Chapter 7

Aircraft Crash/Rescue Fire-Fighting Operations

7-1. Aircraft rescue fire-fighting operations will include aircraft incidents and accidents, MEDEVAC, search and rescue, refuel/defuel, and maintenance standby operations.

AIRCRAFT CRASH OPERATIONS

7-2. An aircraft crash/rescue team provides support to Army aviation and to Air Force, Navy, Marine, allied, and civil aviation assets in support of Army operations. The types of support include, search and rescue, emergency evacuation, forward arming resupply point (FARP), and basic life support.

7-3. The standard requirement for crash/rescue operations will be a minimum of one LB team and one LC team. Aircraft that are over 10,000 pounds, have a normal fuel load over 400 gallons, or have an average load of 12 or more persons will require two LB teams and one LC team, as a minimum. Additional LB teams can be assigned, if available.

AIRCRAFT EMERGENCY NOTIFICATION

NOTIFYING THE CONTROL TOWER

7-4. When notified of an emergency, the control tower will immediately contact the FCC. The center will then dispatch the required response teams and notify the subordinate support units. The control tower will supply as much of the following information as possible:

- Location and nature of the emergency.
- Type of aircraft.
- Amount of fuel on board.
- Number of personnel on board.
- Types of hazardous cargo (explosives, radioactive, flammable, and/or toxic).
- Estimated time of arrival.

7-5. The control tower must relay this information to the FCC as it becomes available. The FCC transmits the information to the responding crews. Fire-fighting crews will then proceed to predetermined standby positions alongside, but clear of, the designated runway. Drivers and crews must be ready to reposition as required.

NOTIFYING OTHER PERSONNEL

7-6. When other personnel are notified of an emergency, the FCC will notify the control tower. When cleared from the tower, the FCC will then notify the

responding fire-fighting units. The dispatcher should try to get as much information as possible from the caller.

STANDBY AND RESPONSE OPERATIONS

7-7. During emergencies and hazardous conditions, fire-fighting equipment and crews will be stationed in the immediate vicinity of an aircraft or its anticipated landing point. While on standby status, personnel will prepare the equipment to maneuver and discharge the extinguishing agent without delay. Fire-fighting crews will provide standby service according to the degree of risk involved. The degree of risk and the response involved are as follows:

- Severe risk (all fire-fighting and rescue assets respond immediately). Situations at this level include aircraft crashes or serious accidents, emergency landings, and large fuel spills (over 100 gallons).
- Moderate risk (one fire-fighting vehicle and crew will respond or stand by). Situations at this level include medium fuel spills (5 to 100 gallons), continuous fuel leaks, MEDEVAC aircraft activities, loading munitions, welding aircraft, and working on open fuel cells.
- Mild risk (no standby required, fire-fighting crew[s] will maintain an alert status). Situations at this level include helicopter auto-rotation exercises, routine flight activities, routine maintenance activities, engine starts, and small fuel spills (under 5 gallons).

COMMUNICATIONS

7-8. An installation should have at least two methods of receiving incoming emergencies. The following describes several methods:

- A primary crash line is a direct two-way communication line between the control tower and the FCC that can be activated from either location. Other facilities that should be on a primary crash line are medical and security assets, base operations, and the HQ (commander's staff).
- A secondary crash line is any other two-way communications system between the tower and the FCC. A two-way radio or regular phone lines are normal. A secondary system is a back-up system to a primary one in case of damage or failure.
- A light signal system is a system of light codes (no vocal communications) that a tower uses to signal vehicles and aircraft on an airfield (see Figure 7-1).
- An airfield-flag method is used when vehicles do not have warning lights but may be equipped with high-visibility flags so that aircraft can see them on an airfield. The base operations will issue the flags to vehicle operators once they receive clearance to be on an airfield.

