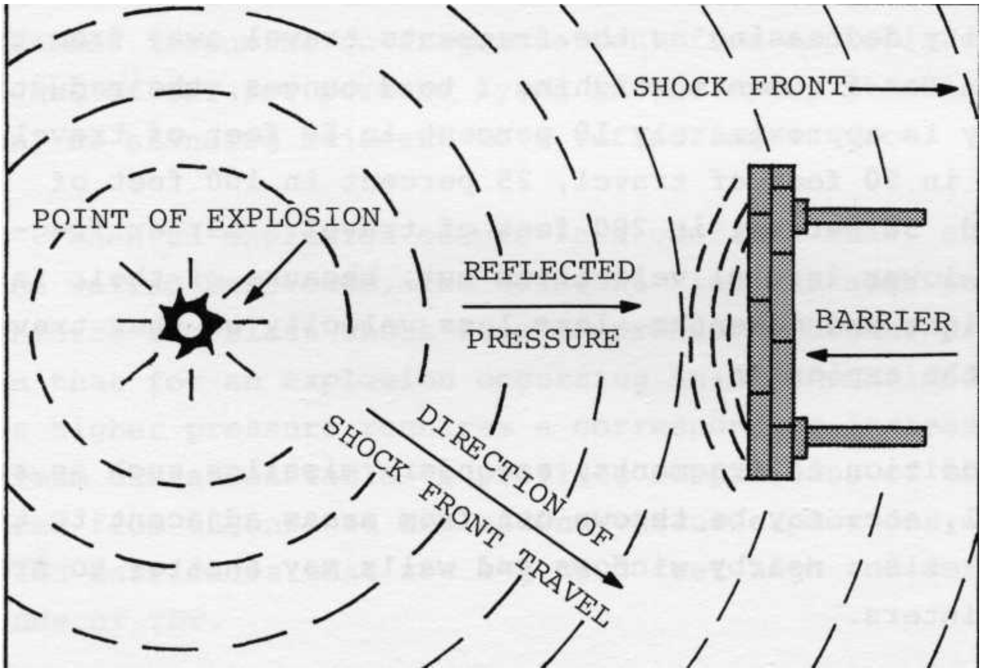


TOP VIEW

Figure 2. Incident Pressure- Side and Top Views



SIDE VIEW



TOP VIEW

Figure 3. Reflected Pressure- Side and Top Views

steel pipe, suitcase, cardboard or wooden box, metal tool box, plastic milk containers, glass bottle, etc. Included in this group are the deliberately added casualty producing missiles assembled in or attached to the outside of the container such as nails and brads, small bits of metal such as nuts, bolts, ball bearings, BB's, broken glass and the like.

Secondary fragments

These are those pieces of the IED other than the container or added casualty-producing missiles which are created by the shattering effect of the explosion such as timing devices, switches, triggering devices, electric power supply items, wire, caps or other such components used to activate the IED.

The initial velocity and size of fragments from an IED depend upon the thickness and construction of the explosive container and the type of explosive used. Initial velocities with TNT explosive can exceed 6,000 miles per hour (8,764 fps), with velocity decreasing as the fragments travel away from the explosion. For fragments weighing 1 to 3 ounces, the reduction in velocity is approximately 10 percent in 20 feet of travel, 15 percent in 50 feet of travel, 25 percent in 100 feet of travel, and 50 percent in 200 feet of travel. Larger fragments have lower initial velocities but, because of their increased weight and momentum, lose less velocity as they travel away from the explosion.

In addition to fragments, secondary missiles such as stones, wood, metal, etc. may be thrown out from areas adjacent to the explosion. Also, nearby windows and walls may shatter to produce flying splinters.

Human tolerance to fragment impact is very low and, in general, complete protection against fragments must be afforded. Such protection can normally be provided by barriers to stop or deflect the fragments away from an individual.

EFFECTS FROM BLAST PRESSURES WITH TNT EXPLOSIVE

An individual's ability to withstand the effects of the blast pressure of an explosion varies with the duration of the pressure, the amount of pressure, and the orientation of the person relative to the blast (standing or prone).

Blast pressure resulting from the explosion of an IED containing less than 50 pounds of explosive is of a short duration (less than one-hundredth of a second). Refer to Table I for short duration pressure effects on unprotected persons; to Table II for the effects of blast pressure upon structures.

Tables III, IV, and V list safety criteria or minimum distances (assuming no fragmentation) from explosions of various weights of TNT for persons lying in the open, standing in the open, or standing adjacent to a reflecting surface.

When an explosion occurs in a confined area, such as a three walled barricade, the adjacent flat surfaces reflect and reinforce the blast shock wave to produce a higher pressure than that for an explosion occurring in an unconfined area. This higher pressure requires a corresponding increase in minimum distances. Table VI provides comparisons of minimum distances from unconfined explosions versus explosions within three walled barricades that are 1-1/2 to 3 feet high and for up to 50 pounds of TNT.

Should an explosion occur in a more confined area such as a room or hallway, the minimum distances would have to be increased. However, no exact distance figures can be given since an infinite variety of situations could be encountered.

A person standing immediately behind a barrier or shield is afforded some protection from the incident pressure of an explosion. Tests have been conducted on flat and curved body shields approximately 3 feet wide and 4 to 6 feet high, to determine their effectiveness. These tests have shown that the incident pressure behind the shield is reduced by nearly 50 percent in some cases. In other tests, where a top and sides have been added to a shield, pressure reductions of up to 75 percent have been attained. Table VII lists a comparison of minimum distances from an unconfined explosion for an unprotected person versus minimum distances for a person protected by a flat or curved shield.

It is essential that the shield has the ability to withstand the forces exerted upon it and at the same time will remain immobile. Since the presence of these characteristics can be established only by a testing program, it is recommended that no shield be used until it has been thoroughly tested and proven effective.

Structures as well as persons are adversely affected by blast pressures. Refer to Table VIII for safety criteria for structures exposed to a TNT explosion. Note that a distance range rather than a precise distance figure is given for each condition. The range is given to provide for variations in size, degree of support, condition, etc., of the various structures. Also, the figures are based on an explosion in an open area with a single structure present. Should an explosion occur in a hilly area, or in an area containing other structures, the blast shock wave could be reflected to cause damage at distances greater than those shown.

TABLE I

SHORT DURATION BLAST PRESSURE EFFECTS

UPON UNPROTECTED PERSONS

Pressure (psi)	Effect
5	Slight chance of eardrum rupture
15	50 percent chance of eardrum rupture
30-40	Slight chance of lung damage
80	Severe lung damage
100-120	Slight chance of death
130-180	50 percent chance of death
200-250	Nearly 100 percent chance of death

Pressure as provided in this table is the highest of either incident pressure, the incident plus the dynamic pressure, or the reflected pressure, as applicable.

TABLE II

BLAST PRESSURE EFFECTS UPON STRUCTURES

EXPOSED TO AN UNCONFINED EXPLOSION OF OPEN GROUND

Pressure in Pounds Per Square Inch (psi)	Structure or Material
1/2to1	Shatter single strength glass
1 to 2	Crack plaster walls Shatter asbestos siding Buckle steel sheeting Failure of wooden wall
2 to 3	Crack nonreinforced cinder block wall
2 to 8	Crack nonreinforced brick wall
5 to 10	Shatter safety glass in automobile

TABLE III

SAFETY CRITERIA FOR UNPROTECTED PERSONS LYING IN THE OPEN WITH HEAD OR FEET EXTENDING TOWARD A TNT EXPLOSION

TNT (lbs.)	Distance from Explosion (in Feet)		
	Slight Chance of Eardrum Rupture	Slight Chance of Lung Damage	Slight Chance Of Death
1	15	6	4
2	19	8	5
5	25	10	6
10	32	13	8
15	36	15	9
20	40	16	10
25	43	17	10
30	46	18	11
35	48	19	12
40	50	20	12
45	52	21	13
50	54	22	13

TABLE IV

SAFETY CRITERIA FOR UNPROTECTED PERSONS STANDING IN THE OPEN AND EXPOSED TO A TNT EXPLOSION

TNT (lbs.)	Distance from Explosion (in Feet)		
	Slight Chance of Eardrum Rupture	Slight Chance of Lung Damage	Slight Chance of Death
1	16	7	5
2	21	9	6
5	28	12	8
10	35	15	10
15	40	18	12
20	44	20	13
25	47	21	14
30	50	22	15
35	53	23	15
40	55	24	16
45	57	25	17
50	59	26	17

TABLE V

SAFETY CRITERIA FOR UNPROTECTED PERSONS STANDING ADJACENT TO A REFLECTING SURFACE WHICH IS FACING A[1] TNT EXPLOSION

TNT (lbs.)	Distance from Explosion (in Feet)		
	Slight Chance of Eardrum Rupture	Slight Chance of Lung Damage	Slight Chance of Death
1	24	10	6
2	31	12	8
5	41	16	11
10	52	20	13
15	60	23	15
20	65	25	16
25	71	27	18
30	75	29	19
35	79	31	20
40	83	32	21
45	86	33	22
50	89	34	22

TABLE VI

COMPARISON OF SAFETY CRITERIA FOR UNPROTECTED PERSONS EXPOSED TO AN UNCONFINED TNT EXPLOSION VERSUS A TNT EXPLOSION WITHIN A THREE WALLED BARRICADE

TNT (lbs.)	Distance from Explosion (in Feet)					
	Slight Chance of Eardrum Rupture		Slight Chance of Lung Damage		Slight Chance of Death	
	Unconfined	Barricade	Unconfined	Barricade	Unconfined	Barricade
1	16	18	7	8	5	6
2	21	23	9	10	6	7
5	28	31	12	14	8	10
10	35	39	15	17	10	12
15	40	45	18	20	12	14
20	44	49	20	22	13	15
25	47	53	21	24	14	16
30	50	57	22	26	15	17
35	53	60	23	27	15	18
40	55	63	21	28	16	19
45	57	65	25	29	17	20
50	59	67	26	30	17	20

TABLE VI-A

COMPARISON OF SAFETY CRITERIA FOR UNPROTECTED PERSONS EXPOSED TO AN UNCONFINED TNT EXPLOSION VERSUS A TNT EXPLOSION WITHIN A THREE WALLED BARRICADE

TNT (lbs.)	Distance from Explosion (in Feet)					
	Slight Chance of Eardrum Rupture		Slight Chance of Lung Damage		Slight Chance of Death	
	Unconfined	Barricade	Unconfined	Barricade	Unconfined	Barricade
1	15	17	6	7	4	5
2	19	22	8	9	5	6
5	25	30	10	12	6	8
10	32 .	37	13	15	8	10
15	36	43	15	17	9	11
20	40	47	16	19	10	12
25	43	50	17	20	10	13
30	46	53	18	21	11	14
35	48	56	19	22	12	15
40	50	59	20	23	12	15
45	52	61	21	24	13	16
50	54	63	22	25	13	16

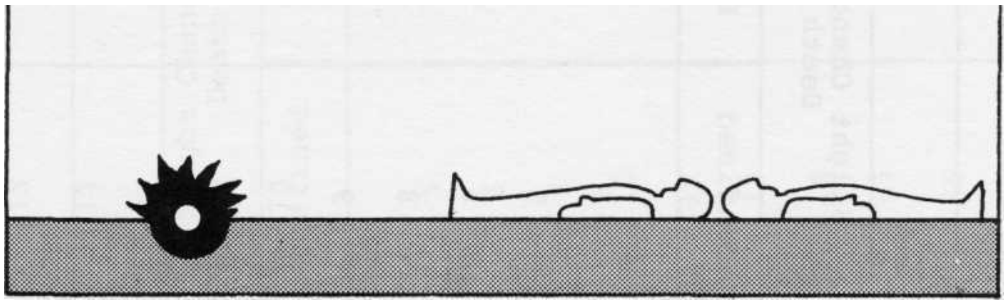
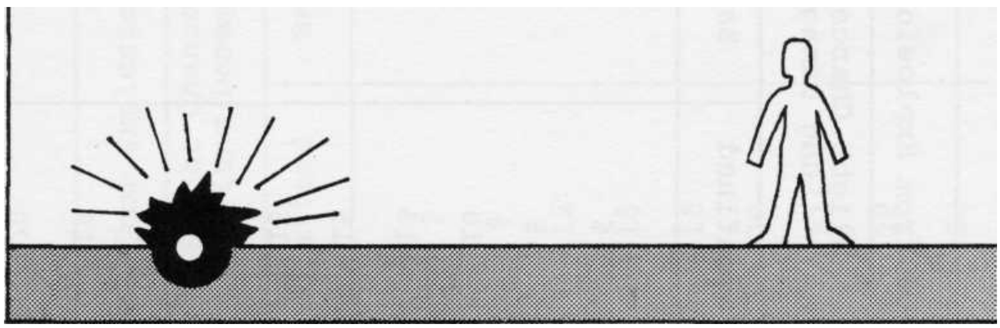


TABLE III



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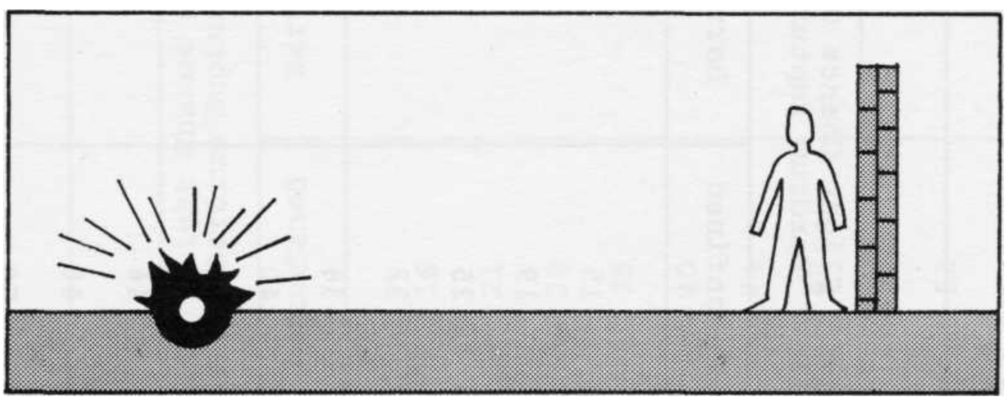


TABLE V

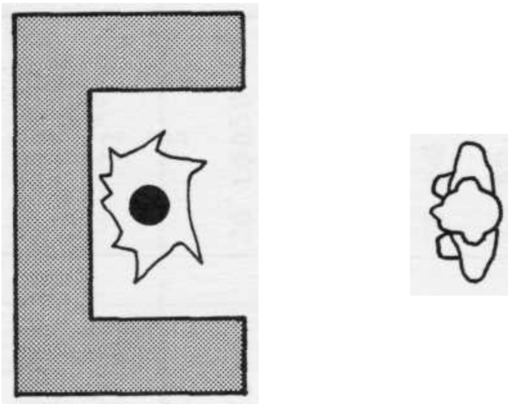


TABLE VI

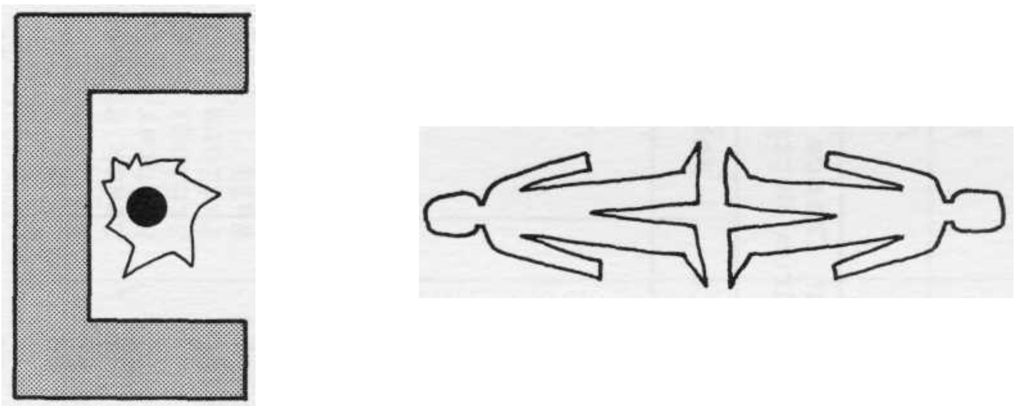


TABLE VIA

TABLE VII

COMPARISON OF SAFETY CRITERIA FOR UNPROTECTED PERSONS EXPOSED TO AN UNCONFINED TNT EXPLOSION WHEN STANDING IN THE OPEN VERSUS STANDING IMMEDIATELY BEHIND A FLAT OR CURVED SHIELD

TNT (lbs.)	Distance from Explosion (in Feet)					
	Slight Chance of Eardrum Rupture		Slight Chance of Lung Damage		Slight Chance of Death	
	No Shield	Behind Shield	No Shield	Behind Shield	No Shield	Behind Shield
1	16	10	7	5	5	3
2	21	13	9	6	6	4
5	28	17	12	8	8	5
10	35	21	15	10	10	6
15	40	25	18	11	12	7
20	44	27	20	12	13	8
25	47	29	21	13	14	8
30	50	31	22	14	15	9
35	53	33	23	15	15	9
40	55	34	24	15	16	10
45	57	35	25	16	17	10
50	59	36	26	16	17	10

TABLE VIII

SAFETY CRITERIA FOR BUILDINGS AND MATERIALS EXPOSED TO

AN UNCONFINED TNT EXPLOSION ON OPEN GROUND

TNT (lbs.)	Shatter Single Strength Glass	Crack Plaster Walls; Shatter Asbestos Siding; Buckle Steel; Failure of Wooden Wall	Crack Nonreinforced Cinder Block or Concrete Block Wall	Crack Non-reinforced Brick Wall	Shatter Safety Glass in Automobile
1	60 to 90	50 to 90	35 to 50	20 to 50	15 to 25
2	110 to 200	60 to 110	45 to 60	23 to 60	20 to 30
5	140 to 270	80 to 140	60 to 80	31 to 80	27 to 40
10	180 to 340	100 to 180	75 to 100	39 to 100	34 to 50
15	210 to 390	115 to 210	85 to 115	45 to 115	39 to 60
20	230 to 430	125 to 230	95 to 125	50 to 125	43 to 65
25	250 to 460	135 to 250	100 to 135	53 to 135	46 to 70
30	270 to 490	145 to 270	105 to 145	56 to 145	49 to 75
35	280 to 520	155 to 280	110 to 155	59 to 155	51 to 80
40	290 to 540	160 to 290	115 to 160	62 to 160	53 to 85
45	300 to 560	165 to 300	120 to 165	65 to 165	55 to 90
50	310 to 580	170 to 310	125 to 170	67 to 170	57 to 95

TABLE IX

RELATIVE EFFECTIVENESS OF EXPLOSIVES COMPARED TO TNT

Type of Explosive	Relative Effectiveness Factor
TNT	1.00
Black Powder	0.55
Nitroglycerin	1.50
Composition C-3/Composition C-4	1.34
40 percent straight dynamite	0.65
60 percent straight dynamite	0.83
40 percent ammonia dynamite	0.41
60 percent ammonia dynamite	0.53
40 percent gelatin dynamite	0.42
60 percent gelatin dynamite	0.76

[1]Source of information: Army Field Manuals 5-25 and 5-34

TABLE X

WEIGHTS OF UNCONFINED EXPLOSIVES
PRODUCING THE SAME PEAK INCIDENT PRESSURE

Type of Explosive	Weight of Explosive						
TNT	1	2	5	10	20	25	50
Black Powder	1.5	3.5	9	18	36	45	90
Nitroglycerin	0.5	1	3	6	13	16	33
Composition C-3/Composition C-4	0.5	1.5	3.5	7	15	18	37
40 percent straight dynamite	1.5	3	7.5	15	30	38	76
60 percent straight dynamite	1	2	6	12	24	30	60
40 percent ammonia dynamite	2	4.5	12	24	48	61	122
60 percent ammonia dynamite	1.5	3.5	9	18	37	47	94
40 percent gelatin dynamite	2	4.5	11	23	47	59	119
60 percent gelatin dynamite	1	2.5	6.5	13	26	32	65

DETERMINING PEAK INCIDENT PRESSURE

In order to determine the peak incident pressure likely to be encountered with a particular IED, it is necessary to first know the amount and kind of explosive involved. Once these are known, if the explosive is TNT, the pressure can be determined directly from Graph I. If the explosive is not TNT, its equivalent weight in TNT must first be determined. This may be accomplished either by the use of Table IX which lists a relative effectiveness factor from which the equivalent weight of TNT can be computed; or by the use of Table X which directly relates the weight of various explosives to an equivalent weight of TNT. When using Table X if the weight of explosive is not given, use the next higher weight. See the following examples.

Problem (using Table IX)

What is the equivalent weight in TNT of 10 pounds of Composition C?

Solution

Referring to Table IX the relative effectiveness factor for Composition C is 1.34. Therefore, the equivalent weight of TNT = 1.34 x 10 or 13.4 pounds.

Problem (using Table X)

What is the equivalent weight in TNT of 5 pounds of 40 percent straight dynamite?

Solution

Referring to Table X for 40 percent straight dynamite, the 5 pound weight is not given; therefore, use the next higher weight which is 71/2 pounds. This is equivalent to 5 pounds of TNT.

Upon establishing the weight of the TNT, or the equivalent weight in TNT of any other explosive encountered, determine the peak incident pressure from Graph I as follows:

Locate the line in the lower half of the graph corresponding to the weight of the TNT.

Find the distance in feet from the point of detonation at which you wish to know the pressure.

Proceed along a vertical line toward the top of the graph until the curved line is reached. (The point of intersection of the vertical and curved lines will also be intersected by a horizontal line.)

Follow the horizontal line to the left side of the graph to find the peak incident pressure.

Following are examples of the use of Graph I.

Problem

What peak incident pressure is developed at a distance of 20 feet by an unconfined explosion of 5 pounds of TNT on open ground?

Solution

Locate the horizontal line marked 5 pounds; then locate the 20 foot mark on this line. Move vertically up the graph until the curved line is reached; proceed horizontally to the left and read the pressure - 7 psi.

Problem

An IED is known to contain 2 pounds of unconfined TNT. What peak incident pressure will be developed at 5 feet if the explosive detonates?

Solution

Locate the horizontal line marked 2 pounds; then locate the

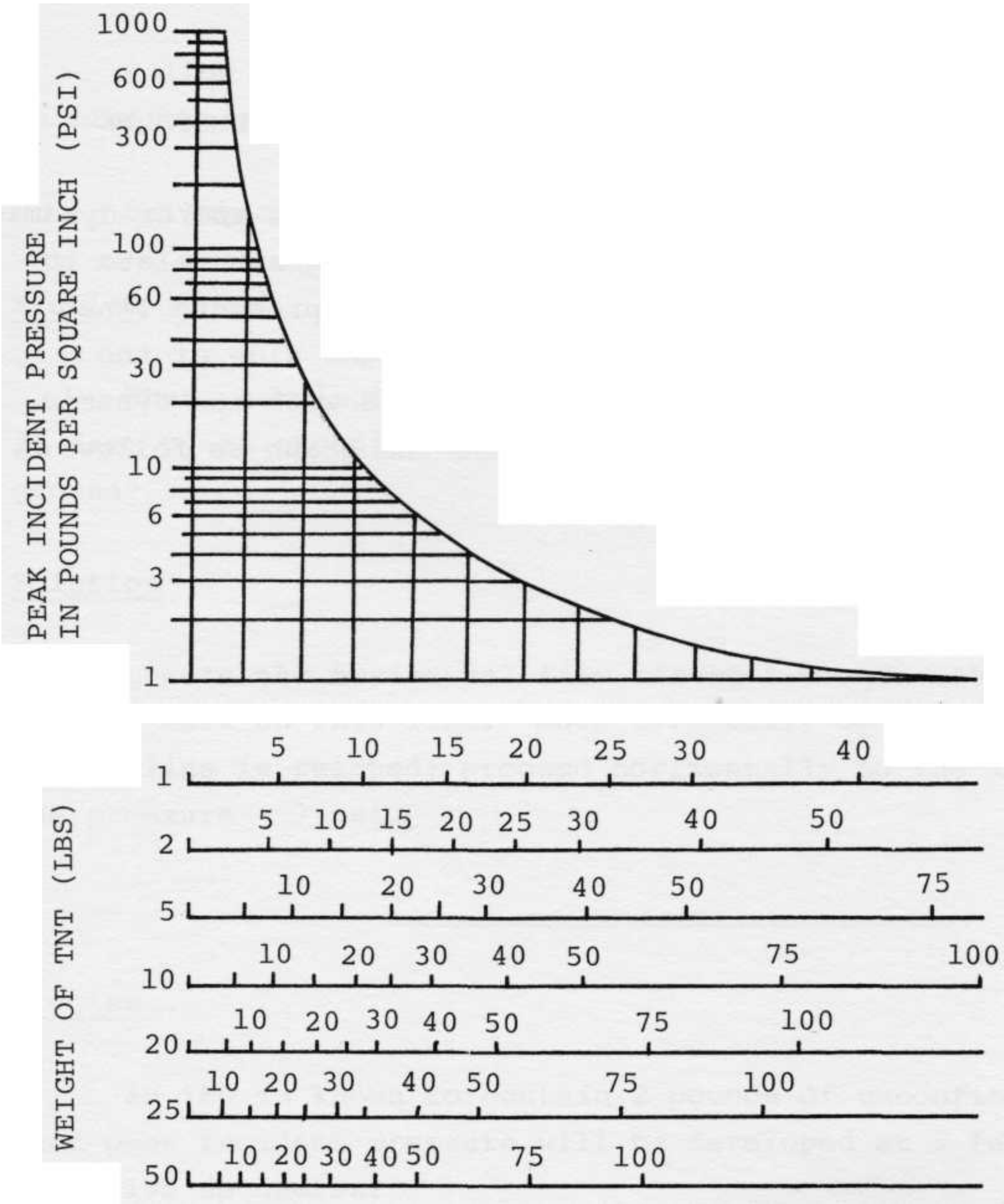
5 foot mark on this line. Move vertically up the graph stopping at the curved line; proceed horizontally to the left and read the pressure - approximately 60 psi.

DETERMINING REFLECTED PRESSURE AND DYNAMIC PRESSURE

Use Graph II to determine reflected pressure and/or dynamic pressure. The numbers on the left side of the graph relate to reflected pressure and are used with reflected pressure line plotted on the graph. The numbers on the right side of the graph relate to dynamic pressure and are used with the dynamic pressure line plotted on the graph. Use the graph as follows:

GRAPH I

PEAK INCIDENT PRESSURE VERSUS DISTANCE
FROM DETONATION OF UNCONFINED TNT



DISTANCE FROM POINT OF DETONATION (FT)

Find the known peak incident pressure (obtained from Graph I) at the bottom of Graph II.

Proceed vertically up the graph to the slant line marked reflected pressure.

Upon reaching this slant line, move horizontally to the left side of the graph to read the reflected pressure.

Following are examples of the use of Graph II.

<u>Problem</u>

The peak incident pressure is 20 psi. What is the reflected pressure?

<u>Solution</u>

Find 20 psi on the bottom of the graph and proceed vertically up the graph to the reflected pressure line; move horizontally to the left and read the reflected pressure - to psi.

<u>Problem</u>

The peak incident pressure is 80 psi. What is the dynamic pressure?

<u>Solution</u>

Find 80 psi at the bottom of the graph and proceed vertically up the graph to the dynamic pressure line; move horizontally to the right and read the dynamic pressure - approximately 85 psi.

DETERMINING PEAK WIND VELOCITY AND SHOCK FRONT VELOCITY

Use Graph III to determine peak wind velocity and shock front velocity in feet per second (fps) or miles per hour (mph). Use this graph as follows:

Find the known peak incident pressure (obtained from Graph I) at the bottom of Graph III.

Proceed vertically up the graph to the peak wind velocity line or the shock front velocity line.

Move horizontally to the right to read the velocity in fps; or to the left to read the velocity in mph.

Following are examples of the use of Graph III.

Problem

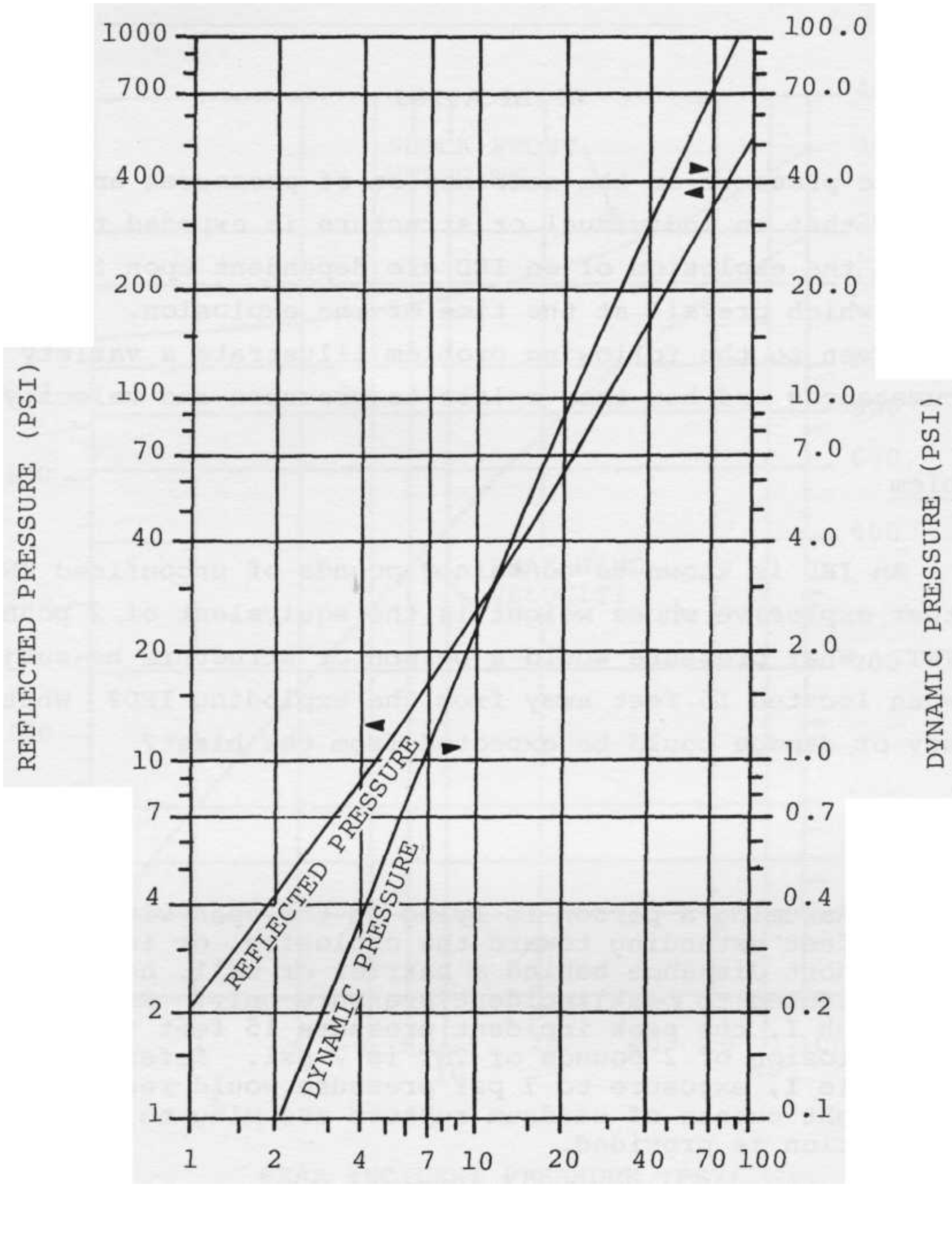
The peak incident pressure is 4 psi. What is the peak wind velocity?

Solution

Locate the number 4 at the bottom of the graph, then move vertically up the graph to the line marked peak wind velocity. Proceed horizontally to the right to read the velocity in fps (approximately 190); or to the left to read the velocity in mph

GRAPH II

REFLECTED PRESSURE AND DYNAMIC PRESSURE



PEAK INCIDENT PRESSURE (PSI)

(approximately 140). In a similar manner, the shock front velocity of approximately 1,300 fps or 900 mph can be determined.

APPLICATION

The pressure or the combination of pressures and the velocities that an individual or structure is exposed to in the event of the explosion of an IED are dependent upon the circumstances which prevail at the time of the explosion. The solutions given to the following problem illustrate a variety of circumstances and how they relate to pressure and velocity.

Problem

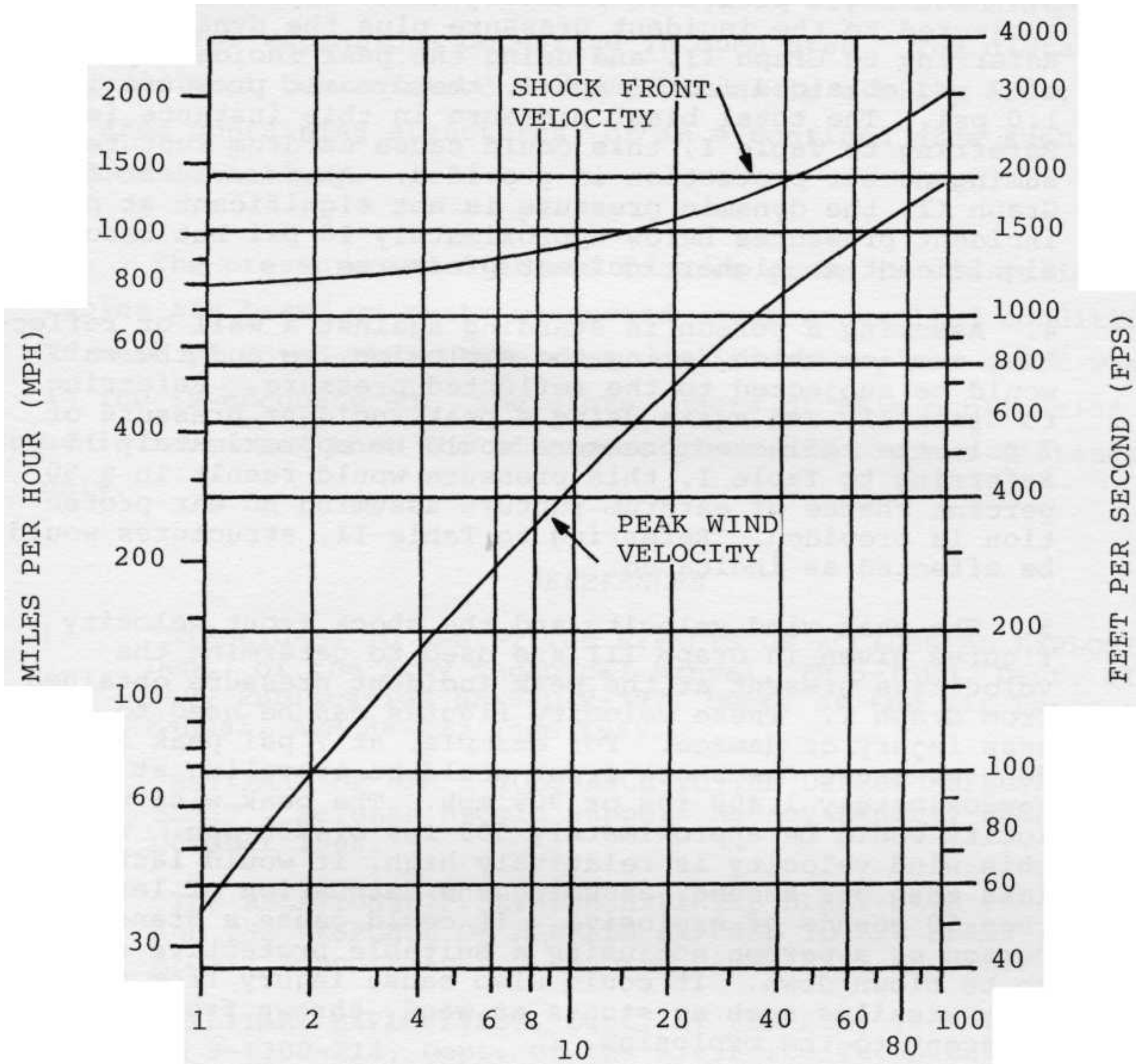
An IED is known to contain 2 pounds of unconfined TNT or another explosive whose weight is the equivalent of 2 pounds of TNT. What pressure would a person or structure be subject to when located 15 feet away from the exploding IED? What injury or damage could be expected from the blast?

Solution

1. Assuming a person is lying in the open with his head or feet extending toward the explosion, or is positioned a short distance behind a barrier or wall, he would be subjected to peak incident pressure only. Referring to Graph I, the peak incident pressure 15 feet from the explosion of 2 pounds of TNT is 7 psi. Referring to Table I, exposure to 7 psi pressure would result in a slight chance of eardrum rupture assuming no ear protection is provided.

GRAPH III

PEAK WIND VELOCTIY AND SHOCK FRONT VELOCITY



PEAK INCIDENT PRESSURE (PSI)

2. Assuming a person is immediately behind a suitable protective shield, he would be subjected to approximately half the peak incident pressure noted in solution 1. This would be approximately31/2psi and, in accordance with Table I, should not cause eardrum rupture.

3. Assuming a person is standing in the open, he would be subjected to the incident pressure plus the dynamic pressure. Referring to Graph II, and using the peak incident pressure of 7 psi obtained from Graph I, the dynamic pressure is 1.0 psi. The total blast pressure in this instance is 8 psi. Referring to Table I, this could cause eardrum rupture, assuming no ear protection is provided. As is evident from Graph II, the dynamic pressure is not significant at peak incident pressures below approximately 10 psi but becomes significant at higher incident pressures.

4. Assuming a person is standing against a wall or reflecting surface which facing the explosion, he and the wall would be subjected to the reflected pressure. Referring to Graph II, and again using a peak incident pressure of 7 psi, the reflected pressure would be approximately 15 psi. Referring to Table I, this pressure would result in a 50 percent chance of eardrum rupture assuming no ear protection is provided. Referring to Table II, structures would be affected as indicated.

5. The peak wind velocity and the shock front velocity figures given in Graph III are used to determine the velocities present at the peak incident pressure obtained from Graph I. These velocity figures can be used to assess injury or damage. For example, at 7 psi peak incident pressure the shock front would be traveling at approximately 1,400 fps or 900 mph. The peak wind velocity would be approximately 300 fps or 200 mph. While this wind velocity is relatively high, it would last for less than one second, assuming the detonation of less then 50 pounds of explosive. It could cause a standing person or a person not using a suitable protective shield to be blown down. It could also cause injury from secondary missiles such as stones or wood, thrown from areas adjacent to the explosion.

APPLICATION

The use of the tables and graphs contained in this publication will enable the determination of peak blast pressure and its effects upon persons and structures exposed to the explosion of an IED. It is emphasized that complete protection against fragmentation and other blast derived airborne missiles must be provided; Users of this publication are cautioned that the distance and velocity figures given are minimum figures for explosions occurring in open area. The distance figures must be increased for explosions in a hilly area, in an area containing structures, or in a confined area such as a room or hallway.

The pressure and distance figures given in the various tables are based on tests conducted under controlled conditions. It must be noted that these same conditions may not exist when an IED is encountered. Therefore, users of this publication are again cautioned that the distances given are minimum distances only.

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5. "ELEMENTS OF ARMAMENT ENGINEERING, PART TWO, BALLISTICS", U. S. Army Material Command Pamphlet, AMCP 706-107, September 1963.

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8. "ENGINEER FIELD DATA", Dept. of the Army Field Manual, FM 5-34, December 1969.

APPENDIX I

MILITARY DISPOSAL ASSISTANCE

1. Classification: Unclassified.

2. Subject: Military Explosive Ordnance Disoosal Assistance.

3. Source: Picatinny Arsenal, Dover, New Jersey.

4. Background: This bulletin describes the procedures which should be followed by civilian law enforcement personnel whenever military explosive ordnance is encountered during the performance of their duties, or whenever public safety is threatened by the presence of commercial explosives, or homemade bombs, and no local civilian bomb disposal capability exists.

Military explosive ordnance is frequently found incorporated into improvised explosive or incendiary devices, as part of souvenir collections, and in weapon caches accumulated by groups or individuals. It may, however, be encountered anywhere.

For the purpose of this bulletin, military explosive ordnance is defined as artillery, mortar, rocket, and small arms ammunition; mines; grenades; bombs; explosive simulators; and fuzes for any of the foregoing, as well as bulk explosives and any chemical and/or nuclear items which are manufactured for military use.

INHERENT DANGER OF MILITARY EXPLOSIVE ORDNANCE

Most military explosive ordnance of recent manufacture has reliable safety features incorporated into its design. The safety features of some foreign explosive ordnance, however, may be unreliable or absent altogether. Even though safety features are incorporated into most items of modern explosive ordnance, these items may still become armed accidentally, and it is often difficult, and sometimes impossible, to tell whether they are armed or not.

Older ordnance, such as wartime souvenirs, presents the additional problem of possible material deterioration or decomposition. In some cases filler materials may have reacted with container materials to form new compounds, which may be unstable and dangerous. Some explosive items, such as those filled with black powder, become more unstable with time. A souvenir from the Civil War, for example, may contain black powder which will explode upon receiving a very slight shock, a small temperature rise, or a spark.

Finally, very old United States ordnance, and devices of foreign manufacture, are unfamiliar to most civilians. Therefore, no military explosive ordnance should be touched or moved except by trained military personnel.

PROFESSIONAL ARMY EXPLOSIVE ORDNANCE DISPOSAL (EOD) HELP

Army Regulation 75-15 (AR 75-15) states that it is the Army's responsibility to dispose of all military explosive ordnance regardless of type, age, or origin. Army EOD detachments throughout the United States are available to provide this type of assistance, without charge, to civilian law enforcement agencies. The local Army EOD detachment can be easily contacted whenever a military item is found. A map depicting the location and numerical designation of Army EOD detachments is shown in figure 1. A list of all Army EOD detachments in the United States, with their locations and telephone numbers, is attached as Addendum A.

Although the primary mission of Army EOD detachments is the safe disposal of hazardous military explosive ordnance, the provisions of AR 75-15 also authorize Army assistance to civilian agencies whenever public safety is threatened by commercial explosives, or homemade bombs, and no local civilian bomb disposal capability exists. A copy of pertinent portions of AR 75-15 is attached as Addendum B. To assist civilian communities threatened by such explosive hazards, EOD units are also authorized to conduct training courses for civil defense and law enforcement personnel. These courses include recognition of military ordnance, and safety and reporting procedures to be followed in the event of an incident involving military explosive ordnance or clandestine devices, pending the arrival of the military EOD personnel.

Public officials contemplating the use of Army bomb disposal assistance should establish liaison with the nearest EOD detachment commander. The attached Addendum A is a complete listing of these detachments, in alphabetical order by state, including their locations and commercial telephone numbers.