Color and Type of Signal	Meaning		
	Aircraft on the Ground	Aircraft in Flight	Movement of Vehicles, Equipment, and Personnel
Steady green	Cleared for takeoff	Cleared to land	Cleared to cross, proceed, go
Flashing green	Cleared to taxi	Return for landing (to be followed by steady green at the proper time)	Not applicable
Steady red	Stop	Give way to other aircraft and continue circling	Stop
Flashing red	Taxi clear of landing area/ runway in use	Airport unsafe - do not land	Clear the taxiway/runway
Flashing white	Return to starting point on airport	Not applicable	Return to starting point on airport
Red and green	General warning signal - exercise extreme caution		

Figure 7-1. Airfield light signal system

AIRCRAFT-ACCIDENT EMERGENCY TEAMS

7-9. Aircraft-accident response teams should be made up in three separate groups. The following lists the personnel in each group:

- Group I (personnel are required to participate in operations immediately). This groups consists of firefighters and crash/rescue and medical personnel.
- Group II (personnel are required to perform related support services as circumstances may develop). This group consists of maintenance and wrecker personnel, a provost marshal, MP or guard personnel, photographic personnel, and an aviation safety officer.
- Group III (personnel are required to attend if their specific duty performance is needed). This group consists of an installation or airfield commander, an installation fire marshal, aircraft-accident personnel, chaplains, investigation personnel, and public affairs personnel.

7-10. An installation commander should contact EOD personnel for help in identifying and rendering safe all explosive hazards associated with an aircraft. Aircraft carrying explosive cargo will require an EOD response for technical help and disposition of explosive hazards.

EMERGENCY RESPONSE

ON AN AIRFIELD

7-11. When a potential or an actual emergency occurs on an airfield, the following emergency crews will respond accordingly:

Fire-Fighting and Rescue Crews

7-12. The duties and responsibilities for personnel in this group are listed below:

- The crew member who receives the notification of an emergency will immediately dispatch and advise all other crew members of the nature of the emergency.
- Designated fire-fighting and rescue units on duty will respond immediately. If an alert is for a potential emergency, fire-fighting crews will align attending vehicles near the runway at predetermined points for prompt action. Placement of the fire-fighting equipment along a runway could be based on the nature of an aircraft emergency and the type of aircraft involved. Crash/rescue aircraft may be started and flown to standby positions.
- Vehicles will not proceed onto a runway without clearance from the control tower. Taxiing aircraft will stop and will not proceed without clearance from the tower.
- Fire crews will respond to the crash site immediately after an aircraft impacts. They should approach the site cautiously, watching for injured personnel and casualties.
- Crash crews will need grid maps to locate emergencies that occur off an airfield. When necessary, the responding aircraft should locate the crash site and then guide fire and rescue crews to it. When not directing fire trucks, the aircraft will circle the crash site until released by the on-scene fire official.

Medical Personnel and Ambulance Crews

7-13. The duties and responsibilities for personnel in this group are listed below:

- The designated medical officer, ambulance crews, and emergency room personnel will be alerted when notified of an impending or an actual aircraft emergency.
- The designated medical officer and ambulance crews will respond to an accident site unless the SFO has notified them that their services are not required.
- Off-post/HN medical and ambulance services will be requested as required.

Fire Chief orSFO

7-14. The fire chief or SFO will—

- Respond to the scene of the emergency immediately when notified.
- Assume direct command of the fire-fighting and rescue operations when he arrives at the site.
- Determine if additional assistance from other on- or off-post organizations is required.

Provost Marshal,MP, orGuard Personnel

7-15. The personnel in this group will—

- Proceed to the scene of an accident.
- Secure the scene from unauthorized entry of personnel.
- Prohibit smoking or open flames in the vicinity of an accident site.
- Establish traffic-control points into and out of an accident site.
- Establish guard posts to control the security of the perimeter of an accident site.

Aviation Maintenance Officer

7-16. An aviation maintenance officer will assist the accident investigation team as required.

Photographic Personnel

7-17. Photographic personnel will—

- Respond to an accident site and record as much physical evidence as possible.
- Assist an accident investigation team, as required.

Aviation Safety Officer

7-18. An aviation safety officer will—

- Respond to an accident site.
- Ensure that the request reports are submitted.
- Ensure that an investigation is conducted according to AR 385-95.

Chaplains

7-19. The chaplains will respond to an accident scene, when requested, and will provide services as required.

Public Affairs Officer

7-20. A public affairs officer will—

- Respond to an accident scene, when requested.
- Maintain liaison with the local news services.
- Issue news releases, as required.