ADDENDUM A

LIST OF EOD DETACHMENTS

ORGANIZATION	LOCATION	TELEPHONE NO.
ALABAMA		
123d Ord. Det. (EOD)	Ft. Rucker, AL 36360	(205) 255-5004/6720
142d Ord. Det. (EOD)	Ft. McClellan, AL 36201	(205) 238-5124/5430
ALASKA		
176th Ord. Det. (EOD)	Ft. Richardson, AK 99505	(907) 862-8114
	Ft. Wainwright, AK 99703	(907) 353-3111
ARIZONA		
77th Ord. Det. (EOD)	Yuma Proving Ground Yuma, AZ 85364	(602) 328-2125/2841
ARKANSAS		
52d Ord. Det. (EOD)	Pine Bluff Arsenal, AR 71601	(501) 534-4600 Ext 2731/2732
CALIFORNIA		
34th Ord. Det. (EOD)	Sierra Army Depot Herlong, CA 96113	(916) 827-9409
49th Ord. Det. (EOD)	Ft. Ord, CA 93941	(408) 242-3054/3489
70th Ord. Det. (EOD)	Ft. Rosecrans, CA 92106	(714) 225-7481/7482
87th Ord. Det. (EOD)	Presidio of San Francisco CA 94129	(415) 561-2437/2524
548th Ord. Det. (EODC)	Presidio of San Francisco CA 94129	(415) 561-4203/4312
COLORADO		
94th Ord. Det. (EOD)	Ft. Carson, CO 80913	(303) 579-2643/4242
DISTRICT OF COLUMBIA		
67th Ord. Det. (EOD)	Ft. Leslie J. McNair Washington, DC 20315	(202) 693-8612/8614
FLORIDA		
66th Ord. Det. (EOD)	Homestead Air Force Base FL 33030	(305) 257-8172/8173

ADDENDUM A • Continued

ORGANIZATION	LOCATION	TELEPHONE NO.
GEORGIA		
13th Ord. Det. (EOD)	Ft. Gillem Forest Park, GA 30050	(404) 363-5436/5437
38th Ord. Det. (EOD)	Ft. Stewart, GA 31313	(912) 767-8207/8498
89th Ord. Det. (EOD)	Ft. Benning, GA 31905	(404) 544-4668
647th Ord. Det. (EODC)	Ft. Gillem Forest Park, GA 30050	(404) 363-5225/5226
HAWAII		
6th Ord. Det. (EOD)	Ft. Shafter, HI 96823	(808) 86-2315
ILLINOIS		
50th Ord. Det. (EOD)	Granite City Army Depot IL 62040	(314) 263-5262/5263
51st Ord. Det. (EOD)	Ft. Sheridan, IL 60037	(312) 926-2907/2227
259th Ord. Det. (EOD)	Savanna Army Depot Savanna, IL 61074	(815) 273-8846/8847
INDIANA		
64th Ord. Det. (EOD)	Ft. Benjamin Harrison IN 46216	(317) 542-2392/239S
KANSAS		
74th Ord. Det. (EOD)	Ft. Riley, KS 66442	(913) 239-3313/3814
KENTUCKY		
17th Ord. Det. (EOD)	Ft. Campbell, KY 42223	(502) 798-2312/2825
43d Ord. Det. (EOD)	Ft. Knox, KY 40121	(502) 624-5631/6426
LOUISIANA		
45th Ord. Det. (EOD)	Ft. Polk, LA 71459	(318) 578-5505/5726
MARYLAND		
144th Ord. Det.(EOD)	Ft. George G. Meade MD 20755	(301) 677-5770/2104
149th Ord. Det. (EOD)	Aberdeen Proving Ground MD 21010	(301) 671-4147/3872
549th Ord. Det. (EODC)	Ft. George G. Meade MD 20755	(301) 677-5182/5183/ 3659/5477
U. S. A. Technical Escort Center (TEC) t	Aberdeen Proving Ground MD 21010	(301) 671-4381/2601/ 3044; Off/ Duly hours 671-2773/4259

ADDENDUM A • Continued

ORGANIZATION	LOCATION	TELEPHONE NO.
MASSACHUSETTS		
14th Ord. Det. (EOD)	Ft. Devens, MA 01433	(617) 796-4448/2027
MICHIGAN		
75th Ord. Det. (EOD)	23921 Joy Blvd. Mt. Clemens, MI 48043	(313) 469-3621
MINNESOTA		
88th Ord. Det. (EOD)	Twin Cities Army Ammunition Plant New Brighton, MN 55112	(612) 483-5913
MISSISSIPPI		
40th Ord. Det. (EOD)	Camp Shelby, MS 39401	(601) 583-1745/1746
MISSOURI		
63d Ord. Det. (EOD)	Ft. Leonard Wood MO 65473	(314) 368-4229/2818
543d Ord. Det. (EODC)	Ft. Leonard Wood MO 65473	(314) 368-6145
NEW JERSEY		
54th Ord. Det. (EOD)	Ft. Monmouth, NJ 07703	(201) 532-9000 Ext 1655
60th Ord. Det. (EOD)	Ft. Dix, NJ 08640	(609) 562-4250/6382
542d Ord. Det. (EODC)	Ft. Dix, NJ 08640	(609) 562-5940 4184
NEW YORK		
55th Ord. Det. (EOD)	Camp Drum Watertown, NY 13602	(315) 782-6900 Ext. 78/79
143rd Ord. Det. (EOD)	Seneca Army Depot Romulus, NY 14541	(315) 586-8363/8364
14Cth Ord. Det. (EOD)	U. S. Military Academy Stewart Annex Newburgh, NY 12550	(014) 564-7000 Ext 3232/3233
NORTH CAROLINA		
18th Ord. Det. (EOD)	Ft. Bragg, NC 28307	(919) 396-5801/8578
NORTH DAKOTA		
551st Ord. Det. (EOD)	Stanley R. Michel sen Safeguard-Complex, ND 58350	(701) 949-5213/5214

ADDENDUM A - Continued

ORGANIZATION	LOCATION	TELEPHONE NO.
OHIO		
71st Ord. Det. (EOD)	Rickenbacker Air Force Base OH 43217	(614) 492-3809/3800
OKLAHOMA		
Gist Ord. Det. (EOD)	Ft. Sill, OK 73503	(405) 351-5209/2313
PENNSYLVANIA		
28th Ord. Det. (EOD)	Letterkenny Army Depot Chambersburg, PA 17201	(717) 263-6681/7783
T›6th Ord. Det. (EOD)	Indiantown Gap Military Reservation Annville, PA 17003	(717) 273-2601 Ext 2811/2881
SOUTH CAROLINA		
48th Ord. Det. (EOD)	Ft. Jackson, SC 29207	(803) 751-5126/6919
TEXAS		
41st Ord. Det. (EOD)	Ft. Bliss, TX 79906	(915) 568-8703/8905
47th Ord. Det. (EOD)	Ft. Hood, TX 76544	(817) 685-2309/2929
137th Ord. Det. (EOD)	Corpus Christi U. S. Naval Air Station Corpus Christi, TX 78419	(512) 939-2991/2992
546th Ord. Det. (EODC)	Ft. Sam Houston, TX 78234	(512) 221-5308
UTAH		
62d Ord. Det. (EOD)	Ft. Douglas, UT 84113	(801) 524-4334
VIRGINIA		
57th Ord. Det. (EOD)	Ft. Belvoir, VA 22060	(703) 664-4168/1186
147th Ord. Det. (EOD)	Ft. Lee, VA 23801	(804) 734-2709/3373
WASHINGTON		
27th Ord. Det. (EOD)	Ft. Lewis, WA 98433	**(206) 967-5507/ 5508/4420**
53d Ord. Det. (EOD)	Vancouver Barracks, WA 98661	(503) 289-1334 (206) 693-2291

t The Technical Escort Center (TEC) is not a conventional EOD detachment. It provides assistance in the areas of selected ammunition and military chemical items for the Department of Defense. As a result, TEC support to civil authorities is limited to those instances where special considerations make Army assistance relative to hazardous chemicals absolutely essential in the public interest.

ARMY REGULATION
No. 75-15

ADDENDUM B

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC. *17 September 1973*

EXPLOSIVES

RESPONSIBILITIES AND PROCEDURES FOR EXPLOSIVE ORDNANCE DISPOSAL

Effective 15 November 1973

This is a complete revision of AR 75-15. Changes are primarily concerned with the single manager assignment for military explosive ordnance disposal technology and training and clarification of Department of the Army and new major Army command responsibilities. This regulation may be supplemented at major command and field army levels. Army Staff agencies and major Army commands will furnish one copy of each supplement to HQDA (DALO-SMS-D-EOD), WASH DC 20310; other commands will furnish one copy of each to the next higher headquarters.

***This regulation supersedes: AR 75-15, 23 June 1969, including all changes; DA letter DALO-AMD-P-EOD, 10 January 1972, subject: Implementing Instructions—Single Manager Assignment for Military Explosive Ordnance Disposal Technology and Training; DA message DALO-AMD-P-EOD 222015Z May 1972 (U), subject: EOD Assistance to Federal Agencies; DA message DALO-AMD-P-EOD 152146Z January 1973 (U), subject: Responsibilities and Procedures for EOD, AR 75-15; and Part Two, DA message DACA-CSJ-E 011447Z June 1973 (U), subject: Demolition Duty (Interim Change to AR 75-15).**

TAG0 161A—September 540-487—73

Changed per DA message **DALO-SMS-D-EOD,** Subject: Responsibilities and Procedures for EOD, AR 75-15 082015Z January 1975 (U).

2-10. Disposal of nonmilitary commercial-type explosives, chemicals, or dangerous articles, *a*. The Department of the Army is not responsible for the disposal of nonmilitary commercial-type explosives, chemicals, or dangerous articles in the possession of or controlled by commercial concerns or civil agencies.

b. Assistance for disposal may be provided upon receipt of requests from Federal agencies or civil authorities and upon determination that such assistance is required in the interest of public safety or public relations. Except for EOD services to commercial carriers (para 2-11) EOD services will not be provided to private concerns or individuals unless requested by Federal agencies or civil authorities. In such cases—

(1) All responsibility connected with the disposal remains with the requesting authorities or agencies.

(2) CHANGED: SEE PAGE II.

c. Commanders are cautioned that this category may cover a wide variety of commercial chemicals, gases, flammables, and other items for which EOD personnel have not been specifically trained and for which EOD procedures have not been developed.

(1) EOD detachments will not be directed to receeive, transport, or dispose of commercial hazardous material until positive identification of the material has been made and specific instructions and authorization are provided by the commander of the major command involved.

(2) Pending receipt of specific instructions, the actions of the EOD team normally will be limited to technical assistance and those emergency actions necessary to reduce hazards to life and property (recommending evacuation procedures, application of coolants, leak sealing, etc.).

(3) Toxic commercial chemicals will not be transported by EOD detachments without the specific authority of the major commander concerned.

d. Other than for improvised explosive devices (homemade bombs and arson devices), US and foreign military EO, or explosives which are abandoned or for which responsibility cannot be determined within a reasonable time, requesting agencies (Federal agencies excepted) or civil authorities will be informed that they will be required to reimburse the Department of the Army, as provided in the agreement in appendix A, for the costs involved in furnishing all requested services under this paragraph.

e. In all instances of requested service, requesting agencies (Federal agencies excepted) or civil authorities will be informed that, as a condition to the performance of the requested services, they will be required to accept certain responsibilities and liabilities, also set forth in the agreement in appendix A.

f. Except under emergency conditions when delay might contribute to further hardships or possible disaster, when Department of the Army personnel are called upon to give EOD assistance to a requestor the EOD staff officer or senior EOD NCO on the scene will require the representative of the requestor to sign the agreement in appendix A, acknowledging the requestor's understanding and acceptance of its responsibilities and liabilities (*d* and e above). Federal agencies are exempt from the requirement to execute the agreement in appendix A. The EOD officer or NCO providing assistance will sign the agreement for the Army.
When assistance must be given under emergency conditions which do not allow sufficient time for execution of the form, the EOD staff officer or senior EOD NCO at the scene must explain the requestor's responsibilities and liabilities orally, either by reading to the requestor the provisions of the agreement in appendix A or otherwise, and must receive assurance of the requestor's under-

standing and acceptance of these matters. On such occasions, the agreement (app A) must be signed by the requestor's representative as soon as possible after performance of the requested services.

g. Collections of sums of money for services rendered under the provisions of this paragraph will be in accordance with finance procedures in the AR 37 series. Checks will be made payable to "Treasurer of the United States" and will be submitted to the billing office of the Army commander concerned.

2-11. Disposal of military explosives and other dangerous articles involved in accidents or incidents when shipped by commercial carriers. The Department of the Army will respond to requests for assistance from commercial carriers in connection with movement, salvage, demolition, neutralization, or other disposition of DOD-owned sliipments involved in accidents or incidents while being transported by commercial carriers as provided in paragraphs 4 and 7, AR 385-14, and paragraph 216011, AR 55-355.

AMC installation commanders will provide assistance under provisions of paragraphs 2-8a(8) and (10), basic regulation, when requested by an Army EOD unit.

PARAGRAPH 2-10b(2).

EOD personnel may act as technical consultants or advisors, or they may perform the render safe procedures and disposal as requested. EOD units responding to requests for assistance will evaluate each situation to determine if the incident/accident is within the unit's operational capability. If it is determined that the incident/accident is beyond the operational capability of the unit, the proper EOD Control Detachment will then notify the appropriate commands and initiate direct communication for technical advice/assistance with the US Army Technical Escort Center to insure that all available expertise is employed in response to the situation. Technical Escort personnel will be dispatched promptly to the scene of the accident/incident, when requested. If chemical accident/incident control (CAIC) plans arc placed in effect, EOD personnel will report their evaluation to the CA1C Officer and/or on-scene commander, and may recommend that requests for technical advice/assistance be initialed. CA1C responsibilities are outlined in AR 50-21. Assistance can be obtained by contacting the U. S. Army Technical Escort Center, Aberdeen Proving Ground, MD (duty hours: Area 301-671-4381/3601/3044: Autovon 584 plus extension; off/duty hours: Area Code 301-671-2773/4249: Autovon 584 plus extension).

CHAPTER 5
IMPROVISED EXPLOSIVE DEVICES (IED)

Section I. GENERAL

5-1. General. There has been a drastic increase in the use of improvised explosive devices (IED) by individuals or groups within the United States. Concurrently, a large volume of publications have been published by individuals or groups containing detailed construction information on IED. As a general rule, except for a few large metropolitan police departments, civil law enforcement agencies do not possess the required skills and equipment to deal with the problem.

a. Under the Constitution and laws of the United States, the protection of life and property and the maintenance of law and order within the territorial jurisdiction of any State are primarily the responsibility of local and State governments. Authority to enforce the laws is vested in the authorities of those governments.

b. The Posse Commitatus Act (18 USC 1385) prohibits the use of any part of the Army to execute local, State, or Federal laws except as the Constitution or act of Congress authorizes.

5-2. Policy. The Department of Army policy is to assist public safety and law enforcement agencies in developing a capability to deal with the IED threat and, when necessary, to provide EOD service in the interest of public safety.

a. Army EOD personnel will not participate in bomb or IED search operations or assist in the enforcement of civil law.

6. The normal response of US Army Ordnance detachments (EOD) to Federal, State, and local requests for EOD service is based upon the protection of public safety.

(1) Because of the nature of an IED threat, EOD service response must be efficient and immediate to protect public safety effectively.

(2) US Army EOD personnel will respond to such requests when a suspected or actual device has been located and when—

(a) The responsible agency has no EOD capability or its capability is overextended.

(&) The responsible agency (Federal agencies excepted) executes the Civil Support Release and Reimbursement Agreement (app A). Paragraph 1 of that agreement does not apply to IED situations. Under emergency conditions, the provisions *at* paragraph 2-10/ apply.

(3) The responding EOD personnel when requested by the responsible agency may

(a) Function as technical consultants or advisors.

(6) Attempt render-safe procedures.

(c) Assist in or perform disposal of hazardous residue.

APPENDIX A

EXPLOSIVE ORDNANCE DISPOSAL CIVIL SUPPORT RELEASE AND REIMBURSEMENT AGREEMENT

AGREEMENT BETWEEN

(EOD unit/command)

AND

(requesting agency or civil authority)

In the event that the United States, through the United States Army, begins explosive ordnance disposal (hereinafter referred to as "EOD") procedures upon__________________located at__________________in__________________,
(type of device) (street or location) (city and state)
then, in consideration therefor, and in recognition of the peculiar hazards involved in the disposal of nonmilitary commercial-type explosives, chemicals, and similar dangerous articles,_____,____________________________(herein-
(requesting agency or civil authority)
after referred to as "requestor"), agrees:

1. To reimburse the Department of the Army for the costs involved in furnishing all requested EOD services. Such costs may include personal services of civilian employees, travel and per diem expenses for military and civilian personnel, and other expenses to include transportation and supplies, material, and equiment with prescribed accessorial charges; costs of consumed supplies, material, and equipment and such supplies, material, and equipment which is damaged beyond economical repair; and costs of repairing or reconditioning nonconsumable items not damaged beyond economical repair. (This paragraph is inapplicable and the requestor does not agree to its provisions in instances when EOD assistance is requested for improvised explosive devices (homemade bombs and arson devices) or explosives which are abandoned or for which responsibility cannot be determined within a reasonable time.)

2. To consider all military and civilian personnel of the Department of the Army involved in furnishing requested EOD services as its own agents or servants.

3. To hold the United States and the Department of the Army and all military and civilian personnel of the Department of the Army harmless for any consequences of services rendered pursuant to this agreement without regard to whether the services are performed properly or negligently. (This paragraph is inapplicable if requestor is the United States Government or one of its instrumentalities.)

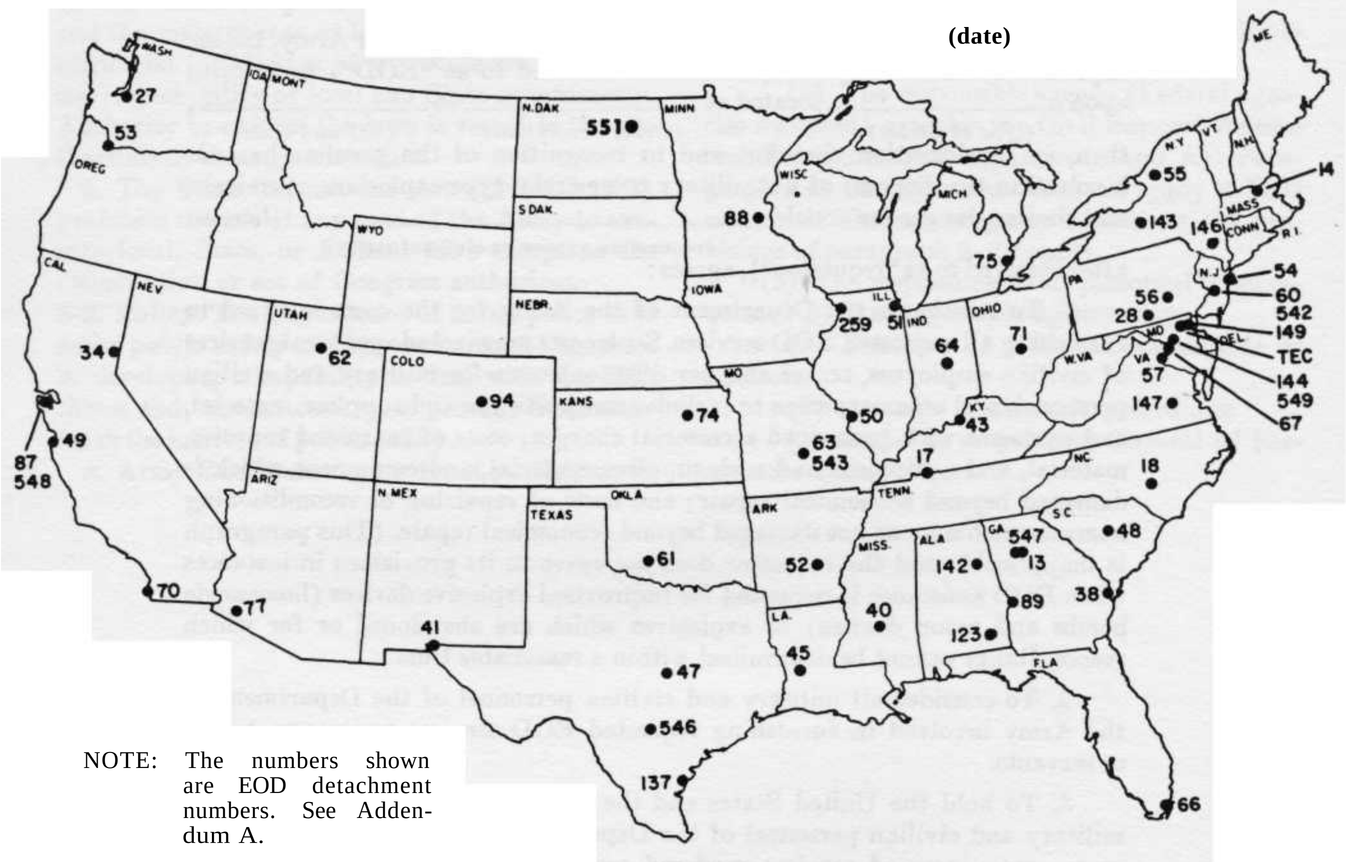
4. To indemnify the United States and the Department of the Army and all military and civilian personnel of the Department of the Army for any costs incurred as a result of any claims or civil actions brought by any third person as a result of the services requested even though negligently performed, and to pay all costs of settlement or litigation.