OFF AN AIRFIELD

7-21. When a potential or an actual emergency occurs off an airfield, personnel involved in the operation will follow the guidelines below:

- Predesignated emergency response crews, when notified, will respond immediately after they are released from the tower.
- Any available aircraft in an area will be used to guide the emergency equipment into an incident site. These aircraft will also provide any advance information that they can about an incident site.
- Emergency equipment and personnel may have to be escorted through the community where an incident has occurred.
- All duties will be the same as an *on-an-airfield* response except that there will normally be more coordination with civilian authorities and agencies.
- Some damage-control guidelines should be put into place if an incident has occurred on private property.
- A larger security force may be needed because security at a site may be harder to maintain.
- Pre-arranged assistance agreements with local fire departments, medical-response facilities, and police agencies are important.

GRID MAPS

7-22. Each flight-operations office must have local-area grid maps. They should be of suitable scale and cover at least a 15-nautical-mile radius center on an airfield. Copies of the grid maps will be posted in each location where emergency calls are received. Additional maps will be located in each responding vehicle assigned to emergency crews. All supporting vehicles and aircraft identified in the airfield fire-fighting and rescue plan will also have grid maps.

7-23. All personnel assigned to the fire-fighting, rescue, and medical-support elements will acquaint themselves, as part of the training program, with the terrain surrounding an airfield. This includes becoming familiar with the locations and bearing capacity of the roads, bridges, culverts, trails, and other significant terrain features within a 15-nautical-mile area of the airfield. Personnel will do this through map orientation and personal inspection.

7-24. When notified of an incident, personnel will be given the location or section on the grid map. They will clearly identify the area and repeat the information back to the dispatcher. Emergency personnel will then locate the site on the grid map and respond. All personnel assigned to the emergency crews will be proficient in reading and locating points on a grid map and in being able to navigate to those points.

SCHEDULED AEROMEDICAL EVACUATION

7-25. At installations where fire-fighting crews and equipment are available, fire crews will—

- Be notified of aeromedical evacuations in advance to permit mobilization. At least one LB fire truck with crew will respond.
- Take a strategic position for rapid response in case of a landing or a takeoff accident.
- Stand by in the immediate area of an aircraft when incapacitated patients are onboard and during loading and unloading.
- Ensure that an aircraft is not fueled when patients are onboard except when absolutely necessary.
- Be required to stand by during takeoff, landing, loading, and unloading of patients and during refueling operations. Crew members will position the fire trucks to provide maximum fire protection to personnel and the aircraft.
- Follow an aircraft, during takeoff, to the run-up area and remain there until it is airborne. A crash crew will remain on alert status until an aircraft clears the traffic pattern.
- Follow an aircraft from the ramp to the parking area during landing. The fire crews will position themselves to provide maximum coverage of the rescue paths, personnel, and aircraft. Fire crews will remain on standby until all patients have been loaded or unloaded.

SEARCH AND RESCUE OPERATIONS

7-26. Fire-fighting personnel might conduct search and rescue operations with aviation personnel and assets. If they do, they will perform rescue and life-saving procedures from an aircraft and/or with an aircrew.

EMERGENCY EVACUATION OF THE INJURED

7-27. Firefighters can assist in the emergency evacuation of the injured. (Such a duty is not considered primary for them.) They are trained in basic life support and first-responder-level medical care.

FARP OPERATIONS

7-28. Fire-fighting teams will support aviation units as required. Security will be a primary concern when operating in a forward area; therefore, fuses will be removed from the sirens and emergency lights. Fire-fighting crews will subdue all highly visual areas on the truck with materials available. All driving will be conducted under blackout conditions. Fire protection will be limited to rescuing personnel in the event of a crash and suppressing fires of mission-essential equipment and resources. When operating out of the immediate area of the FARP, a security force must be provided.