5. To file no claim for administrative settlement with any Federal agency nor institute any action or suit for money damages in any court of the United States or any State for injury to or loss of property or for personal injury or death caused by the negligence or wrongful act or omission of any military or civilian employee of the Department of the Army while such employee is engaged in rendering EOD services pursuant to this agreement.

(authorized representative of requestor)

(authorized representative of US Army)

(date)



NOTE: The numbers shown are EOD detachment numbers. See Addendum A.

Figure 1. U. S. Army Explosive Ordnance Disposal Detachments in the United States (Except Alaska and Hawaii)

APPENDIX II

MILITARY AND IMPROVISED COMMERCIAL EXPLOSIVE COMPOUNDS

I. GENERAL

Explosive materials are chemical compounds or mixtures which react chemically very rapidly under proper conditions, producing considerable quantities of gas and heat.

All explosive materials are exothermic chemical compounds or systems. As they react, the atoms are converted into more stable compounds. The quantities of heat which are set free cause the gasses, which are simultaneously produced, to assume a high pressure.

Since oxidation processes are primarily involved in the chemical reaction of such materials, oxygen has a special significance. In its gaseous form it is familiar as a component of explosive mixtures, such as firedamp in mines (methane and air). It is contained in explosive materials in the form of oxygen carriers, primarily nitrates, chlorates and perchlorates, or chemically bonded in esters and nitro compounds. In the early 1900's, mixtures containing a fuel (wood flour, peat dust, pulverized cork and rubber, etc.) combined with liquid oxygen were used as explosive materials.

II. EXPLOSIVES

Explosives are compounds or mixtures produced for blasting and demolition operations. Of the great range of explosive materials noted above, only those materials are designated explosives which fulfill certain requirements.

An explosive may be further defined as any substance that, through chemical reaction, violently changes and releases pressure and heat, equally in all direction. It is this sudden buildup of gas pressure that constitutes the nature of an explosion.

III. COMMERCIAL EXPLOSIVES

The requirements for a usable explosive are variable within certain limits depending upon the purpose for which they apply:

a. Explosives must be easy and, above all, safe to handle. The solid physical state of explosives is the result of this requirement.

b. Dependable detonation must be possible using accessories which are simple to apply, i.e., a certain degree of sensitivity must be guaranteed in spite of the required safety in handling.

c. The explosive and resulting explosion must fulfill certain technical requirements e.g., detonation velocity,and should have as high a density as feasible,

d. Mining explosives (permissibles) should not produce any poisonous gasses when detonated.

e. Production and use must not present any unusual difficulties or dangers when the appropriate safety measures are observed.

IV. MILITARY EXPLOSIVES

Demands placed upon military explosives exceed those requirements which are placed on explosives in general. They must:

a. Also be chemically stable when subjected to moderate heating and must permit long storage periods. Good military explosives can be stored for a minimum of ten years within the temperature limits of -83°C to + 50°C, **e.g.** TNT;

b. be resistant to mechanical stress during loading, shipment and handling;

c. be resistant to dampness;

d. detonate completely when fired;

e. produce a high shattering effect (brisance);

f. be insensitive to non-detonating projectiles;

g. be insensitive to the effects of nuclear explosions.

V. SPECIFIC REQUIREMENTS AND REACTIONS

Speed of combustion reaction is of primary importance to produce the violent, physical disruption of materials in contact with, or near, explosive substances at time of detonation. Explosives can be extremely varied, with seemingly inactive substances causing powerful explosions, i.e., wheat dust in storage towers and coal dust in mines. A modern chemical explosive contains its own oxygen supply in the form of an oxidizing agent and some substance that is readily combustible. This compound when activated, changes from a liquid or a solid into a gas at an extremely rapid rate of expansion, accompanied by large amounts of heat and light, thereby exerting very high pressure on its surroundings,

VI. CHARACTERISTICS

Detonation rate i.e., velocity at which the substance turns into a gaseous state is not to be confused with the movement of the air around an explosion - 7,900 - 28,000 feet per second.

Temperature - 3,000 - 4,000 degrees C

(5,300 - 7,100 degrees F)

Pressures - up to 4,000,000 lbs., per sq. inch

Expansion rates - 10,000 - 15,000 : 1

Note: Ammonium Nitrate, Nitramon and other NCN type blasting agents used for cratering, ditching and quarry have a detonation rate of 8,900 - 16,500 feet per second.

Note: Black Powder and Smokeless Powder do not detonate, they deflagrate or change from a solid to a gaseous state relatively slowly over a sustained period at a rate of approximately 1,300 fps.

VII. COMPARISON OF DETONATION AND DEFLAGRATION

Due to the chemical structure of an explosive, an explosion can take place in the form of a deflagration or a detonation. It is therefore necessary to select the proper explosive for each required result.

Low explosives are thus used when the materials are only to be pushed aside and damaged as little as possible, since they produce only a thrusting, tearing effect. This applies primarily to the quarrying of rocks and soils, where large blocks, slabs or cut stone are produced with the aid of the driving force.

High explosives on the other hand are used wherever it is desirable to obtain a fragmentation effect from the explosive. Particularly obvious examples of this are demolition, mining operations, excavation of galleries and tunnels, and in the military, bombs and other munitions.

Comparison of Deflagration and Detonation

	Deflagration	Detonation
Type	Powder Explosive	High Brisant Explosive
Firing	By Flame	By Detonator
Explosion Velocity	50 to 1,250 fps. (Combustion velocity)	1,250 to 29,250 fps, (Detonation velocity)
Explosion Pressure	Gas Pressure	Detonation Pressure + Gas Pressure
Action	Thrusting, tearing	Shattering, smashing
Fragmentation	Weak	Strong
Debris	Large Pieces	Small Pieces

VIII. CLASSIFICATION OF EXPLOSIVES

Explosives are classed as low or high, according to the detonating rate or velocity at which it changes to a gas.

a. Low Explosives (Propellants)

Low Explosive Formulas

Potassium Nitrate	Hickory Charcoal	Sulfur
75%	20%	5%

Potassium Nitrate	Straw Charcoal	Sulfur
79%	18%	3%

Potassium Chlorate	Charcoal	Sulfur
75%	12.5%	12.5%

Potassium Nitrate - Sulfur - Sodium Sulfate
70.4% 19.4% 10.2%

Potassium Nitrate - Sawdust - Sulfur - Lampblack
64% 17% 12% 7%

Potassium Nitrate - Sulfur - Antimony Sulfate
70.6% 23.5% 5.9%

Potassium Nitrate - Starch - Sulfur - Antimony Powder
37.5% 37.5% 18.75% 6.25%

Potassium Nitrate - Ammonium Perchlorate - Sulfur - Willow Charcoal
50% 25% 12.5% 12.5%

Potassium Perchlorate - Sulfur - Charcoal
69.2% 15.4% 15.4%

Barium Nitrate - Sulfur - Charcoal
75% 12.5% 12.5%

Sodium Peroxide - Sodium Thiosulphate
67% 33%

Guamdine Nitrate - Potassium Nitrate - Charcoal
49% 40% 11%

The above formulas are safe enough to be made and used by black powder shooters.

The following are not as safe and homemaking should not be attempted:

Potassium Chlorate - Tar Oil
88% 12%

Potassium Chlorate - Potassium Perchlorate - Oil
68% 20% 12%

Potassium Chlorate - 105 degree flash point Fuel Oil		
90%	10%	

Potassium Chlorate - Kerosene - Albumen		
90%	9.5%	.5%

Ammonium Perchlorate - Resin - Zinc Dust - Oil			
70%	10%	15%	5%

Best examples of burning type explosives are Smokeless Powder. Manufacturers designate various Smokeless Powders as either Single Base, or Double Base. Single Base refers to the fact that powder was manufactured from pure, gelatinized, nitrocellulose. The Double Base Powders contain nitroglycerin (usually between 10% and 40%) and are considered high velocity powders. Low explosives are ideal where a pushing or shoving effect is required. They are readily available from the manufacturer or through sporting goods stores. When confined in a strong walled, sealed container, such as a steel pipe, the pressures developed are sufficient to burst the pipe in a manner similar to the detonation of a high explosive.

(1) Black Powder

Black powder is a mixture of approximately 75% Sodium Nitrate or Potassium Nitrate (Saltpeter), 15% crushed charcoal and 10% Sulfur. It is extremely sensitive to flame or spark and can be initiated with a time fuse or electric squib. It is manufactured in granular and pellet form. The burning rate is controlled by grain size; the finer the granulation the faster the burning. The burning rate or grain size is indicated by the "F" rating.

FFFG, or finer granulation, is fast burning and is used for smaller caliber rifle and pistol charges and as a priming charge in flintlock arms. The FFg granulation is somewhat slower burning and is used in medium sized calibers. The Fg, or slowest burning granulation is used in large-capacity cartridges.

Pellets are formed when granular powder is compressed; there is a hole through the center of each pellet. Pellets are less dangerous to handle, are more efficient and more economical to use than the granular form. The pellet, as issued in the military, comes in 50-pound wooden cases; the granular form is issued in 25-pound drums. The granular form is available in containers ranging from 1 to 30-pounds. The sulfur and charcoal are both identifiable by smell in unburned black powder.

(2) <u>Smokeless Powder</u>

Replaced Black Powder in mid-1800 as a propellant because of its stability in handling and the uniformity of burning rate. Commercially it is made from nitrocellulose of 12-13% nitrogen content, for powders of light density and low velocity. The dissolved (soluble in etheralcohol) nitrocellulose is mixed with a stabilizer or other chemicals, depending on the intended use, and then pressed through dyes by hydraulic presses. The cords produced are then cut into specific lengths and allowed to dry. Finished powder contains 3-7% alcohol and ether mix. The powder of higher velocity is made in the same manner.

Nitrocellulose of 13-14% nitrogen content is dissolved (acetone is used). Nitroglycerin is a prime ingredient of this powder, along with the usual stabilizers and additives. Smokeless Powder is used in the same manner as Black Powder in improvised bombs.

a. Primary High Explosives

These are sensitive high explosive compounds used generally as initiators in blasting caps, detonators and primers. They are difficult to manufacture outside of laboratory conditions and are extremely sensitive to shock, heat, friction and spark or flame. They are easily detonated and are used to propagate a detonating or shock wave to initiate Secondary High Explosives.

b. Secondary High Explosives

These are relatively insensitive high explosive compounds. The change in this type compound to a gaseous state - detonation - occurs almost instantaneously from 3,280 to 27,888 feet per second, producing a shattering effect (brisance on a target).

c. Gas and Dust Explosives

(1) Flammability of Gases

Under some conditions, common gases act as a fuel. When mixed with air, they will burn rapidly or explode. For some fuel-air mixtures, the range over which explosions can occur is quite wide while for others the limits are narrow. The upper and lower amounts of common fuels that will cause an ignitable mixture are shown in the table below. The quantity shows the percentage by volume of air. If the fuel-air mixture is too lean or too rich, it will not ignite. The amounts shown are therefore called limits of inflammability.

Fuel	Gases (% by volume of Air)	
	Lower Limits	Upper Limit
Water gas or Blue gas	7.0	72
Natural gas	4.7	15
Hydrogen	4.0	75
Acetylene	2.5	81
Propane	2.2	10
Butane	1.9	9

These fuels have been tested under laboratory conditions. They are effective. Ignition depends on method of initiation, uniformity of mixture, and physical conditions.

(3) <u>Dust Initiation</u>

Any finely-divided organic material (dust) or volatile fuel (see chart p. 128) can be initiated to propagate an explosive action. The initiator, or base explosive charge consists of an explosive compound (dynamite, TNT, C3 or improvised), and an incendiary mix. The incendiary mix can be composed of 2 parts aluminum or magnesium powder, mixed with 3 parts ferric oxide. (Sheet aluminum finely shredded or aluminum wire finely chopped can be used instead of powders). The incendiary element is thoroughly mixed with the explosive and packed in a suitable container. The dust or fuel, called a surround or cover, is placed in another container which is set on top of the explosive container. Upon initiation of the explosive charge, the surround is distributed throughout the air and ignited by the incendiary material. A one-pound charge will effectively detonate up to 45-pounds of cover. Cover of approximately 4-pounds is required for each 1,000 cubic feet of target. The following is a partial list of dusts which may be used:

Wheat flour	Corn Starch
Tapioca	Hard rubber dust
Coal dust	Aluminum powder
Powdered soap	Cork dust
Confectioners sugar	Cocoa
Powdered coffee	Magnesium powder

IX. <u>CONVENTIONAL EFFECT OF EXPLOSIVES</u>

a. <u>Blast</u>

Positive pressure wave with velocities of about 1100 feet per second (Mach 1) and pressures up to 1,000,000-lbs-per-sq-inch.

b. Heat

3,000 to 4,000 degrees C. - metal fragments are hot enough to start fires.

c. Suction Phase

A low pressure area is produced at the point of detonation by the outward moving pressure wave. When the pressure in this area drops below atmospheric pressure, the wind in the high pressure area reverses its outward direction and moves into the partial vacuum created in the low pressure area.

APPENDIX III
TELEPHONE CALL BOMB THREAT PROCEDURES

When a bomb is located without warning or detonates, the procedures to be followed are relatively simple and uncomplicated. On the other hand, the steps involved in the processing and evaluation of bomb threats are not as well defined, and often require decisions based upon little or no reliable data. It is, therefore, essential that personnel be trained to handle threats in a manner that will provide as much solid information as possible to assist in the evaluation of such warnings.

While bomb threats or warnings may be received by mail or message, the most popular method is by telephone. An accurate analysis of the telphone threat can provide public safety personnel with many valuable clues on which to base their recommendations, actions, and subsequent investigations. For example, the caller could reveal personal characteristics such as sex, ethnic or national group origin, or mental state. He may even unwittingly provide a clue to his location by background noises. Bombers often intentionally provide accurate information on the type of bomb and exact location. The natural reaction of an untrained person receiving a threat regarding a bomb is panic. A properly trained individual, however, will remain calm and take full advantage of the situation to improve the likelihood that the incident will safely and effectively be handled. There is the possibility, that if the person receiving the call remains calm and courteous, that he can ask the caller, in a routine manner, "Who shall I say called, Sir (or Mam)?" The caller, from force of habit or from a built in response to a polite question, may actually give his (or her) name. See attached Record Sheet.

As a minimum, every telephone operator or receptionist should be trained to respond calmly to a bomb threat call.

To assist these key individuals, a bomb threat call checklist of the type illustrated should be developed and kept in the immediate vicinity of their telephones. In addition to the use of a checklist, it is always desirable that more than one person listen in on the bomb threat call. To accomplish this, a system of covert signaling, perhaps a coded buzzer signal to a second reception point, could be considered. This signal would be activated by the first party receiving the threat so that a second party could listen in on the conversation, and provide an additional description of the bomb threat call.

Since a bomb threat could be directed to any extension in a facility, it is advisable to have a checklist at each telephone. An even more effective method is the automatic recording of threats. This can be accomplished by connecting all telephones to a central recorder. If the constant recording of all calls is undesirable, as soon as a call is recognized as a bomb threat, regardless of who receives the call, a button is pushed to activate the recording system. Recording eliminates the possibility of gaps, due to human error, in the information which the bomb threat call will provide and also may serve as evidence to identify the bomber. The recording, coupled with the information provided by the checklist, will often furnish important information necessary for the evaluation of the bomb threat.

If the individual receiving the call remains calm, it is often possible to extract additional information from the caller. This is especially true when the bomber wishes to avoid injuries or death. If told that a building is occupied or that a facility cannot be evacuated in the warning time provided, the bomber may be encouraged to provide more specific information regarding the location of the bomb.

The presence of the checklist will suggest additional avenues of inquiry to the person talking with the caller.

Depending upon the nature of the facility involved and the probability of bomb attack, it may be necessary to train all personnel to respond properly to telephone threats. In any event, training should include personnel on duty during periods when the facility is normally closed. Newspaper offices, news services and television stations are sometimes contacted with bomb threats against local facilities, and it is advisable to solicit their assistance in handling such threats in the most effective manner.

Facilities with high volume of bomb threat calls may, if located in medium size cities, possibly arrange for a telephone service that permits incoming call circuits to be locked open for tracing. This special service and the possibilities of routine call tracing should be discussed with the telephone company security officials.

BOMB THREAT CALL CHECKLIST

1. Exact location of the bomb?

2. Time set for detonation?

3. What does it look like?

4. What is the explosive?

5. Why was it placed?

Obtain as much detail as possible about the bomb and its location. Legitimate callers usually wish to avoid injury or death - request <u>more</u> data by expressing a desire to save lives.

1. Date ____________ and time ____________ of call

2. High points of language used:

3. Sex: ☐ Male ☐ Female   Age: ☐ Child ☐ Adult ☐ Teenager ☐ Ederly

Estimated Age ____.

4. Speech:

Speed	Tone
☐ Rapid	☐ Excited
☐ Normal	☐ Calm
☐ Slow	☐ Deliberate
☐ Hesitant	☐ Angry

Characteristics

☐ Disguised	☐ Lisp
☐ Broken	☐ Slurred
☐ Sincere	☐ Hiss
☐ Repetitive	☐ Obscene

5. Accent: National origin ______________ or Section of U.S. ___.

6. Background noises: ____

____

7. Name of Person receiving call ___________ location __________.

Upon receipt of a bomb threat, notify ____________ ext. _____.

APPENDIX IV

ENVELOPE AND PACKAGE BOMBS

DESCRIPTION AND IDENTIFICATION

1. Background

Since December 1971, terrorist elements have conducted an active campaign to deliver envelope and/or package bombs to selected individuals who are in disagreement with terrorist activity. Package bombs were mailed initially from Israel. In July and August 1972, letter bombs mailed from Beirut, Lebanon, were intercepted. More recently, envelope bombs, mailed in Amsterdam, Holland, and Benang, Malaysia, have been received in several countries including the United States, Canada, England and Germany.

2. Description

Envelope and package bombs intercepted and identified to date have been postmarked in India, Israel, Lebanon, Holland and Malaysia. The basic description of the bombs identified are:

a. Envelope bombs varying in size from 3 x 6 inches to 8 x 11 inches. The thickness has varied from 1/8 to 5/16 inches with a weight of approximately 1.7 ounces. Both standard air mail and plain envelopes in a variety of colors have been found. Addresses have been either handwritten or typed on a 1-3/4 inch white label with red trim or directly on the envelope.

It is important to remember that with clandestine devices of this type, the envelope sizes, shapes, colors and postmarks may vary extensively.

b. Package bombs recently received have been about 5 x 51/2 inches and have weighed approximately one pound. Each was packaged to appear as either a gift desk calendar, book or box of candy and placed inside an envelope; most of these were addressed in green ink. These items also could be received in a great variety of sizes, shapes and colors.

3. Suggested Precautions

The envelope and package bombs described above are designed to produce death or injury from an explosion, initiated electrically or mechanically, when the envelope/package is opened. Proper planning and coordination with local police and postal officials could prevent death or injury. The following procedures are suggested, should a suspicious item resembling the descriptions in paragraph 2 above be encountered: (Wear rubber gloves to avoid getting fingerprints on the envelope/package.)

a. Envelopes:

(1) Do not open.

(2) Hold before a light and try to identify the content. If content cannot be identified, continue with the following procedure.

(3) Grasp both edges of the envelope, at the bottom end, between the thumb and forefinger of each hand.

(4) Move thumbs and forefingers up the long axis, both edges, with a gentle rolling motion to ascertain flexibility.

(5) Continue rolling action with increasing pressure.

(6) If the envelope does not give to increased pressure without unusual resistance, move thumbs and forefingers toward the center and gently feel for secreted material, i.e. rubber-like substance, cardboard padding and round or flat object approximately one-half the circumference of a pencil with a length of about 11/2 to 2 inches.

(7) The firing mechanism may consist of parts made of plastic, brass, copper and other non-ferrous material but generally the component containing the priming compound (the primer) is made of ferrous material and can thus be detected with a magnet. A small magnet should be moved lightly up and down the long axis of the envelope. If ferrous metal is detected by the magnet, it could well be the primer of the firing mechanism.

(8) If steps 6 or 7 results in a suspected or positive finding, immediately place the envelope in a secure area of the office/building, i.e. fire resistant cabinet/safe; rest room, unpopulated basement area, unpopulated office space (open the windows, if possible). A very good "safe area" for the envelope can be formed by piling cartons of stationary or other available paper products to form a hollow square, two or three cartons high. Place the envelope in the center or "hollow" of this square of cartons. If bomb blankets are available, the envelope could be placed in a non-metallic box, wastebasket or other container and covered with the blanket. It is <u>not</u> recommended that the full weight of the blanket be placed on the envelope. If bomb blankets are not available, consideration should be given to placing the envelope on top of open books or other non-metallic, non shrapnel producing material.

(9) Simultaneous with step 7, evacuate all personnel for a minimum distance of 25 feet from the area; secure the area, and call the appropriate agency as determined by prior coordination. CAUTION - evacuation under these conditions must be accomplished judiciously and with discretion to avert panic.

A staged action such as power outage in the area or an urgent meeting in the conference room might be considered.

(10) Have a responsible official present at a predesignated location to meet the responding officials and accompany them to the suspect area. Ask for their recommendations as to additional measure to be taken (Wear rubber gloves to avoid getting fingerprints on package).

b. Packages:

(1) Do not open.

(2) If x-ray is used, it should be done remotely so as not to expose x-ray technicians to possible death or injury due to premature detonation of devices sensitive to x-ray pulse.

(3) Mechanically timed explosive devices are more adaptable to packages then envelopes; therefore, a medical stethoscope could be used to detect ticking or other mechanical sounds.