HAZARDOUS MATERIALS

7-29. The following list describes some HAZMATs associated with aircraft:

- Liquid and gaseous oxygen. Oxygen is a powerful oxidizer in the liquid and gaseous states. It is colorless, odorless, and slightly heavier than air. Liquid oxygen is pale blue and slightly denser than water.
- Hydrazine. At room temperature, hydrazine is a clear, oily liquid with an odor similar to ammonia. It is a health hazard in the liquid and vapor forms. Hydrazine is combustible and explosive.
- Beryllium. In a dust or powder form, beryllium is a silvery material resembling aluminum powder.
- Magnesium. Magnesium is a silvery metal that looks like aluminum but is lighter in weight.
- Depleted uranium. Depleted uranium is used as counterweights in some aircraft. The weights are coated for protection.
- Ammonia. Anhydrous ammonia is 99.5 percent (by weight) basic ammonia (NH_3) and is normally a pungent, colorless vapor.
- Liquid hydrogen. Liquid hydrogen is a nontoxic, transparent, colorless, and odorless liquid of low viscosity.
- Nitrogen tetroxide. Nitrogen tetroxide fumes vary in color from light orange to reddish brown to blue or green, at low temperatures.
- Carbon-graphite composite fibers. Composite fibers are bonded together for strength to form parts for aircraft. The majority of all operational aircraft now in use contains composite fibers in varying amounts and locations.
- Sulfurhexaflouride gas (SF-6). SF-6 is colorless, tasteless, and nontoxic. It is heavier than air and is nonflammable and noncorrosive. This gas reacts with water to form hydrofluoric acid.
- FC-77. FC-77 is a nonreactive, noncorrosive, nonflammable inert liquid. When heated above 572^{o}F or when electricity is passed through the solution, some forms of nerve gas may evolve.
- Triethylborine (TEB*)*. TEB is used as a fuel additive to provide rapid ignition of a nonhypergolic fuel or propellant. It is an extremely toxic and volatile liquid with a sweet, pungent odor.
- Lithium thionylchloride. This HAZMAT is a soft, silvery, highly reactive metallic element that is used as a heat-transfer medium in thermonuclear weapons and alloys.

AIRCRAFT PREFIRE PLANS

7-30. Aircraft prefire plans are located in Appendix B. All Army aircraft and primary Air Force aircraft that support Army operations are listed. Additional information can be located in Air Force Technical Order (TO) 00-105E-9 and Soldier Training Plan (STP) 5-51M14-SM-TG.

TECHNIQUES AND PROCEDURES OF FIGHTING AIRCRAFT FIRES

7-31. AR 420-90 states that training will be conducted according to DODI 6055.6. All personnel conducting airfield fire-fighting duties shall be DOD certified at the level of airport firefighter. Supplemental training will be conducted from the STP 5-51M14-SM-TG and IFSTA Manual 206.

AIRCRAFT FIRE-FIGHTING AND CRASH/RESCUE

7-32. Rescuing aircraft crash victims takes precedence over all other operations until no further life hazards are involved. After rescuing victims, firefighters extinguish fires and limit further damage to an aircraft. Each rescue situation is different, and the SFO has the authority to change procedures and use all the equipment and resources available to complete a rescue. All installations will create and enact prefire plans to handle crash and rescue emergencies.

AIRCRAFT ENGINES

7-33. Fixed-wing aircraft will have an opposed-cylinder or turboprop, single- or multiple-engine configuration. Helicopters will have a gas-turbine, single- or multiple-engine configuration. A turboprop engine creates the same type of thrust that a jet engine creates; therefore, do not approach the aircraft from the rear or around the exhaust. Short circuits in the electrical systems and broken fuel and oil lines are the main sources of fires in gas engines. During start-up and shutdown of a gas engine, you should watch for fuel being drained or pumped through the engine.

AIRCRAFT SYSTEMS

7-34. Many of the systems in an aircraft can be potential fire hazards. Component systems in an aircraft include the following:

- Fuel.
- Installed fire extinguishing.
- Electrical.
- Hydraulic.
- Oxygen.
- Anti-icing.
- Canopy jettison.
- Seat ejection.
- Escape.
- Ordnance.

7-35. To prepare for aircraft accidents, firefighters must recognize all the systems and potential hazards in an aircraft. Figure 7-2, page 7-10, shows the color-code designations on the pipes for some of the aircraft systems. For safety, firefighters should know the color codes before entering a damaged aircraft.

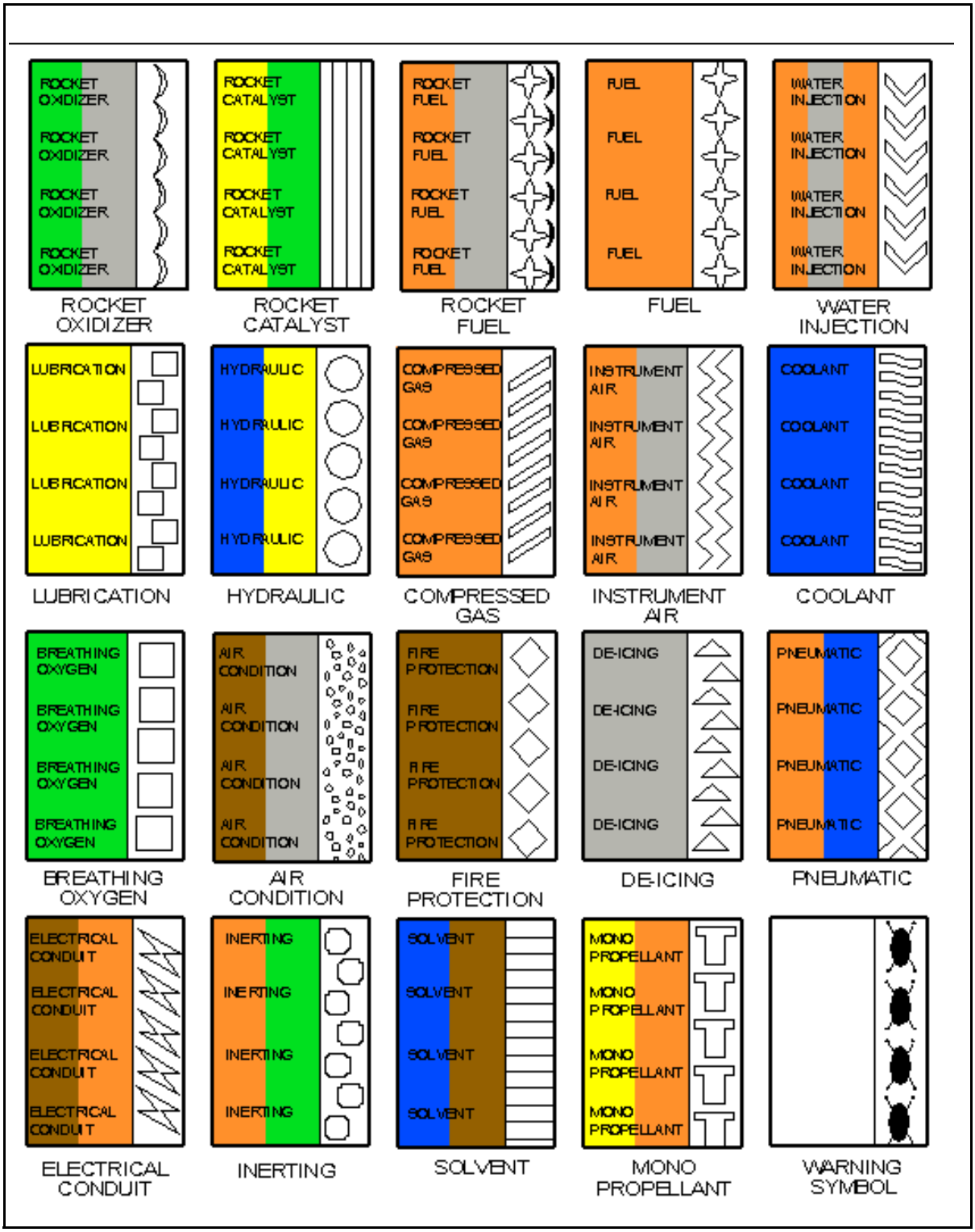

Figure 7-2. Color symbols for extinguishers

FUEL

7-36. A fuel system stores and distributes fuel to the engines. Fuel tanks, portable bladders, lines, control valves, pumps, and other components are located throughout an aircraft. Newer aircraft are equipped with a crashworthy fuel system that contains self-sealing tanks, breakaway valves, and fuel vent lines. Although crashworthy, this system may still leak fuel. When an aircraft crashes, the force of the impact can rupture fuel lines and tanks. Sparks, electrical short circuits, static-electricity discharges, hot surfaces, and hot exhaust gases are possible ignition sources.