(4) Large, heavy duty envelopes, end or side opening, wallet envelopes, photographic negative envelopes and the recently available Postal Service padded mailing envelopes should be classed as packages rather than envelopes and handled accordingly.

(5) If a suspicious noise is detected, the procedures in steps 7 through 9 for envelope bombs should be followed.

APPENDIX V

DO'S & DON'TS FOR SUSPECTED BOMBS

1. DON'T submerge in water due to conductivity of electric circuits and possibility of violent reactions with chemical agents.

2. DON'T bring a bomb or suspected package into POD office or inhabited building.

3. DON'T indiscriminately shock or jar a bomb while transporting it.

4. DON'T attempt to open a package by hand; always use remote means where possible.

5. DON'T cut a string or unlatch a box or package by hand due to the possibility of pressure release devices.

6. DON'T turn a box or cylindrical object by hand due to the possibility of sliding contacts, mercury switches, or balanced pendulum fusion systems.

7. DON'T transport suspected nitroglycerine in metallic containers - use plastic or clean glass containers well cushioned if transporting is necessary.

8. DON'T lay a bottle on its side as this may cause certain hypergolic chemicals to mix causing a mechanical explosion or violent reaction.

9. DON'T puncture or cut into a box with a metallic object as the possibility of an electric probe-proof circuit may be employed.

10. DON'T accept identification markings on any suspected package as legitimate.

11. DON'T stereotype the bomb as being high explosive as the contents may be incendiary in nature.

12. DON'T transport a bomb through congested areas.

13. DON'T allow radio transmissions in the near vicinity of a suspected package.

14. DON'T pass metallic tools over or in the near vicinity of a suspected package until identification of its contents are made due to the possibility of a magnet device.

15. DON'T work one man alone and use a maximum of two per suspected device. One cardinal rule, however, is to work as a team keeping the number of personnel at a minimum on the actual device.

16. DON'T cut through any two wires or a double strand wire at one time and DO wear rubber surgeon's gloves while working on electric circuits as the sweat of the hands could bridge two wires and complete an electric circuit.

17. DON'T open pipe caps or related devices by hands as loose black powder may be present in the threaded portion.

18. DON'T attempt a rendering safe procedure on military munitions as the nature of these could include sensitive fuses, directional munitions or toxic gas agents. Request military assistance.

19. DON'T ever touch a package until jarring and tumbling remotely has been accomplished due to the possibility of a sentivity vibratory switch.

20. DON'T be heroic as a foolish heroic act in an attack on a suspected package could cost your life. It is much easier to replace a building or damaged area than a human life. In many cases, the perpetrator relies on your heroic attack to trigger his devices.

21. DON'T stereotype or try to outguess a perpetrator based on previous incidents or like devices. The device should be rendered safe with all the precautions of an unknown device until positive identification is made.

22. DON'T attempt to perform demolitions without completing an approved course of instruction under trained personnel.

23. DON'T permit smoking in the immediate vicinity of a suspected bomb.

24. DON'T transport a bomb or suspected package in the same vehicle in which you are riding. Always use a detached vehicle such as a trailer filled with sand or approved bomb carrier.

25. DON'T cut any one wire of any electric circuit until the circuit is identified as the possibility of a collapsing circuit could exist.

26. DON'T transport electric blasting caps, squibs, or like devices in a vehicle without proper shielding to keep out stray electricity.

27. DON'T remove or separate any explosive components by hand once access is gained to a device due to the possibility of booby-traps even on the smallest device. Use remote means of separation of explosive components.

28. DON'T wear nylon clothing while working on suspected packages due to the high static charges which could accumulate.

29. DON'T work near steam pipes, moving wheels, belts, or pulleys due to the danger of static charges.

30. DON'T give information as to tools and methods to unauthorized persons as the perpetrator may use this information against you in future operations. Consider all techniques and attacks as confidential.

31. DON'T make a hasty decision, use all available references and tools. If necessary consult with other disposal experts for a decision prior to attempting a rendering safe procedure on an unknown device or package.

32. DON'T underestimate evacuation distances. It is better to overestimate the evacuation distance for safety reasons. A good rule of thumb is the evacuation distance plus 50%.

33. DON'T overestimate delay time in a timing device. It is sound reasoning to figure the bomb will detonate twenty minutes earlier than the bomber said, than three minutes later. However, time is of the essence to the disposaleer as the bomb could explode at any time during operations.

34. DON'T underestimate the size of a suspected package as an explosive charge the size of a thimble or cigarette lighter could kill or maim nearby personnel.

35. DON'T x-ray any package where a clock work mechanism is heard to be active, as gaining access and neutralization with speed - by remote means - is very essential due to time element.

36. DON'T ever horse play while working with explosives.

37. DON'T become too careless or overconfident while working with explosives - your first mistake will usually be your last.

38. DO use speed with caution in any suspected package due to the possibility of a silent delay being employed.

39. DO use protective clothing and safety glasses while working on a suspected device.

40. DO arrange for medical and fire standby in all cases of suspected packages.

41. DO use chemical protective clothing (acid resistant, glasses, etc.) in the disposal of any hazardous chemical agents such as acids, nitrates, etc.

42. DO cooperate and coordinate plans with all available authorized personnel as these people are essential in any moving situation.

APPENDIX VI

MINIMUM SAFE DISTANCE RADIO & TV BROADCASTS

Radio Frequency (RF) transmitters, which include AM and FM radio, television and radar, create powerful electromagnetic fields, decreasing in intensity with distance from the transmitter antenna. Tests have demonstrated that electric blasting cap wires, under certain circumstances, may pick up enough electric energy from such fields to cause caps to explode.

To date there have been a few authenticated cases of a cap being fired accidentally by RF pickup on the wires. Investigation showed that even these cases would not have happened if Table 5 of distances had been adhered to. This long-term experience and also numerous tests indicate that if proper precautions are taken, such as adherence to the enclosed table of distances, the probability of an accidental firing is extremely remote.

The usual method for firing an electric blasting cap is to apply electric energy from a blasting machine, generator, battery, power line or other source of electric power to the open ends of the cap wires or the blasting circuit. The electric current then flows through the wires to the cap and the very small resistance wire inside the cap heats the primary explosive to the burning-explosion temperature.

If the electric blasting cap wires are in a strong RF field (near a transmitter that is radiating RF power), the usual unshielded leg wires or circuit wires, whether connected to a blasting machine or not, or shunted (short circuited ends) or not shunted (open ends), will act as an antenna similar to that on a radio or TV set. This antenna will absorb RF energy from the transmitter RF field and the electric current produced in the cap wires will flow into the cap.

In certain cases, depending on the strength of the RF field and the antenna configuration formed by the blasting cap wires and its orientation, sufficient RF energy may be induced in the wires to fire the electric blasting cap.

Commercial AM broadcast transmitters (0.535 to 1.605 MHz) are potentially the most hazardous. This is because they combine high power and low enough frequency so that there is little loss of RF energy in the lead wires.

Frequency-modulated FM and TV transmitters are unlikely to create a hazardous situation. Although their power is extremely high and antennas are horizontally polarized, the high frequency currents are rapidly attenuated in cap or lead wires. These RF sources usually employ antennas on top of high towers. This has an additional effect of reducing the electromagnetic field at ground level.

Mobile radio must be rated as a potential hazard because, although its power is low, it can be brought directly into an area where there is an Improvised Explosive Device (IED) with an electric cap in the circuit.

There is little possibility that sources of RF energy such as microwave relay will ever constitute a practical problem unless an IED using an electric cap is placed near the antenna.

For the radio frequencies used in AM radio broadcasting and mobile operations, cap and lead wire layouts can act as RF circuits (receiving antennas).

The most hazardous conditions exist when: 1) the circuit wiring and/or electric blasting cap leg wires are elevated several feet off the ground, 2) the length of this wiring is equal to one-half the wavelength of the radio wave or some multiple of it and 3) the electric cap is located at a point where the RF current in the circuit wiring is at a maximum.

Another hazardous situation occurs when the electric cap is at one end of wiring which: 1) is elevated in the air, 2) has a length equivalent to one-quarter the radio wavelength or an odd multiple of it and 3) is grounded to earth through the electric cap.

Radio wavelengths in feet are approximately obtained by dividing 1,000 by the frequency in megahertz. Both of these circuits require that the lead or cap wires be suspended above the ground. Both antennas achieve their maximum current pick-up when they are (1) parallel to a horizontal transmitting antenna, FM, TV or amateur radio or (2) pointed toward a vertical antenna, AM, mobile, etc.

Another sensitive RF pickup circuit and one which could exist in an IED is the loop circuit. The loop circuit is sensitive to the magnetic portion of the electromagnetic wave. In general, the larger the loop area, the greater the RF current pickup. The loop orientation for maximum pickup results when it is placed in the plane of the transmitting antenna. The loop configuration was selected for calculations deriving safe distance tables for AM broadcast transmitters and mobile transmitters, both employing vertical antennas.

In general, loop areas can be reduced by picking up both lead wires as in a duplex wire circuit and making wire splices as close to the ground as possible.

TABLE 1

Recommended Distances for Commercial
AM Broadcast Transmitters
0,535 to 1.605 MHz

Transmitter Power (1) (Watts)	Minimum Distance (Feet)
Up to 4,000	750
5,000	850
10,000	1,200
25,000	2,000
50,000(2)	2,800
100,000	3,900
500,000	8,800

(1) Power delivered to antenna.

(2) 50,000 watts is the present maximum power of U.S. broadcast transmitters in this frequency range.

TABLE 2

Recommended Distances for Transmitters up to
30 MHz (Excluding AM Broadcast) Calculated
for a Specific Loop Pickup Configuration (1)(2)

Transmitter Power (3) (Watts)	Minimum Distance (Feet)
100	750
500	1,700
1,000	2,400
5,000	5,500
50,000	17,000
500,000 (4)	55,000

(1) Based on the configuration shown in Figure 2b, using 20.8 MHz, which is the most sensitive frequency.

(2) This table should be applied to International Broadcast Transmitters in the 10-25 MHz range.

(3) Power delivered to antenna.

(4) Present maximum for International Broadcast

TABLE 3

Recommended Distances for VHF TV and FM Broadcasting Transmitters

Effective Radiated Power (Watts)	Minimum Distance (Feet) Channels 2 to 6 and FM	Minimum Distance (Feet) Channels 7 to 13
Up to 1,000	1,000	750
10,000	1,800	1,300
100,000 (1)	3,200	2,300
316,000 (2)	4,300	3,000
1,000,000	5,800	4,000
10,000,000	10,200	7,400

(1) Present maximum power channels 2 to 6 and FM - 100,000 watts.

(2) Present maximum power channels 7 to 13 - 316,000 watts.

TABLE 4

Recommended Distances from UHF TV Transmitters

Effective Radiated Power (Watts)	Minimum Distance (Feet)
Up to 10,000	600
1,000,000	2,000
5,000,000	3,000
100,000,000	6,000

(1) Present maximum power channels 14 to 83 - 5,000,000 watts

TABLE 5

Recommended Distances of Mobile Transmitters

Including Amateur and Citizens' Band

Minimum Distance (Feet)

Transmitter(1) Power (Watts)	MF 1.6 to 3.4 MHz Industrial	HF 28 to 29.7 MHz Amateur	VHF 35 to 36 MHz Public Use 42 to 44 MHz Public Use 50 to 54 MHz Amateur	VHF 144 to 148 MHz Amateur 150.8 to 161.6 MHz Public Use	UHF 450 to 470 MHz Public Use
10	40	100	40	15	10
50	90	220	90	35	20
100	125	310	130	50	30
180 (2)				65	40
250	200	490	205	75	45
500 (3)			290		
600 (4)	300	760	315	115	70
1,000 (5)	400	980	410	150	90
10,000 (6)	1,250		1,300		

Citizens' Band (Walkie-Talkie) 5 watts - Minimum Distance 5 ft.
26.96 to 27.23 MHz

(1) Power delivered to antenna.
(2) Maximum power for two-way mobile units in VHF (150.8 or 161.6 MHz range) and for two way mobile and fixed station units in UHF (450 to 460 MHz range).
(3) Maximum power for major VHF two-way mobile and fixed station units in 35 to 44 MHz range.
(4) Maximum power for two-way fixed station units in VHF (150.8 to 161.6 MHz range).
(5) Maximum power for amateur radio mobile units.
(6) Maximum power for some base stations in 42 to 44 MHz band and 1.6 to 1.8 MHz band.

APPENDIX VII

COMMON HOUSEHOLD COMMODITIES FOR MAKING EXPLOSIVES

Aluminum Flake (paint)
Aluminum Powder (paint)
Cement, "Duco"
Coal & Charcoal
Coal Dust
Cocoa
Coffee Powder
Cornstarch
Gasoline
Kerosene
Lead, Red
Magnesium Powder
Oil, Fuel
Paraffin

Petroleum Jelly
Photoflash Powder
Pitch
Plaster of Paris
Rice Powder
Resin
Rubber Dust
Sawdust
Soap Powder
Sugar, Confectioners
Tapioca
Turpentine
Wheat Flour
Zinc Powder

Common Ignition Compounds

Hypergolic and Exothermic Reactions

Potassium Chlorate & Sugar and a drop of Sulfuric Acid
Ignition Time - Instantaneous

Potassium Permanganate (finely ground) and a few drops of Glycerine
Ignition Time - 30 seconds to 2 minutes

Sodium Peroxide & Sugar and a few drops of Water
Ignition Time - Instantaneous

HTH Granular Dry Chlorine and an ounce or two of any of the following: Brake fluid, anti-freeze, paint thinner and solvent, Lestoil and Pineoil cleaners and many others
Ignition Time - 20 seconds to 4 minutes depending on amount of liquid used and freshness of HTH

Common Chemicals for Making Explosives

Aluminum Sulfate (tanning)
Aluminum Nitrate (fertilizer)
Ammonium Perchlorate
Barium Peroxide

Calcium Carbide (acetylene)
Calcium Hypochlorates
Carbon Bisulfide (fumigant)
Catechol
Copper Sulphate (weed killer)
Dinitrobenzine (dye)
Ferric Oxide (rust)
Ferric Sulfate
Glycerin (solvent & medicine)
Hydrogen Peroxide (bleach)
Lead Dioxide
Lead Tetraethel (gasoline)
Manganese Dioxide
Mercury (thermometers)
Naphtha (solvent)
Nitric Acid (fertilizer)
Nitrobenzine (solvent)
Nitrocellulose (explosive)
Nitromethane
Phosphorous, Red & White
Phenal, (disinfectant)
Piric Acid (dye)
Potassium Chlorate (matches)
Potassium Dichromate (photography)
Potassium Nitrate (extracted from barnyard soil)
Potassium Permanganate (disinfectant)
Resorcinal (dye & medicine)
Rosin (soap)
Silver Nitrate Powder (photography)
Sodium Chlorate (weed killer)
Sodium Nitrate (fertilizer)
Sodium Peroxide (bleach)
Stearic Acid (soap)
Sulfur (medicine & matches)
Sulfuric Acid (automobile battery acid)

List of Common Household Commodities and Their Chemical Name

CHEMICAL NAME	HOUSEHOLD SUBSTITUTE
acetic acid	vinegar
aluminum oxide	alumia
aluminum potassium sulfate	alum
aluminum sulfate	alum
ammonium hydroxide	ammonia
carbon carbonate	chalk
calcium hypochloride	bleaching powder
calcium oxide	lime
calcium sulphate	plaster of paris
carbonic acid	seltzer
carbon tetrachloride	cleaning fluid
ethylene dichloride	dutch fluid
ferric oxide	iron rust
glucose	corn syrup
graphite	black lead (pencil lead)
hydrochloric acid	muriatic acid
hydrogen peroxide	peroxide
lead acetate	sugar of lead
lead tetroxide	red lead
magnesium silicate	talc
magnesium sulfate	Epsom salts
naphthalene	mothballs
phenol	carolic acid
potassium bitartrate	cream of tartar
potassium chromium sulfate	chrome alum
potassium nitrate	saltpeter
silicon dioxide	sand
sodium bicarbonate	baking soda
sodium borate	borax
sodium carbonate	washing soda
sodium chloride	salt
sodium hydroxide	lye
sodium silicate	water glass
sodium sulfate	Glauber's salt
sodium thiosulfate	photographer's hypo
sulfuric acid	battery acid
sucrose	cane sugar
zinc chloride	tinner's fluid

Below are listed the most important and common ingredients that are used to form an explosive compound:

Ammonium Nitrate	An extremely unstable, white explosive, usually in crystalline form.
Aluminum	A silver metallic powder. When in pyro grade, it is a major ingredient in many ammonal explosive compounds.
Ammonium oxalate	A very valuable stabilizing agent, especially for NG.
Barium nitrate	Nitrated barium, in white crystalline powdered form.
Charcoal Powder	A fine black powder, which is extremely absorbent, and used extensively in pyrotechnics.
Guncotton	Nitrated cellulose (sawdust) is fairly stable, but usually used with other ingredients rather than alone. It is about 13-14 percent nitrogen.
Napthalene	This is a sensitizing agent that is normally in a white crystalline form.
Paraffin	This is a primary ingredient in plastique, and acts as a texturizer.
Potassium nitrate	An explosive compound in itself which is stable. It is usually in a white crystalline form.
Potassium perchloride	A white powder used as an igniting agent in high explosives. It is an extremely common ingredient in low explosives.
Resin	A gummy substance, which is flammable, and used in high explosives as an igniting agent.
Sodium carbonate	This is nothing more than ordinary table salt, and is used as a cooling agent in many high explosives.
Sodium nitrate	A stable explosive compound which has the advantage of being water-absorbent.
Sodium sulfate	A stabilizing powder, which is water-resistant.
Starch	This can be either potato or corn starch, and acts as an absorbent in many explosive compounds.

Sulfur	A yellow crystalline powder, which should be used in flour form only.
Vaseline	A clear petroleum jelly used in a similar manner as paraffin, as a plasticizer, for many forms of exploding gelatins and plastic explosives.

Common Household Commodities and Chemicals for Thickening Flame Fuels (Gasoline, Kerosene, etc.):

Lye System	Lye Resin Castor Oil
Lye - Alcohol System	Lye Ethyl Alcohol Tallow
Soap - Alcohol System	Ethyl Alcohol or Isopropyl Alcohol Laundry Soap
Egg System	Egg White and any following - Salt, Coffee, Tea Leaves, Cocoa, Sugar, Saltpeter, Sal Soda
Latex System	Latex and any following - Acetic Acid, Sulfuric Acid, Hydrochloric Acid, Formic Acid (from crushed red ants)
Wax Systems	Any following - Ozocerite, Mineral wax, Fossil wax, Ceresin wax, Bees wax, Bayberry wax, Myrtle wax
Animal Blood System	Animal Blood or Serum and any following - Salt, Coffee, Tea Leaves, Sugar, Lime, Baking Soda, Epsom Salts

APPENDIX VIII
COMMON TERMS ASSOCIATED WITH EXPLOSIVES AND BLASTING AGENTS

Strength

Straight dynamite is the base to which all other dynamite grades are compared. "Strength" is a measure of the energy content of an explosive which, in turn, contributes to the force and power it develops.

In straight dynamite, the percentage by weight of nitroglycerin is used to designate the strength rating. There is 40% nitroglycerin in 40% straight dynamite, etc. The power developed by 60% straight dynamite is however, not twice that of 30% straight dynamite, nor is 40% twice as powerful as 20%. The percentage of other ingredients is also a contributing factor in creating the energy delivered by the explosive. When the nitroglycerin content of 20% straight dynamite is tripled, the working ability or energy of the nitroglycerin is also tripled but the energy contributed by the other ingredients is diminished by 50%. Thus 60% straight dynamite has only been increased in energy over 20% straight dynamite by about half of what would be expected due to the energy loss brought about by the decrease of other contributing ingredients.

In dynamites, other than straight dynamite, the nitroglycerin content is reduced and other strength producing ingredients such as ammonium nitrate, are substituted. In these dynamites, the percentage classification indicates that the particular dynamite is equal in strength to a like figure of a straight dynamite on a weight-for-weight basis. In other words, one pound of 40% ammonia dynamite has the same strength as one pound of 40% straight dynamite regardless of the ratio of nitroglycerin. In these cases the percent strength markings are in fact weight-strength markings. Blasting agents and other non-nitroglycerin explosives are also percentage graded relative to an equal grade and weight of straight dynamite.

Other types of dynamite are graded according to their bulk or strength by volume. This bulk strength figure indicates that one cartridge, marked 40%, has the same strength as a cartridge of straight dynamite of the same per cent figure and bulk.

Rate of Detonation or Velocity

Velocity is a measure of the speed the detonation wave travels through a column of an explosive. Velocity data generally refers to a 1 1/4 inch diameter column. As the velocity is increased, the shattering effect on hard materials is increased.

The rate of detonation of a given explosive, provided that sufficient initiator or booster explosive is used, is determined by its degree of confinement and loading density. If confined only slightly, as by a cardboard or glass tube, a cylindrical column of high explosive detonates at a lower rate than if a heavy steel tube surrounds the explosive. This is because of the greater loss of energy in directions at right angles to the axis of the column. This effect is seen also if the diameter of the column of explosive is decreased. In such cases, there is a minimum diameter, also dependent upon degree of confinement, below which detonation cannot propagate itself throughout the length of the column. In practice, detonation rates are determined with columns 1 inch or more in diameter confined in Shelby steel tubing or as strong a material as the test method will permit. Decrease in loading density causes decrease in rate of detonation, the relationship being linear.

Each explosive has a characteristic maximum rate of detonation for a given density, although in the least sensitive explosives, particle size has some effect on this value. If an explosive is improperly initiated or has become desensitized, a detonation wave can, in some cases, progress through the explosive at much less than its normal maximum rate. Although nitroglycerin usually detonates at a maximum rate of about 26,000 feet (8,000 meters) per second, it can do so at rates as low as 4,900 to 6,350 feet (1,500 to 2,000 meters) per second. However, investigation has indicated that not all of the nitroglycerin is detonated in such cases. Gelatin dynamites, which normally detonate at rates of about 12,700 feet (4,000 meters) per second when manufactured, sometimes become desensitized during storage and detonates at about half the original rate.

As used in military ammunition high, explosives are loaded by casting in a molten form or by pressing to near their maximum densities.

In general, the rates of detonation of explosives are reflected by their relative brisance (shattering or fragmentation) values. The higher the rate of detonation of an explosive, the greater the brisance and more effective it is as a booster charge to initiate another explosive. This is the reason for the use of RDX, PETN and Tetryl in boosters for artillery shells.

Rate of Burning

As ordinarily applied, the term burning refers to the high temperature oxidation of an organic material or other fuel, such as sulfur or hydrogen. Ordinarily the oxygen utilized in such burning is that present in the surrounding air. Some high explosives and all propellants can undergo a type of autocombustion also referred to as burning, in which the oxygen present in the material is utilized for oxidizing the carbon and hydrogen.

The exothermicity of this recombination is such that autocombustion is self-sustaining from layer to layer of the material. If the material contains sufficient oxygen to convert all the carbon and hydrogen present to carbon dioxide and water, these and nitrogen are the gaseous products of burning. If less than this proportion of oxygen is present in the high explosive, or propellant, carbon monoxide and hydrogen also are formed.

Some high explosives, such as mercury fulminate, can undergo burning only when they have a layer thickness of about one crystal. If the layer is thicker, burning is transformed into detonation. If desensitized by pressing (dead pressed) at 25,000 psi or more and then ignited, mercury fulminate burns without detonation, the rate of burning decreasing with increase in density.

Priming compositions burn with great rapidity but do not undergo detonation. The detonation of those containing lead azide, mercury fulminate, or lead styphnate is prevented by the dampening effect of relatively inert ingredients, such as antimony sulfide, lead thiocynate, ground glass, or sulfur.

While high explosives such as TNT and Tetryl burn with the aid of atmospheric oxygen, they do not undergo autocombustion at atmospheric pressures. The destruction of such materials by the burning of thin layers, therefore, is practicable. Nitroglycerin, on the other hand, undergoes little if any autocombustion prior to detonation, even at atmospheric pressure.

Except as ingredients of propellant compositions, high explosives are not used under conditions where they undergo burning rather than detonation. The burning rates of high explosives therefore, are of little practical significance. Propellants are utilized under conditions where they undergo autocombustion and detonation is very undesirable.

Density

In regard to commercial dynamite, density is expressed by the number of 1 1/4 inch by 8 inch cartridges contained in a 50 pound case. In the various commercial lines this may vary from 85 to 205 cartridges per 50 pounds.

In military terminology it refers to loading density. Loading density is an important characteristic of military explosives a maximum density being desirable because of the fixed volume of the space available for explosives in a round of ammunition. The greater the loading density at which a fixed weight of a given explosive is pressed or cast, the greater is its effect when detonated. However, the standard explosives having the greatest density values, mercury fulminate and lead azide, are not the most powerful standard explosives; and the selection of an explosive for a specific use cannot be based primarily upon its density. Absolute density is seldom critical in small arms and artillery propellants, since they are seldom used at maximum density. However, this characteristic sometimes is of importance in propellants used for jet propulsion.

In most blasting agents and large diameter explosives, density is related to the density of water and is expressed as gram/cc. Density will generally range from a low 0.4 gram/cc to a high of 2.0 gram/cc. Free flowing Nitro-Carbo-Nitrates (NCN) vary widely in density depending on the amount of compacting the product receives in packaging and subsequent handling and storage. A single product can have poured density as low as 0.8 and compacted density of nearly 1.0 gram/cc.

Sensitiveness

Sensitiveness is a measure of the propagating ability of an explosive or blasting agent. The sensitiveness distance for dynamite is measured as the distance in inches, over which a one-half cartridge (1 1/4 x 8 inches) will propagate to another one-half cartridge (1 1/4 x 8 inches) when both halves are enclosed in a cardboard tube, cut ends facing, and shot. Non-nitorglycerin explosive and blasting agents must also meet sensitiveness requirements. Large diameter cartridge and canned items are tested to determine minimum propagation distance between a primed and unprimed unit. Free flowing products must be tested to insure column propagation in the minimum diameter in which they are to be used.

Sensitivity

Sensitivity is the measure of ease of initiation. Drop and friction tests are measures of sensitivity as are bullet impact tests and tests for sensitivity to heat and spark.

Impact Sensitivity

It is well known that explosives present considerable hazard when subjected to shock, but it is only recently that the mechanism of explosion by impact has been elucidated. It was long thought that initiation of explosion by a blow was due to rapid shear causing rupture of explosive molecules or the energy of impact causing direct mechanical excitation of such molecules. It has been since found that explosion by impact probably is due to the development in the explosive of hot spots of finite size. Such hot spots are formed by the adiabatic compression of small air or vapor bubbles trapped within the explosive, the friction of a particle of grit with a crystal of the explosive, or the viscous heating of rapidly flowing explosive under the pressure of impact. The first of the three causes is the most generally operative and can explain the initiation of explosives free of grit and those having very high melting points.

The greatly compressed gas bubble becomes highly heated and is surrounded by explosives also under considerable pressure at the instant of impact. If the temperature of the gas and the pressure are sufficiently great, explosion of the molecules adjacent to the gas is initiated and the explosive wave propagates itself throughout the rest of the explosive. The temperature required for explosion and, therefore, the degree of compression and severity of impact will vary for different explosives. In military testing, sensitivity to impact is expressed as the minimum height of fall of a 2-kilogram (4.4 lbs.) weight required to cause at least one explosion in 10 trials or to cause an explosion in 50% of the trials.

Friction Sensitivity

Like explosion by impact, the initiation of explosion by friction is ascribed to the formation of hot spots. In the case of frictional initiation, the first stage usually is a burning process. Lead azide is an exception to this, true detonation starting at this point of initiation. For a given frictional force, the incidence of hot spots is determined by the thermal conductivity of the sliding surfaces involved. The melting point of the fiction-producing material also is of importance, as this determines the highest temperature that can be developed. If this is low in value, explosion cannot be caused by friction. The sensitizing action of grit appears to be of no effect if the melting point of the grit is below 500 and if the hardness is below 2-3 on the Moh's scale. The most effective seem to be particles with high hardness (4 and up) and high melting point.

Bullet Impact Sensitivity

Another test used for differentiating explosives, with respect to sensitivity to mechanical shock, is the rifle bullet impact test, in which the explosive is subjected to a combination of impact and friction. A bomb is prepared by screwing a closing cap to one end of a piece of a cast-iron pipe 3 inches long, 2 inches in diameter, and threaded at both ends. The bomb is filled with the cast, pressed, or liquid explosive and is closed by screwing on a closing cap. With the loaded bomb in a vertical position, a caliber .30 bullet is fired through it from a distance of 30 yards, so that the bullet strikes between the two closing caps and at a right angle to the axis of the bomb. Five or more such tests are made and the percentage of explosions is noted.

Heat and Spark Sensitivity

Heat causes the decomposition of an explosive at a rate that varies with the temperature. Almost all explosives are characterized by a critical temperature, below which the rate of decomposition is so small as to be negligible. Nitroglycerin has a critical temperature of approximately 50 C, and, above this, the increase in rate of decomposition with increase in temperature is disproportionate. Other explosives have higher critical temperatures, those of TNT and Tetryl being about 460 and 235 C, respectively.

If a small mass of an explosive is suddenly subjected to a high ambient temperature, there ensues an induction or incubation period during which the explosive absorbs heat. If the ambient temperature is sufficiently high, decomposition of part of the explosive liberates heat and causes acceleration of the increase in temperature of the remaining explosive. When the temperature reaches a certain value characteristic of the explosive, the rate of the decomposition value becomes so great that explosion of the remaining material takes place. The temperature of the products of explosion is enormously greater than that developed during the prior slow decomposition; and if the explosion is so brought about at the end of a column of explosive, self-propogating detonation of the column can ensue. This occurs with ease when the explosive is of the initiating type, but it is not practicable to initiate the detonation of high explosives such as TNT and Tetryl by externally applied heat unless the explosive is under considerable pressure. This is due to the impracticability of developing the extremely high ambient temperatures necessary to reduce the incubation period to the order of 10   second.

Nonelectric sparks, such as those from steel, burning wood, etc. are much more effective in causing ignition and, therefore, represent greater hazard. As an example, black powder must be classed as a very dangerous explosive with respect to solid sparks, and all explosives must be classed as dangerous in this respect. It is for this reason that only nonsparking tools are used in mechanical operations in connection with both high and low explosives.

Initiation Sensitivity

Just as explosives vary greatly with respect to sensitivity to impact, friction, and heat, so do they vary in sensitivity to initiation by another explosive. Particle size affects the sensitivity to some extent, as do temperature, density, and physical state. Cast TNT is distinctly less sensitive to initiation than pressed TNT. Solid nitroglycerin is less sensitive than the liquid material. Decrease in initial temperature causes decrease in sensitivity to initiation, but this is not of great magnitude. Increase in density causes decrease in sensitivity, this effect being most pronounced with the least sensitive explosives. The effects of change in particle size vary considerably. Decrease in the average particle size of TNT causes increase in sensitivity to initiation, but reduction of the average particle size of Ammonium Nitrate past a certain value causes desensitization.

In general, sensitivity to initiation is parallel to sensitivity to impact; but this is not true with respect to sensitivity to initiation and heat.

The most frequent use of sensitivity tests is in connection with relatively insensitive blasting agents. Any compound intended for use in blasting which can be initiated with a number 8 cap is classed as a high explosive. The widespread use of Ammonium Nitrate-fuel oil mixtures for blasting has led to many means to increase the sensitivity of these mixtures. Improved propagation characteristics does not necessarily result from increased sensitivity; it can however lead to decreased safety since these mixtures are generally not handled with proper equipment or with methods developed for more sensitive high explosive compounds.

Inflammability

This refers to the ease with which a high explosive or blasting agent can be ignited. In the case of dynamites this ranges from some types that ignite readily and burn violently, to others that will not support combustion unless an outside source of flame is continuously applied. Most military explosives ignite with relative ease and may be destroyed by burning, care being taken to insure that there is no confinement such as may be caused by stacking or other form of compacting.

Fumes

Gases resulting from the detonation of commercial explosives and blasting agents are principally carbon dioxide, nitrogen and steam, and these are in the ordinary sense nontoxic. In addition, poisonous gases, including carbon monoxide and nitrogen oxides, result from any detonation. In the explosives industry, these gases are called fumes.

Exposure to either carbon monoxide or oxides of nitrogen can be fatal. In past years, there was major concern over carbon monoxide concentrations resulting from blasting. In recent years, increased amount of emphasis has been placed on the hazards of oxides of nitrogen. The reason for this is that the oxides of nitrogen are more insidious in that non-fatal concentrations may cause permanent tissue damage and recovery from exposure to higher concentrations may be less complete.

Simple mixtures of Ammonium Nitrate and fuel can produce severe fume situations. Variations in reactivity as well as loss of fuel through evaporation or migration can result in unbalanced compositions. If, in a simple mixture of Ammonium Nitrate and oil, part of the oil is lost by evaporation or settles out to accumulate in the bottom of the container, the product in the top of the container will be deficient in fuel and high oxides of nitrogen will result. At the same time, the mixture in the bottom of the container will contain excess fuel and produce high quantities of carbon monoxide.

Cartridge dynamites are formulated to be loaded in the wrapper supplied. This wrapper should not be removed nor should additional combustible material be added to the charge. A low detonation caused by absorption of water, improper handling or poor storage will result in excessive fumes. Fume classifications are based upon the cubic feet of poisonous gases produced by 1 1/4 x 8 inch cartridge:

Fume Class 1: less than 0.16 cu. feet
Fume Class 2: 0.16 to 0.33 cu. feet
Fume Class 3: 0.33 to 0.67 cu. feet

Water Resistance

High explosives differ widely in their ability to resist the effects of water. The gelatin dynamites are best in this respect. Some of the higher density ammonia dynamites possess good water resistance, while the low density ammonia dynamites and permissibles have little or no water resistance. When water is encountered in blasting, an explosive with at least some water resistance is necessary. If the blasts are to be fired soon after loading, an explosive possessing medium resistance may be satisfactory, but if the explosive is to be left under water for any length of time, a water resistant type, such as gelatin dynamite, should be used. Obviously, in dry work this property of explosives is of no importance.

For optimum reliability it is desirable to incorporate water resistance or water tolerance into the explosives or blasting agent formulation and not depend upon the package entirely. Experience also has shown that less durable bags and tubes are apt to become damaged in the field and permit water penetration regardless of how well they were sealed when manufactured. The failure of a single tube to protect the contents from water desensitization can result in column propagation failure unless multiple priming is used to permit shooting around the desensitized unit.

CARE AND PRECAUTIONS TO BE OBSERVED IN HANDLING EXPLOSIVES

Although explosives are considered hazardous materials, and there is a long history of accidents involving their manufacture and use, they can be handled and transported with safety. The excellent record of the explosives industry during the past half century, which is much better than those of some supposedly less dangerous occupations is attributable, in part, to the use of carefully designed buildings and equipment and, in part, to the training of personnel in accordance with stringent safety regulations. These designs and regulations have the primary objective of preventing human injury or fatality and the secondary objective of minimizing property damage in case of accident.

In addition to explosive hazard, explosives also represent varying degrees of toxicity hazard when inhaled, ingested or absorbed through the skin. Because of this and the fact that dust-air mixtures present additional explosion hazard, explosives should be handled under conditions of good ventilation, so that dust-air mixtures cannot be formed. Prevention of the spark discharge of static charges of electricity also should be insured by proper grounding devices.

The inhalation of vapors of nitroglycerin or the nitrated glycols can cause severe headaches. Some individuals are sensitive to very small amounts of such materials. The inhalation of the dusts or vapors of nitro compounds such as TNT and Picric Acid has been known to have fatal effects. If practicable, explosives should always be handled in well-ventilated places.

Effects of contact of the skin with explosives vary from simple discoloration to dermatitis and from headaches to poisoning, because of absorption through the. skin. The hands should be dry when handling explosives, as moisture increases the absorption through the skin. After handling small quantities of explosives, the hands should be washed thoroughly, preferably with a dilute solution of Sodium Sulfite and then with water. If exposed to contact with explosives throughout the day, the worker should bathe and change clothes.

Since they represent explosion hazards because of their characteristic sensitivity, explosives must be handled with care proportional to their relative sensitivity. For this reason, the degree of sensitivity of a new or unknown explosive should be determined before anything else is done with it. The outcome of sensitivity tests then will determine in what quantity and under what conditions material should be handled. The more sensitive the explosive, the smaller the quantity that should be handled at one time and the greater the precautions to be taken to prevent injury and damage in case of accidental explosion. It should be borne in mind that sensitivity is a characteristic involving initiation by any form of applied energy, regardless of whether by friction, compression, shock, mechanical, thermal, chemical or electrical sources.

Because of the very real danger from fragments, the more sensitive explosives should not be handled in glass vessels when dry and only behind a barricade when this is necessary. Metal vessels are dangerous if the explosive can react with the metal to form a sensitive compound. Metal spatulas, scoops, etc. should not be used for handling explosives, rubber articles being preferable.

The nervous reaction of the individual working with explosives is of great importance. The extremely nervous individual is not compatible with sensitive explosives, nor is the hurried worker. A slightly phlegmatic disposition and a consciously deliberate attitude are excellent complements to close observance of standard safety regulations.

APPENDIX IX

REFERENCE READING

FILMS AND SLIDE SETS

NOTE: The reader may question the necessity or validity of reference reading printed 40 years ago. This broad span of reference material shows the change in attitude, techniques, expertise and motivations of both the bombmaker and those person who must defeat the bombmaker.

BOOKS

1. Bebier, J., Manual of Explosives, Military Pyrotechnics, and Chemical Agents, MacMillan Publishing Co., New York.

2. Colver, E. High Explosives, De Van Nostrand Co. New York.

3. Danisevich, Phil, High-Low Boom, Directory of Explosives, Pyrotechnics, References and Application, 8917 Southfield Drive, Oaklawn, Ill. 60455.

4. Lenz, Robert, Explosives and Bomb Disposal Guide, Springfield, I11., Charles C. Thomas Publisher.

5. Pierce, G. McGuire (LC MCR), Destruction by Demolition, Incendiaries and Sabotage, (Field Training Manual, Fleet Marine Force), Paladin Press, P.O. Box 1307, Boulder, Colorado 80302

6. Powell, William, The Anarchist Cookbook, Lyle Stuart, Inc., New York, N.Y.

7. Reilly, J., Explosives, Matches, and Fireworks, De Van Nostrand Co., New York.

8. Sax, Irving N. Dangerous Properties of Industrial Materials, Reinhold Publishing Co., New York.

9. Saxon, Kurt, The Poor Man's James Bond, Atlan Formularies, P.O. Box 438, Eureka, CA 95501

10. Saxon, Kurt, Granddad's Wonderful Book of Chemistry, Paladin Press, P.O. Box 1307, Boulder Colorado 80302

11. Stoffel, Joseph F., Explosives and Homemade Bombs, Springfield, I11., Charles C. Thomas, Publisher.

12. Swearenson, Thomas S., Tear Gas Munitions, Charles C. Thomas, Publisher, Springfield, I11.

13. Brucker, Ernest W., Blasting Cap Recognition and Identification Manual, Police Technical Series 02, IACP Security Research Section, Eleven Firstfield Road, Gaithersburg, Maryland 20760.

COMMERCIAL PUBLICATIONS

1. The Chemistry of Powder and Explosives, Tenny L. Davis, John Wiley & Sons, Inc. New York.

2. Elements of Ammunition, O. Hart, Hohn & Sons, Inc., New York.

3. The Chemical Encyclopedia, G.S. Clark and G.G. Hawley, Reinhold Publishing Co., New York.

4. The Blasters Handbook, E.I. DuPont de Nemours and Co., Inc. Wilmington, Deleware.

5. Pamphlets, Books and Periodicals on Explosives and Related Items, published by The Institute of Makers of Explosives New York.

6. Ammunition, Powder and Explosives, four volumes, Picatinny Arsenal, Dover, New Jersey.

7. Explosions- Their Anatomy and Destructiveness, First Edition McGraw Hill Book Company, New York.

8. Bomb Scene Investigation, developed as a college textbook, available from Bomb Scene Investigation, 8226 E. Clarendon, Scottsdale, Arizona 85251

The following are available from Paladin Press, P.O. Box 1307, Boulder, Colorado 80302:

9. Underwater Demolition Team Handbook, 225 pp., 8 1/2 x 11

10. The Chemistry of Powder and Explosives, 490 pp., 5 1/2 x 8 1/2

11. Explosive Trains, 156 pp., 8 1/2 x 11

12. OSS Sabotage and Demolition, Incendiaries and Sabotage.

13. USMC Destruction by Demolition, Incendiaries and Sabotage, 270pp., 5 1/2 x 8 1/2

14. Booby Traps (FM 5-31), 133 pp., 5 1/2 x 8 1/2

15. Improvised Munitions Systems, by James Glackin, 60 pp., 5 1/2 x 8 1/2

16. CIA Explosives For Sabotage, 70 pp., 5 1/2 x 8 1/2

17. Special Forces Demolition Techniques (extract from FM 31-20), 6700., 4 1/2 x 6 1/2

18. Improvised Munitions Handbook (Frandford Arsenal), 164 pp., 51/2x81/2

19. Explosives and Demolitions (FM 5-25), 188 pp., 81/2x 11

20. Unconventional Warfare Devices and Techniques (TM 31-200-1)

21. Elements of Explosive Production, By James Glackin, 60 pp., 51/2x81/2

22. We Shall Fight in the Street, by Capt. S.J. Authbert, (Scots Guards), 68 pp., 51/2x81/2

23. Minimanual for the Urban Guerilla, By Carlos Marighella, 42 pp., 51/4x 8

24. Special Forces Operational Techniques (FM 31-20), 535 pp., 41/2X61/2

25. Manual of Explosives, Military Pyrotechnics and Chemical Warfare Agents, 170 pp., 51/2x81/2

26. Improvised Weapons of the American Underground, 20 pp., 81/2x11

MILITARY PUBLICATIONS

1. AMCR 385-100 SAFETY (Safety Manual), Department of the Army, Washington, D.C., U.S. Army Material Command.

2. Explosive Ordnance Reconnaissance, Pt. I & II, Headquarters, Third United States Army, Fort McPherson, Georgia.

3. Handbook, Explosive Ordnance Reconnaissance for U.S. Forces in Vietnam, Military Assistance Command, Vietnam.

4. Mines and Booby Traps Used by the Viet Cong in South Vietnam, Vietnam: Assistant Chief of Staff for Intelligence, Military Advisory Command, Vietnam.