7-37. Fuel tanks may be separate units installed between an aircraft's structural framework or built in as part of a wing. In fixed-wing aircraft, fuel tanks are usually located in the wings and possibly in the fuselage. In most helicopters, the fuel tanks are located in the fuselage. Some aircraft carry auxiliary fuel tanks located under the wings or in the cargo area. Upon severe impact, these tanks usually rupture and set the entire fuselage on fire. Fuel lines in Army aircraft are quick-disconnect, self-sealing types. Some fuel systems are pressurized to maintain a steady fuel flow. When these systems develop leaks or broken lines, fuel may spray out and create a major fire hazard.

INSTALLED FIRE EXTINGUISHING

7-38. Many aircraft are equipped with this extinguishing system. A pilot can activate the system to extinguish fires throughout the aircraft. The system consists of pressurized containers, tubing, nozzles, fusible devices, and electrical or mechanical appliances for controlling the agent.

ELECTRICAL

7-39. This system supplies the current for all the electrical and avionics equipment. The principal fire hazard is the electrical wiring short-circuiting or arcing. In a crash, a large number of wires could be torn or damaged. Moving the aircraft could produce sparks that ignite fuel vapors.

7-40. Batteries are usually located in the fuselage, wings, or engine nacelle. Before an aircraft is moved after a crash or a fuel spill, disconnect and secure the battery and the battery cable ends. Alkaline or nickel cadmium batteries can overheat from internal shorting or thermal runaway. When a crash crew detects an overheated battery, they should use the following guidelines:

- If flames are present, use available extinguishing agents.
- If flames are not present but smoke, fumes, or electrolytes are emitted from the battery or vent, lower the battery temperature using a water fog and ventilate.
- If flames, smoke, gases, or electrolytes are not emitted from the battery or vent tubes, ventilate.

HYDRAULIC

7-41. This system consists of hydraulic-fluid reservoirs, pumps, various appliances, and tubing. A pressure pump moves the hydraulic fluid through the piping system. The hydraulic systems will remain pressurized even though the engines have stopped. You must be cautious not to cut pressurized

hydraulic lines during rescue or fire operations. When a pressurized hydraulic line ruptures or is cut, the fluid is released in a highly flammable fine mist. When sprayed on the hot brakes, exhaust, or electrical components, the fluid may ignite.

OXYGEN

7-42. Aircraft used for high-altitude operations have an extensive oxygen-supply system for life support and propulsion. The oxygen is stored in a gaseous or liquid state. Army aircraft use either a fixed or portable oxygen system. Oxygen may be found in one or more containers located in the fuselage. Aircraft equipped with high-altitude ejection seats will have small, gaseous oxygen bottles as part of the survival kits. These bottles are for emergency use when a crew member ejects at a high altitude or when the normal oxygen system fails. You must recognize oxygen containers that have been ripped from their locations by the impact of the crash. Leave the containers where they are and cordon off the area until trained personnel remove the containers.

7-43. Two hazards exist with the oxygen systems: explosion and the increased availability of oxygen to support combustion. Oxygen intensifies fuel burning as it is present. Danger of explosion is caused by the mixture of liquid oxygen with flammable materials.

7-44. Another explosive situation occurs when the oxygen-storage tank or liquid-oxygen (LOX) container is exposed to intense heat or severe impact. LOX is light blue and transparent and has a boiling point of -297^{o}F. By itself, it is not flammable, but it does contribute to the combustion of other materials. When fighting fires involving LOX, cut off the fuel or oxygen supply. Blanketing or smothering agents are ineffective against LOX.

ANTI-ICING

7-45. Anti-icing fluids are usually an 85 percent alcohol, 15 percent glycerin mixture; however, some systems will use a 100 percent alcohol mixture. The location and size of the tanks containing anti-icing fluids vary with aircraft type. Separate tanks are provided for alcohol and alcohol-glycerin mixtures. Single-engine aircraft and helicopters usually carry 3 to 4 gallons; larger aircraft may carry from 6 to 40 gallons of anti-icing fluids. Although anti-icing fluids are not considered great fire hazards, their presence must be considered because of the alcohol in the system.