5. FM 5-25 Explosives and Demolitions, Department of the Army, Washington, D.C.

6. FM 5-34 Engineer Field Data, Department of the Army, Washington, D.C.

7. FM 9-16 Explosive Ordnance Reconnaissance, Department of the Army, Washington, D.C.

8. FM 23-30 Hand and Rifle Grenades, Department of the Army, Washington, D.C.

9. FM 31-20 Special Forces Operational Techniques, Department of the Army, Washington, D.C.

10. TM 5-31 Booby Traps, Department of the Army, Washington, D.C. (Confidential).

11. TM 5-280 Foreign Mine Warfare Equipment, Department of the Army, Washington, D.C.

12. TM 9-1300-203 Artillery Ammunition, Department of the Army, Washington, D.C.

13. TM 9-1300-206 Care, Handling, Preservation, and Destruction of Ammunition, Department of the Army, Washington, D.C.

14. TM 9-1300-214 Military Explosives, Department of the Army and Department of the Air Force, Washington, D.C.

15. TM 9-1345-200 Land Mines, Department of the Army, Washington, D.C.

16. TM 9-1370-200 Military Pyrotechnics, Department of the Army, Washington, D.C.

17. TM 9-1375-200 Demolition Materials, Department of the Army, Washington, D.C.

18. TM 9-1900 Ammunition General, Department of the Army, Washington, D.C.

19. TM 9-1904 Ammunition Inspection Guide, Department of the Army, Washington, D.C.

20. TM 9-1910 Military Explosives, Department of the Army, Washington, D.C.

21. TM 31-200-1 Unconventional Warfare Devices and Techniques, Department of the Army, Washington, D.C. (Confidential)

22. TM 31-201-1 Unconventional Warfare Devices and Techniques/ Department of the Army, Washington, D.C.

23. TM 31-210 Improvised Munitions, Department of the Army, Washington, D.C. (Confidential)

24. TB PMG 20 Crimes Involving Explosives, Department of the Army, Washington, D.C: Government Printing Office, January 6, 1955, 15 pp.

25. Encyclopedia of Explosives, Ordnance Liaison GP, Durham, Box CM, Duke Station, Durham, N.C.

26. TC 5-31 Viet Cong Booby Traps, Mines, and Mine Warfare Techniques, Department of the Army, Washington, D.C.

27. Engineering Design Handbook (Explosive series and explosive training), Department of the Army, Hdq., U.S. Army Material Command, Alexandria, VA 22304

GOVERNMENT PUBLICATIONS

1. Congressional Record, "The Library of Congress Survey of State Laws on Explosives Finds Woeful Inadequacies:, 1970. (With attached Senate Memo #70-9, "The Bomb Culture in America", April 23, 1970, Senate Republican Policy Committee).

2. The Present-Day Ku Klux Klan Movement, Committee on Un-American Activities, Washington, D.C.: Government Printing Office, December, 1967, 371 pp.

3. Bureau of Mines Information Circular 8405, Factors in Selecting and Applying Commercial Explosives and Blasting Agents, United States Department of the Interior 1968.

4. Bureau of Mines Information Circular IC 7335, Destruction of Damaged, Deteriorated, or Unwanted Commercial Explosively United States Department of the Interior 1945.

5. Bomb Threats and Search Techniques, Bureau of Alcohol, Tobacco and Firearms, Department of the Treasury, ATF P 75502 (8-74).

ARTICLES (BY TITLE)

1. "Anti-Bomb Bill", Industrial Security, June, 1970, v. 14, no. 3, p.8.

   (The article is a reprint of Senate Bill #S.365O, introduced in the U.S. Senate on March 26, 1970, by Senator Roman Hruska, dealing with the illegal transportation, use, or possession of explosives.)

2. "The Bomb Sniffer", Time Magazine, March 30, 1970, p. 47.

   (An article on a device to detect the presence of explosives by analysis of vapors given off by the explosive mixtures.)

3. "Bomb Threats: A Practical Procedure", Industrial Security, June, 1970, v. 14, no. 3, p. 4.

   (The author of this article, unnamed, gives the steps his plant, or firm, takes when a bomb threat is received.)

4. "Bombs Blast a Message of Hate:, Life Magazine, March 27, 1970, v. 68, no. 11, p. 24.

   (This Life article, complete with photographs, reports on bombing incidents throughout the U.S., and on the activities of the "Weathermen", and the "Students for a Democratic Society".)

"Drain Quarry Used to Test Bomb Basket:, The Drain Enterprise (Oregon, May 21, 1970, v. 47, no. 52, p. 5.

(An article, with photographs, regarding tests of the P.M. Tabor Co., Laguna Beach, Calif., ballistic fiberglas "bomb basket".)

"Fatal Bombing on California Campus", Security World, May 1969, v. 6, no. 5, p. 25.

(Article reprinted from the April 11, 1969, Santa Barbara News-Press, regarding the combination explosive/incendiary bombing at the University of California's Santa Barbara Campus.)

"Gone Fission", New Yorker Magazine, May 5, 1975.

(A tongue-in-cheek article about how simple it is to build a nuclear device.)

"House, Senate Hearings Set on Explosive Controls," Gun Week (Newspaper) July 24, 1970, p. 1.

(This article concerns the mid-July hearings before the Senate Permanent Subcommittee on Investigations, headed by Senator John McClellan. The hearings dealt with the pattern of bombings which have occurred in the U.S. since January 1, 1969.)

"When Terrorists Go Nuclear", Robert Ginskey in Plain Truth, June 7, 1975.

(A simplistic discussion of how a nuclear bomb works and is assembled. It's really not as simple as this article would lead you to believe.)

ARTICLES (BY AUTHOR)

Barrett, James R., "Bomb Scares and Vandalism," Police Yearbook, 1957, p. 144.

(Article by the Chief, Police Bureau, New York State Division of Safety, Albany, N.Y., on the pattern of bomb threats and the need not to over-dramatize bomb threats in the news, radio, etc.)

Barrett, James R., "Rope Nets for the Handling of Bombs and Suspicious Packages,", Journal of Criminal Law. Criminology and Police Science, May-June, 1941, v. 32, no. 1, p. 108.

(This article describes the construction and testing of a rope basket used to transport "ordinary" fabricated bombs.)

Burkhouse, Frank X., "Sabotage: The Benign Weapon", Industrial Security, July, 1964, v. 8, no. 3, p. 10.

(Article by the Manager of the Security Operations Section WDL Division, Philco Corporation, Palo Alto, California, in which he gives the history of sabotage activities and explains, through illustrations, various devices used in sabotage.)

5. Cote, Robert, "Terrorist Activities in Montreal", Security World, November, 1969, v. 6, no. 10, 0. 41.

(Article by Sgt. Cote, Montreal Police, describing the experience of the Montreal police in combating terrorist bombings during the period 1963-1970.)

6. Durfee, Richard A., Bombs, Explosives, and Incendiary Devices, Cocoa Beach, Florida! Police Science Press, 1961, 37 pp. , Illus.

(A booklet which explains what a bomb is, how to respond to a bomb threat, and what to do with the. bomb and possible bomb fragments. Contains over 50 bibliographic entries.)

7. Thomas, Charles C., Publisher, Accidental or Incendiary (1974) Fitch & Porter, Bannerstone House, Springfield, Ill.

8. Fagerstrom, Dorothy, "Danger: Bomb Squad at Work", Law and Order, November, 1962, p. 62.

(A short article on the training given the Stanford, Conn., Bomb Squad by the New York Bomb Division, New York Police Department, and some of the equipment used.)

9. Goering, George B., "Basics for Bomb Emergency Planning", Security World, June 1970, v. 7, no. 6, p. 16.

(Article by the Head of the Security Branch, Naval Ship Engineering Center, Hyattsville, MD, analyzing steps to be taken when dealing with bomb incidents to include prevention of the incident, what to do when a bomb-threat message is received, when a bomb is discovered, and when the explosion occurs. A chronology of bombing incidents for February and March, 1970, is given.)

10. Kettering, Paul, T., "Magnesium Bombs in A-R-S-O-N", Law and Order, June 1964, p. 76.

(An article on the fabrication and use of magnesium bombs.)

11. Kluchesky, Joseph, "Milwaukee Police Bomb Wagons", Journal of Criminal Law, Criminology and Police Science", May-June 1941, v. 32, no. 1, p. 114.

(In this article, the Chief of Police, Milwaukee, Wisconsin, describes the special police bomb conveying vehicle developed by the Milwaukee Police Department. He also describes the "bomb basket" used in the vehicle.)

12. Lamb, Ralph, J., "Clark County Explosive Ordnance Detail", FBI Law Enforcement Bulletin, November, 1969, p. 3.

(Article by the Sheriff of Clark County, Las Vegas, Nevada, on the equipment used by Clark County explosive disposal details in rendering explosive items safe.)

13. Lenz, Robert R., "Backyard Explosive", Police, November-December, 1964, v. 9, no. 2, p. 36.

(Article by an explosive ordnance disposal specialist, on clandestine explosive devices.)

14. Love, Robert C., "Planning for Bomb Incidents", Law and Order, April, 1960, p. 52.

(Article by the Safety Director, Stanford University, on the importance of having a preconceived plan on how to handle a bomb incident.)

15. McGuckin, Vernon E., "Composition and Nature of Chemical Bombs", Police Yearbook, 1943, p. 149.

(A general discussion by Major McGuckin, Chemical Warfare Service, War Department, Washington, D.C., on chemical bombs, to include smoke bombs, gas bombs, and incendiary bombs.)

16. Muehlberger, C.W., "The Handling of Explosives and Suspected Bombs, Journal of Criminal Law, Criminology and Police Science, May-June, 1940, v. 31, no. 1, p. 100.

(Article by the Chief Chemist, Cook County, I11., Coroner's Laborabory, on how to handle bombs if qualified bomb disposal technicians are not available.)

17. Muelberger, C.W., "The Investigation of Bombs and Explosions", Journal of Criminal Law Criminology and Police Science, September-October, 1937, *V.* 28, no. *3, p.* 406 and November-December, 1937, no. 4, p. 581.

(A lengthy article by the Chief Chemist, Cook County, I11., Coroner's Laboratory, on the classification of explosives, types of bombs, and the chemical analysis of explosives. The author is also a consultant to the Chicago Police Department on bombing investigations.)

18. Pyke, James A., "A Bomb Fragment Identification Chart", Journal of Criminal Law, Criminology and Police Science, November-December 1943, v. 34, no. 4, p. 276.

(An article by the Chief of the Bomb Squad, New York Police Department, explaining how scientific examination of fragments of an exploded bomb may reveal information as to the type of construction of the original bomb.)

19. Pyke, James A., "The LaGuardia-Pyke Bomb Carrier", Journal of Criminal Law, Criminology and Police Science" September-October, 1943, v. 34, no. 34 p.198.

(This article gives the history of the first, second, and third La Guardia-Pyke bomb carrier, used to transport bombs or suspected bombs from the scene of discovery.)

20. Pyke, James A., "Some Notes on the Handling of Suspected Bombs and the Investigation of Explosions", Journal of Criminal Law, Criminology and Police Science, March-April, 1942, V.32, no. 6, p.668.

(This article explains some "don'ts" about handling bombs or suspected bombs.)

21. Ronayne, John A., "Investigating Crimes Involving Explosions", Police, January-February, 1960, v. 4, no. 3, p. 64.

(Article by the Deputy Inspector, New York Police Department devoted mainly to situations in which an explosion has already taken place and an investigative problem exists.)

22. Ronayne, John A., "Package Bombs and Their Investigation", Police, September-October, 1959, v. 4, no. 1, p. 6.

(Article on the handling of bomb incidents and the investigation and disposal of homemade bombs.)

23. Sherwood, E.L., "Effect of Bombs and Bomb Reconnaissance Squads", Police Yearbook, 1943, p. 152.

(This article, by Lt. Col. Sherwood, Bomb Disposal Officer, Ordnance Division, Headquarters, 2nd Service Command, Governors Island, N.Y., is directed toward the police officer who may be called on to be a member of a bomb reconnaissance team. It deals with aircraft bombs and bomb crating.)

24. Stoffel, Joseph F., "Basement Bombers: A Fire-Police Responsibility", Police, November-December, 1965, v. 10, no. 2, p. 6.

(Article by an ex-EOD Officer, on homemade bombs. Special emphasis is placed on makeshift rocket propellants.)

25. Stoffel, Joseph F., "Dynamite and Blasting Caps", Police, September-October, 1963, v. 8:1, p. 23.

(Article on the disposal of dynamite and blasting caps.)

26. Stoffel, Joseph F., "Explosives and the Police Officer", Police, September-October, 1962, v. 7, no. 1, p. 6.

(Article on clandestine explosive devices which may be encountered by the police officer.)

27. Sweeney, Frank A., "Police Control of Disturbances in Small Communities", Police Yearbook, 1957, p. 147.

(Article on areas in which there may be disaffection between the police and the community in small towns. Written by the Police Chief, Jenkintown, Pennsylvania.)

28. Talmadge, Ralph W., "Explosives Disposal Assistance from the U.S. Army", FBI Law Enforcement Bulletin, January, 1968, p. 9.

(Article by Capt. Talmadge, Commanding Officer of the 61st Ordnance Det. (Explosive Disposal), Ft. Sill, Oklahoma, explaining the history of explosive ordnance and the assistance rendered law enforcement officers by EOD units.)

29. Wheeler Charles A., "Bridgeport Police Bomb Buster", Journal of Criminal Law, Criminology and Police Science, May-June, 1941, v. 32, no. 1, p. 117.

(Articles by the Chief of Police, Bridgeport, Conn., on the construction of the "Bomb Buster" vehicles used to transport bombs or suspected bombs.)

30. Wilson, C M. "Disposal of Bombs and Suspicious Parcels", Police Yearbook, 1943, p. 156.

(Article by the Director of the Scientific Crime Detection Laboratory, Chicago Police Department, on basic procedures and problems involved in their disposal.)

MISCELLANEOUS

1. General Procedures for Disposal and Investigation of Bombs and Recovered Explosives, Miami, Florida: Miami-Dade Junior College, North Miami, no date, 72 pp.

(Outline for use by students enrolled in law enforcement and fire and rescue training classes. Contains fragmented information on disposal and investigation of incidents involving bombs and explosives.)

2. The Holland Tunnel Chemical Fire, New York: The National Board of Fire Underwriters, 85 John Street, New York 38, N.Y., 20 pp. (no date).

(This is the report by the National Board of Fire Underwriters, on the May 13, 1949 chemical fire in the Holland Tunnel.)

3. The Roseburg, Oregon, Fire, Explosion and Conflagration, New York: The National Board of Fire Underwriters, 85 John Street, New York 38, N.Y. 20 pp. (no date).

(This is the report by the National Board of Fire Underwriters, on the August 7, 1959 fire and explosion which blasted a twelve-block area in downtown Roseburg, Oregon.)

4. Training Bulletin, Chicago Police Department, April 30, 1962, v. 3, no. 18.

(This is a two-page training bulletin on the handling, dismantling, investigation and disposal of bombs, explosives and suspicious packages.)

5. Bomb Planning Workbook, Brodie, Thomas G. & Feldstein, Dee, Motorola Teleprograms, Inc., Schiller Park, Illinois.

MOVIES, FILMSTRIPS AND SLIDE SETS

BOMB INDOCTRINATION SERIES - 16-mm Movie, 64 min.:

Bombs I - An Introduction to the bomb scare problem. (24. min.)

Bombs II - Tells, among other things, what not to do when faced with a suspected bomb. (20 min.)

Bombs III - Provides theoretical knowledge of various bomb disposal techniques. (20 min.)

BOMB SEARCH PROCEDURES - Sound filmstrip, 16 min.:

Shows in detail the establishment of the search teams and functions of the team.

BOMB THREAT! Plan Don't Panic - 16-mm Movie, 15 min.:

Details how to plan and prepare for bomb threat calls and how to conduct bomb search follow through.

HANDLING TELEPHONE BOMB THREATS - Audio cassette and manual program 20 min.:

Designed specially as a training program to educate switchboard operators or anyone else who might receive bomb threat calls.

PLANNING FOR BOMB THREATS - Sound filmstrip, 16 min.:

Covers the nature of bomb threats, search and evacuation procedures, bomb threat communications, and bomb recognition and handling. (Also avialable in slide/cassette format)

POSTMARK: TERROR - 16-mm Movie, 15 min.:

Employee and security training awareness film deals with all aspects of letter and package bombs.

All above available from Motorola Teleprograms, Inc., 4825 N. Scott Street, Schiller Park, Illinois 60176.

<u>EXPLOSIVES</u> - 35-mm color slide sets:

12 slide sets, (10 slides per set) available. Bomb Scene Investigations, 8226 E. Clarendon, Scottsdale, Arizona 85251

APPENDIX X

GLOSSARY OF TERMS ASSOCIATED WITH EXPLOSIVES, BOMBS, BOMB HANDLING AND DISARMING PROCEDURES

ACCESS and RECOVERY: To gain entrance to; to expose; to avail; to remove; the operation in E.O.D. to first and finally expose a piece of ordnance to an EOD procedure; i.e. digging, moving, probing.

ACCIDENT: An unexpected event involving a nuclear weapon or component resulting in any of the following: Loss or serious damage to the weapon or component; nuclear or non-nuclear detonation of the weapon; radioactive contamination; public hazard.

AMMUNITION: The projectiles thrown against an enemy; such as bullets, shells, grenades, bombs, or mines.

ANTI-DISTURBANCE: A device placed into an explosive unit designed to function the mechanism on any attempt to jar, tilt, or move the unit. Examples: a sensitive vibratory switch or anti-tilt (mercury switch).

ANTI-LIFT: A mechanism used to fire an explosive device when the primary object is lifted or tilted.

ANTI-PERSONNEL: In munitions or warfare anti-personnel refers to the devices or munitions designed for use against personnel or troops.

ANTI-TANK: In mine warfare, anti-tank refers to the mines designed to immobilize or destroy tanks and tracked vehicles.

ANTI-WITHDRAWAL: A device or feature which prevents the removal of fuze or triggering mechanism from an explosive device. Examples: placing epoxy cement in the fuze threads, employing a lock ball or wedge, or welding the fuze into the device to prevent removal.

ANTI-WITHDRAWAL/BOOBY TRAP: A device which locks the fuze into place and is designed to function the explosive on attempted removal of the fuzing system.

ARMED: In munitions, the condition of being ready to function; that is, all explosive components are aligned, and/or all electrical connections are completed ready for firing. In straight mechanical devices, this could be removal of safety pins or lock devices.

ARMING: The action involving removal of safety devices or arranging components from a safe condition to a state of readiness for initiation.

ARMING DELAY: The pyrotechnic, electrical, chemical, or mechanical action which provides a timed delay between the initiating action and complete alignment of all firing components. Usually installed in explosive devices to allow the perpetrator a safety margin for arming the device.

ARMED AND FUNCTIONING: In a timed explosive device, the unit (electrical, chemical, or mechanical) has started and is moving towards the firing time.

BAFFLE: A wall or screen used to deflect, check, or otherwise defeat an explosive shock wave. Example: mattresses placed around an explosive device.

B.I.P. - BLOW-IN-PLACE: The slang expression meaning to destroy-where the item lays without disturbance; in some cases, an RSP.

BLAST (or BLAST EFFECT): The blast of a detonation is the shock wave emitted from the point of detonation, and includes a shock front, a high pressure area behind the shock front, and the following rarefaction. The energy released by the detonation of an explosive charge compresses the layer of air around the charge and forces it outward at high velocity. This layer of highly compressed air is bounded by an extremely sharp front known as the "shock front". The shock front is followed by a High Pressure area composed of the gaseous products of detonation which move outward as a strong wind. Because of the forward inertia of the gaseous products of detonation, the pressure in the High Pressure area cannot decrease in velocity as rapidly as the pressure at the point of detonation. Consequently, a low pressure area is produced, a "rarefaction," behind the High Pressure area. When the pressure drops below the atmospheric pressure level, the wind of the High Pressure area reverses its direction and moves towards the original detonation point (suction phase). Thus a target subjected to the blast of an explosive must undergo both a shattering shock front and pressures in two directions.

BLASTING: The use of explosives to shatter or destroy.

BLASTING CAP: A small pencil-like cylindrical case with a thin wall in which is enclosed a sensitive high explosive, such as mercury fulminate, used as a detonator to set off the main charge explosive in a device. They are normally fired by safety fuze, electric current, or chemical action. Containers for blasting caps are found constructed of copper, aluminum, or plastic. Explosive device for initiating explosives; 1" to 2" metal object about 1/8" to 3/16" in diameter filled with explosives: i.e. an electric blasting cap. Synonym for detonator.

B.D.: The abbreviation for "Bomb Disposal."

BODY: That part of ordnance which encases the explosives and devices of the ordnance; the outer shell of ordnance; of various material; i.e. metal, plastic, wood.

BOMB: A device filled with explosives, chemicals, pyrotechnics, inert filler; a dropped munition; used to destroy installations, dropped by plane; a weapon; usually having stabilizers and initiators.

BOOBY TRAP: An explosive device, which is exploded when an unsuspecting person disturbs an apparently harmless object or performs a presumably safe action.

BOOSTER: A high explosive element, sufficiently sensitive to be actuated by a small explosive element in a fuze or firing device, and powerful enough to cause detonation of a main explosive charge. In a firing train, the order is usually primer, detonator, booster, and main charge.

BRISANCE: In explosives, brisance refers to the degree of shattering effect exerted by the explosive. Example: tetryl explosive by its rapid detonating rate is far more shattering in nature than ammonium nitrate,

BURSTING CHARGE: The internal charge or explosive of a device which breaks the casing of a shell, grenade, rocket, or bomb to produce demolition, fragmentation, or chemical action.

BUTTRESSING: In bomb disposal operations, this refers to the measures taken to provide support, by means of a buttress, to prevent earth shock and blast damage to structures. Example: sand bags or loose sand poured against walls or around an explosive device.

CAMOUFLET: A subterranean cavity; a cavity filled with poisonous or explosive gases usually caused by subsurface explosions; from the word camouflage or concealed.

CARTRIDGE: A case, capsule, shell, containing an explosive charge or propelling charge. Example: a small arms cartridge made of brass and containing the primer, propellant and projectile; a stick of dynamite.

CAST: In explosives, the types which are melted and formed by pouring into a mold to harden. Example: TNT which is melted and poured into a bomb case for hardening.

CAUTION: A reminder of an ever present hazard to EOD personnel; used to E.O.D.B. publications as a safety to personnel.

CAVITY: Any void; a space for an additional component; a standoff; a hole in the ground.

CAVITATION: In explosives, the formation of a cavity or indentation by means of a cavity or shape charge. The cavitation being caused by the explosive jet and slug. Example: the Munroe shape charges.

CAVITY CONTAINERS: Also known as shape charges, and are the geometric cavity suitable liner with a stand-off for deep penetration into a steel or concrete object. It normally consists of a container, cavity liner (cone), an explosive charge, and stand-off distance.

CLANDESTINE DEVICE: A device made and constructed with secrecy; by design usually for an evil or illicit purpose.

COCKED STRIKER: Also called a firing pin. Consists of a blunt or sharp pin held under spring tension and designed to fire a primer or detonator by stab, friction, or percussion action when released.

COMPOUND: In explosives, the mixtures used in the manufacture of an explosive device or explosive itself.

CONE: A ballistic shape for munitions; a nose for munitions; the shape used in shaped charges; cavity liner for shaped charge.

CONTAMINATION: Chemical, biological and nuclear substance hazardous to personnel; unclean, unhealthy; an over abundance of ordnance; i.e. a contaminated ordnance range.

CONTRIVED EXPLOSIVE: Refers to an explosive which is improvised by use of fuel and oxidizers as compared to a commercially manufactured explosive.

CONVENTIONAL EXPLOSIVE: Other than nuclear; a material capable of detonating.

COOK-OFF: An explosive or munition which upon initiation fails to fire but due to excessive heat will eventually function at an unexpected time.

CORDTEX: Also called primacord or detonating cord. Consists of a reinforced tubular structure containing a high explosive and is used to transmit a detonating wave from one place to another.

COUNTER CHARGE: In disposal of explosives, counter charge means placing one explosive charge against another for purposes of detonating the charges.

DETONATION: A term usually associated with high explosives, meaning to explode with sudden violence. A low explosive would normally create a sudden explosion by rapid expansion of gases by burning, whereas a high explosive would detonate violently by a sudden chemical change, resulting in a brisant explosion.

DISARMING: The act or process whereby explosive items are made safe by proper replacement of all safety devices or by separation of various components in the firing train.

DESENSITIZER: Any compound used to reduce the sensitivity of an explosive. Examples: gelatin, starch, sawdust, acetone, etc.

DETONATING CORD: A cord-like explosive with a fabric cover containing a core of high explosive used to transmit a detonating wave. The exterior has a waxy appearance and is initiated by means of blasting cap. Also called cordtex or primacord. Colors and materials of detonating cord are variable.

DETONATOR: A sensitive high explosive element used in an explosive train to create or transmit a detonating wave to a booster or main charge of high explosives. Example: a blasting cap.

DEFLAGRATION: A rapid burning. Low explosives are said to deflagrate whereas high explosives are known to detonate.

DEMOLITION: The act of demolishing. However, in explosives terminology, demolitions could mean the explosives and tools needed for explosive demolition works.

DESENSITIZED: Refers to a normally high sensitive explosive which is desensitized by means of a compound added to reduce sensitivity. Example: nitroglycerin desenitized by adding gelatin to form gelatin dynamite.

DUD-FIRED: In ordnance terms, this means a munition which has undergone a complete arming and firing cycle but, due to a malfunction, has failed to explode or function.

E.O.D.: A military abbreviation for "Explosive Ordnance Disposal."

E.S.P. - ELECTRICAL SAFING PROCEDURE - EMERGENCY SAFING PROCEDURE: Special techniques used to safe ordnance either by removal of the potential supply of power or by some built-in feature of the ordnance.

EXPLOSION: A chemical or mechanical action resulting in a sudden bursting accompanied by a loud noise. A rapid expansion of gases or simply a "loud" boom and a sudden going away of things from where they have just been.

EXPLOSIVE: An explosive substance burning or detonating with violence; such as gunpowder, TNT, ammonium nitrate, etc.

EXPLOSIVE ORDNANCE RECONNAISSANCE - E.O.R.: The location, identification, and descriptive registry of ordnance; determining ordnance; setting of disposal forces.

FREEZE: To lower to cold temperatures; to stop the operation to a fuze by cooling; to slow down; usually associated with slush or CO ; and RSP: to remain motionless during a RSP.

FREEZING: A disposal technique using dry ice, liquid oxygen, liquid nitrogen, CO_2 and alcohol to lower the firing potential of batteries or to slow down certain chemical fuze actions; such as acetone.

FUEL: In explosives, a compound added to provide the basis for an explosion. Nearly all explosives require a fuel to sustain burning an oxidizer to provide oxygen.

FUNCTION: To operate; to explode; to cause to operate; to operate as designed; to dispose of by functioning.

FUSE: A pyrotechnic train of powder used to time and initiate a device. A cord of pyrotechnic powder.

FUZE: A mechanical, electrical or chemical device used to initiate rounds and ordnance.

FUZEE: A burning flare or pyrotechnic device used by railroads, autos, etc., to give warning. Usually will burn with a bright flame for illumination.

FUZE LIGHTER: A device containing a flash primer which is used in blasting operations to ignite safety fuze. Must fuze lighters use friction or percussion methods of ignition.

FUZE WELL; In munitions, a cavity threaded or un-threaded extending into the munition to accept the fuze or firing device.

GAG: A bomb disposal term which refers to techniques used to immobilize movable components on fuzing systems, clocks, etc., to prevent further movement. Examples: plaster of Paris and water applied to a movable plunger, or syrup injected into a clock to stop the action.

GAIN: An explosive train used in Japanese mines and ordnance; a detonator and booster together; a two explosive train.

GREEK FIRE: An ancient incendiary mixture used as far back as the year 670. It consisted of saltpeter, siphones, sulfur, and pitch blends which could hurl the burning incendiaries into ships with a mortar-like device.

GRENADE: A bomb or small shell filled with explosives, gas, etc., and designed to be thrown or projected in some fashion at a target.

HAZARDOUS COMPONENTS: Any device which will cause injury or death to an E.O.D. technician; i.e. a high voltage battery, explosive, detonator, etc.

H.E. - HIGH EXPLOSIVES: Substances capable of exploding by themselves; not designed to burn.

HELL BOX: Often termed a "Blasting Machine" and consists of a generator, hand operated, which is used to electrically initiate blasting caps in explosive operation. A hand operated or battery operated generator.

HIGH ORDER: A successful and complete detonation of an explosive with the entire consumation or detonation at its maximum rate of the explosive being detonated.

HOAX BOMB: A fake bomb designed by an individual to give the appearance of a high explosive bomb or to frighten personnel by its appearance.

HUNG STRIKER: An operated spring loaded striker which was interrupted in movement by some flaw, point of bind or other reason and is still capable of functioning.

HYGROSCOPIC: Means the ability to readily absorb and retain moisture. Example: black powder which readily accepts moisture because of its porous structure.

HYPERGOLIC: Means self-igniting. A term used in the military towards certain chemicals or compounds which, when combined, tend to burst into flames or react with explosive violence on contact. A good example is potassium chlorate and sugar in contact with sulphuric acid which will cause an immediate explosion.

IGNITION TRAIN: A flammable train used by bomb disposal personnel to ignite powders or explosives and is usually about twenty-five feet in length. It could consist of excelsior, burning time fuze, or any slow burning material for safety reasons.

IMPINGED: Having struck; hit; stuck or stuck in; resting on the detonator; capable of being pulled out; having to do with a striker,

IMPLOSION: A collapse caused by a rapid drop in pressure; air pressure collapsing a device.

IMPROVISED: Anything "made-up" or devised; not of standard use or manufacture; associated with clandestine and booby devices.

INCENDIARY: A burning compound or metal used to produce intense heat. Examples: thermite or magnesium.

INERT: Having no explosive charges; may operate properly yet will have no explosive charges.

INFERNAL MACHINE: A machine or apparatus maliciously designed to explode or destroy life and property.

INITIATOR: That part of an explosive train which starts or initiates; such as a primer or detonator. The fuze, in certain instances, could be considered the initiator or first action.

INITIATING ACTION: The first action in a normal firing train which starts the device into motion. Examples: pressure on a plunger, pull on a slack wire, or cutting a tight wire (called tension release), etc.

JET: The hot gases produced by a shaped charge; an ultra high velocity, high temperature gas produced by a shaped charge used to penetrate ordnance bodies and cases.

LEAD-IN: The connecting substances between the initiator and the detonator; a piece of pyrotechnic cord; fuse; a connector between two explosive charges.

LINEAR CHARGE: Basically the same as a cavity charge, except the cavity is arranged in a line to produce a cutting effect rather than a pinpoint penetration of the object.

LONG DELAY: A military term associated with fuzes which incorporate a delay feature extending from minutes to hours. Some delay fuzes can run 120 days in time.

LOW ORDER: The incomplete initiation of an explosive or one which has detonated at less that its maximum rate. The explosive usually fails to detonate because of deterioration, insufficient detonating wave, separation of explosive, or like causes.

LUCKY: LUCKY CRYSTAL: Piezo-electric crystal - A crystal for producing voltage to fire a detonator; called "lucky" due to it's hazard to E.O.D. technicians.

MAIN CHARGE: The final explosive in an explosive train; the bulk of the explosives; bursting charge; least sensitive explosive.

MANUAL REMOVAL: To remove by hand or with hand tools.

MECHANICAL EXPLOSION: The result of bursting pressure on a container; the explosion caused by slow buildup of pressure created by low explosives.

MINE: A cased or uncased explosive, chemical agent, or incendiary designed to destroy or damage vehicles, boats, aircraft, or designed to wound, kill, or otherwise incapacitate personnel. It may be detonated by the action of its victim, by time, or by controlled means.

MISFIRE: Failure to operate; a round of ammunition which did not fire; usually associated with missiles or rockets; i.e. The rocket misfired.

MISSILE: A spear, arrow, bullet, rocket, or bomb capable of being thrown or projected to strike an object.

MOLOTOV COCKTAIL: A crude incendiary hand grenade filled with an inflammable liquid, chiefly gasoline, and fitted with a wick or like ignition device which ignites the device upon impact with its target.

MORTAR: A short tube used to throw projectiles with low velocities at high angles.

MOTOR: The propelling device for rockets; a solid fueled booster; a liquid rocket motor.

MUNITION: Ordnance; explosive ordnance; complete explosive items; war materials which are directly used in battle.

MUSTARD: A chemical agent known as a blister agent, used during World War I as a war gas. This agent produces large blisters on contact, creates blindness, and affects lungs.

NEUTRALIZE: The act of making neutral or rendering safe a device by insertion of safety pins, separation of components, etc. Also referred to as an RSP (Rendering Safe Procedure).

NON-SPARKING: Will not produce sparks or flame; associated with tools used to carry out an R.S.P.; descriptive phrase for E.O.D. tools.

OBSOLESCENT; In the process of becoming obsolete.

OBSOLETE: No longer in use; outdated; dropped or discontinued.

OPEN: To explosively break; to expose the filler; to remove a cover or plate.

OPERATION: The systematic order of events to cause ordnance to function; an explosive operation; to work correctly; to function; a procedure.

ORDNANCE: Any and all explosive munitions including weapons and chemical; biological munitions.

"OUT-OF-LINE": The phrase used to describe detonators in a safe position; a detonator not in contact with the lead-in or explosives in a fuze.

OXIDIZER: An oxygen-bearing compound used in the manufacture of explosives; such as potassium nitrate or chlorate, to produce fast burning internally of a device. The oxidizer supplies the oxygen needed for the internal combustion or detonation of the item.

PERCUSSION: Sensitive to mechanical shock; such as a rifle percussion cap or primer. It fires upon being struck by a blunt firing pin. The percussion primer usually transmits a flame to a propellent or detonator.

PHOTO-FLASH: Often called flash powder, which is extremely sensitive to heat, shock, or friction and is often used as a main charge in clandestine devices. A good example of the brisance of photo-flash is the common "cherry bomb" which explodes with great violence.

"PINEAPPLE": A slang term for dynamite bomb, hand grenade, or like improvised device.

PLASTIC BOMB: An explosive device manufactured using the newer pliable or plastic (putty) type explosive. Often used by terrorists because of its flexibility.

PLASTIC EXPLOSIVE: A pliable, putty-like explosive which can be molded into various shapes and much resembles wood putty. In military terms, these are called the composition explosives, such as C-3, C-4, etc. and range in color from yellow to white.

POWDER TRAIN: The alignment of a group of powders to produce a desired effect, such as powder train delay with a powder propelling charge designed to hurl a mine into the air after a predetermined delay period.

PRECAUTION: The making aware of a hazard; a basic set method or methods for proceeding safely and with caution on ordnance; presenting a hazard and the method to cope with it.

PRIMACORD: See Detonating Cord and Cordtex.

PRIMER: A small container holding a charge of pressure sensitive explosive compound, which is detonated by means of a firing pin, and produces the flame or explosion needed to detonate a detonator or ignite a propellant in a normal firing train. The two types of primers are percussion and stab types. A good example of a primer is the type found in the base of a standard shotgun shell which, upon being struck, will ignite the propelling charge ejecting the bird shot in the shell.

PRIMING: Indicates the methods used to set up an explosive charge for firing; such as inserting the blasting caps for a detonation.

PROBING: A method of finding hidden ordnance or devices by feeling with a long rod or blade; to stick a probe in a package or device.

PROCEDURE: The method of operating or carrying out a R.S.P.: any set pattern of events following by an E.O.D. technician.

PROJECTILE: A missile, either solid or with an explosive, chemical or inert filler propelled from a weapon by the force of gases produced by the propelling charge. Example: An artillery projectile.

PROPELLANT: An explosive which rapidly burns and propels a projectile from a gun tube. Another example is a liquid propellant used to propel a missile or rocket into the air.

PROTECTIVE CLOTHING: A set of clothes or covering worn to prevent contact with a hazard or contamination.

PROTECTIVE MEASURES: Those measures taken for protection against chemicals or explosives during disposal and rendering safe operations on bombs and like devices. These may include shelter, full protective clothing and certain other precautions; such as chemical, or fragmentation precautions.

P.S.E. - PREVENTIVE STRIPPING EQUIPMENT: Sometimes called a booby trap; a device to prevent an E.O.D. technician from safing or rendering safe ordnance.

PSYCHOTIC BOMBER: A person, considered insane by normal standards, who contrives an explosive or incendiary device to be used for an evil purpose against society.

PYROTECHNIC: Modifications of fireworks designed to produce a brilliant light for illumination or to produce colored lights or smoke for signaling purposes.

QUICK-MATCH: A very rapid burning time fuze often used in blasting operations to ignite time or safety fuzes. Quick-match fuzes can be very rapid in burning - some are timed at one foot per second.

RENDERING SAFE PROCEDURE (RSP): The tools and methods employed against an explosive device or munition designed to neutralize or otherwise make safe the fuzing systems, so that it can be assumed safe for transportation and disposal. Any method which could detonate or initiate the munition would not be considered a true rendering safe procedure in bomb circles.

SABOTAGE: Derived from the term to "Tread with a Wooden Shoe." Means the malicious waste or destruction of an employer's property by workmen, or by an enemy agent, or, destructive acts designed to impede the armed forces or essential war industry by neglect or by actions.

SAFE: Not armed; not functioned; theoretically free from harm or hazards; unable to operate or function.

SAFETY: A device to prevent arming; any positive block between a detonator and main charge; a cotter pin.

SAFETY FUZE: A cord containing a continuous core of black powder. It is used to carry flame at a uniform rate to an explosive charge and is usually waterproofed. Burning time is usually 30-45 seconds per foot. Also called time fuze.

SAFETY PRECAUTIONS: Specific precautions to be followed when attacking or proceeding with an R.S.P.

SALTS: Explosives which are created by reaction of ordnance bodies or cases with existing explosives; ultra sensitive explosives; found on or near body breaks or joints.

S.D.A. - SAFE DISPOSAL AREA: A range; an area for disposal; an abbreviation for an E.O.D. procedure.

SECONDARY MISSILE: Items such as brick, glass, concrete, stones, wood, etc. that are propelled through the air by an explosion; often more hazardous than fragments.

SELF DESTRUCT: To function or destroy after a set period of time; to destroy itself if it did not operate or reach its target; to fall short and function.

SERRATED: A scored or machined surface; a jagged edge; made to form shrapnel.

SHAFTING: Materials for open pit digging and bracing; wooden planks and beams; the process of "digging down" to an item or piece of ordnance.

SHAPE CHARGE: See Cavity Container. Also called cavity charge, using Munroe effect.

SHAPED CHARGE: A shaped charge consists of a high explosive charge (usually cylindrical) into one end of which a cone has been sunk. The cone may or may not be lined with an inert material such as glass or metal. In certain cases the cone may be cut into the explosive charge itself. The shaped charge in most cases is detonated at a distance from the target called "stand off distance". When a shape charge is detonated detonation waves are formed which travel in different pre-determined directions in such a manner that they meet and reinforce each other (much like light rays reflecting off a parabolic mirror). This reinforcing effect is called the "Munroe effect" after the man who discovered it. The reinforced detonation forms a rapidly moving jet which contain in it small particles of the collapsing cone liner. The jet is followed by the "slug" which contains the major portion of the cone liner (Mohaupt effect). The major damage from a shaped charge detonation is caused from the jet, which exerts a pressure on the target of several hundred thousand atmospheres, and which literally pushes aside the target material by plastic flow.

SHOOT; To carry out an explosive detonation on a range; the verbal order to fire or detonate explosives.

SHOT: The "setup" or readied explosive procedure; the ordnance, explosives involved and special tools or equipment as arranged for the operation; a quantity of explosives.

SHOT: In munitions, a solid artillery projectile with no HE charge. An armor piercing round.

SHELLS: In munitions, artillery projectiles and various projected rounds are called shells.

SHRAPNEL: Pre-cut or pre-formed cubes, darts, or ball bearings placed into or attached to an explosive device for use against personnel or material.

SLUSH: A freezing mixture of dry ice and alcohol in a slurry.

SOLVENT: An explosive disposal, those solvents which will soften and dissolve certain explosives. Example: acetone/TNT.

SPRAY: During munitions disposal using explosives, a spray is considered to be certain unexploded devices which will fly out of the site of detonation. This usually is the result of poor priming procedures of insufficient explosives to create a complete detonation. A munitions which has sprayed is usually hazardous due to powdered high explosives.

SQUIB: A small pencil-like tube containing black powder used to transmit a flame to ignite certain devices. Squibs resemble blasting caps in appearance and are used for many purposes; such as to ignite rocket igniters, initiate ejection seats in aircraft, or to ignite propelling charges.

"STAND-OFF": The distance provided between the cavity or cone of a shape charge to allow formation of the jet before contact with the target is made. The stand-off distance is determined by the size and shape of the cavity container.

STRIKER: A blunt or sharp pin, also called a firing pin.

SUB-MISSILE: Small sphere-like missiles placed inside a carrier or container and designed to be hurled from the container or ejected in some fashion at or near the target. The sub-missiles may be fuzed to fire on impact with the target or in the air near the target.

SYMPATHETIC DETONATION: A detonation occurring from one explosion transmitting a wave to another nearby explosive, in turn causing it to detonate.

TANK: The safe retreating area or bunker on a range; a special explosion and blast proof bunker; a place to safely observe a shot.

TAPE AND LINE: A technique used to render safe ordnance.

THIN WALL: A very thin case; light metal construction; specific ordnance as opposed to heavy or thick case ordnance.

TIMBERING: The act of actually setting wooden shafting materials; to make safe a shaft; supporting.

TIMING DISC: A small spring-wound disc found in military fuzes and using a clock work mechanism. The rotating disc provides the means to release a spring-loaded firing pin at the proper time. They are found in fuzes called clockwork serial burst or mechanical time.

TORCH: Hot gases shooting out of a burning piece of ordnance; explosives burning unevenly causing a spewing flame.

TREPAN: To cut through or gain access or entrance by cutting, sawing or corrosive acid action.

TRIGGER: Basically the same as a fuze. The device in a firing train which starts the initiation or initiating action.

TRIP WIRE: A small fine wire attached to a standard or improvised firing device designed to initiate the fuze as an unsuspecting person breaks or pulls the wire.

U.W.O. - UNDERWATER ORDNANCE: Mines, depth charges, etc. Ordnance designed to operate piled ordnance; usually associated with a dropped munition; i.e. a bomb.

U.X.O. - UNEXPLODED ORDNANCE: Ordnance which did not function as designed; stock piled ordnance; usually associated with a dropped munition; i.e. a bomb.

VENT: To cautiously open so as to not expose or release an over abundant amount of filler; to allow access to air; to release pressure; to punch a hole in ordnance cases.

WARNING: A reminder of possible hazards to E.O.D. personnel.

WEAPON: Any nuclear device.

X-UNIT: A capacitor bank charged to high voltage; a voltage storage unit.

X-RAY: To determine the internal components of ordnance by x-ray; a hard fast EMR; apparatus for x-ray; Baltograph.