ORDNANCE AND AIRCRAFT

7-46. Ordnance in or on aircraft (small-arms ammunition, missiles, rockets, flares, or bombs) can be cargo or armament. You must identify aircraft carrying ordnance to prevent injuries during fire-fighting and rescue operations. Cargo of hazardous munitions and armament are classified by their reaction characteristics. See Chapter 11 for more information on fighting

HAZMAT fires. Ordnance materials are stored in various areas on aircraft. The following lists some general locations for specific aircraft types:

- Under the wings and inside or along the fuselage in a fighter.
- In the forward or aft fuselage in a cargo plane.
- Under the wings and in the bomb bay in a bomber.
- Under the wings and in the nose in a helicopter.

SPECIAL HAZARDS

7-47. Crash-rescue personnel have no problem categorizing rockets, missiles, bombs, and cannons as explosive hazards. However, there are other hazards which are explosive and can be just as lethal as any bomb or rocket. These are aircraft ejection seats, canopy jettisons, and explosive canopies. Almost all Air Force fighters have canopy jettisons and/or ejection seats. The Army's OV-1 Mohawk has a Martin-Baker ejection seat. The AH-64 Apache and AH-1 Cobra helicopters have explosive charges built into the canopies. The aircrew or rescue crew can activate the charge. Both of these hazards require firefighters to become very familiar with procedures to disarm them or place them on safety. Sometimes the situation is out of a rescue crew's hands. They may be subject to dangerous fragments when a pilot detonates the canopy or the force of a crash jettisons a seat. See TO 00-105E-9 for more information on how to handle these devices safely.

DANGER
Use extreme caution when approaching aircraft known to have special hazards!

FLAMMABLE MATERIALS IN AIRCRAFT

7-48. The following materials carried in aircraft can cause problems for firefighters:

- Aviation gasoline (AVGAS), jet fuel, and hypergolic fuel mixtures.
- Hydraulic fluids.
- Bottled gas (oxygen).
- Anti-icing fluids.
- Pyrotechnics, ammunition, and other ordnance.
- Metals (magnesium), which were discussed above.

AVIATION GASOLINE

7-49. The flash point of AVGAS is about -49^{o}F. It will give off enough vapors in any weather condition to form an ignitable mixture in the air, near the surface of the liquid. The vapor flammability limits in the air are between 1 and 7 percent, so very small amounts of AVGAS can form sufficient vapors to carry the flame away from the initial ignition. AVGAS flames will spread between 700 and 800 fpm. Autoignition occurs between 825 and 960^{o}F.

JET FUELS

7-50. The two most common jet fuels firefighters encounter at an aircraft incident are Jet A and Jet B. Both can represent a significant hazard to the crash survivors and the firefighters. Firefighters need to know the characteristics of each fuel and the best way to extinguish a fire that results from either fuel and prevent reignition once the fire is out.

Jet A Fuel

7-51. This is a kerosene-grade fuel with a flash point between 45 and 95°F, depending on the mixture. Jet A fuel will mix with air above the flash point and become flammable when the fuel-to-air mixture is just under 1 percent. The upper flammability limit is just over 5 percent. Autoignition temperatures range from 440 to 475°F with a flame-spread rate of less than 100 fpm. Jet A fuels do not spread as rapidly as gasoline. Jet petroleum (JP) 5 is a Jet A fuel used in some military aircraft.

Jet B Fuel

7-52. This fuel is a blend of gasoline and kerosene with a flash point at -10°F. JP4 is a Jet B fuel used in military aircraft. Flammable limits range from 1 percent to just over 7 percent. The lower limit of 1 percent makes any fuel potentially dangerous when spilled. Autoignition temperatures range between 470 and 480°F. The flame-spread rate of Jet B fuels is 700 to 800 fpm. At higher temperatures, the flame-spread rate across any jet fuel is increased.

HYPERGOLIC FUEL MIXTURES

7-53. These fuels are mixtures of specific fuels and oxidizers used as propellants in some missiles and rockets. Hypergolic fuels are stored separately and ignite when they come in contact with each other, without an ignition source. Mixtures of fuels and oxidizers that do not react or ignite when combined are called anergols or are anergolic mixtures. The reaction time of hypergolic mixtures varies according to substance and temperature. However, in cold weather, combustion may be delayed until enough fuel and oxidizer accumulate in the firing chamber.

7-54. Other compounds, such as triethylaluminum (TEA) or TEB, react when air or oxygen is introduced. These chemicals are termed pyrophorics and must be maintained under an inert atmosphere. TEA and TEB are used as missile igniters. You must wear special protective clothing and use SCBA when fires involve oxidizers and fuels. Health hazards resulting from such fires include poisoning, frostbite, and chemical burns.

FUEL CHARACTERISTICS

7-55. Upon impact, aircraft fuel tanks may fail, creating fuel mists. The fuels readily ignite under aircraft impact conditions. Under these conditions, fuel mist is as equally flammable as fuel vapors. A constant threat of reignition (flashback) in fires involving large amounts of AVGAS or jet fuels exists. You must be aware of flashback possibilities.

AIRCRAFT INCIDENTS

7-56. Aircraft frequently develop minor difficulties while in flight. Even though appropriate action is taken on board to correct the problem, a standby fire crew is required on the airfield when the aircraft arrives. Other types of emergency situations that fire crews deal with are discussed below:

WHEEL, BRAKE, ANDTIRE FIRES

7-57. These problems occur in fixed-wing aircraft. Wheels and brakes are compounds of combustible metals. Fire crews must know the procedures for suppressing fires consisting of these metals. During a fire, pressure builds in the tires. Fire crews should approach tires from the front or back, never from the side.

WHEELS-UP LANDINGS

7-58. These landings result from hydraulic-system failure or pilot error. This type of emergency may or may not produce a fire. Extreme heat from the friction between the aircraft and the ground and the ruptured fuel tanks and the lines could produce a fire.

WATER CRASHES

7-59. Fuel floating around an aircraft could come in contact with hot engine parts and ignite, making rescue of personnel difficult. Trapped air may keep the aircraft afloat, so any attempt to enter it should be made from under the waterline.

NOSE-DIVE CRASHES

7-60. The impact from a nose-dive crash is so disastrous that there is usually not much chance for rescue operations.

BUILDING CRASHES

7-61. These crashes present several problems:

- Fire spreads rapidly due to excessive fuel leakage over a wide area.
- Rescue operations involve the aircraft and the building.
- The area around the building should be searched and evacuated.
- Fuel could enter storm drains, and the fuel vapors could surface in other areas, creating other hazards.

HILLSIDE CRASHES

7-62. With these crashes, the aircraft could disintegrate or, if it hits obstructions, cartwheel and cause structural components to break away. Also, aircraft personnel may be thrown from the wreckage. Reaching these crashes is the main problem for rescue personnel.

HELICOPTER CRASHES

7-63. Helicopters are of light construction and will usually break up in a crash. The rotor system, undercarriage, and tail will disintegrate, leaving the cabin or fuselage. Fuel leaks are the main concern. Most of the helicopter's

controls are cable systems, and in a crash, these cables could entangle the crew and occupants.

NO-FIRE CRASHES

7-64. With these crashes, fuel spills or leaks are present but have not ignited. You should wear protective clothing, and all nonessential personnel should clear the area. As soon as possible, fire crews should apply a foam blanket, stop leaks, and secure or remove the ignition sources from the area.

RESPONSE PROCEDURES TO AN AIRCRAFT EMERGENCY

7-65. Responding crews must approach a crash scene cautiously. Aircraft personnel may have been thrown clear or escaped from the aircraft. When responding to an aircraft emergency, fire and rescue crews should consider—

- The best route to the scene.
- Alerting the support agencies.
- The terrain.
- The weather.
- The type of aircraft.
- The weapons or armament on board.
- The presence of HAZMATs.
- The type of crash.
- The obstacles at the scene.

FIRE-TRUCK POSITIONS

7-66. The SFO at the crash scene decides where to position fire trucks. The normal pattern is for turrets to cover the escape and rescue paths and for hand lines to cover the secondary paths. If the aircraft is carrying armament or has explosive jettison-type canopies, the SFO must be careful and cautious when deciding where to position the fire apparatus. When only one truck responds, the crew chief decides where to position the vehicle.

INITIAL ATTACK

7-67. The most effective method of quick attack is a mass application of extinguishing agents through large-volume turrets, with minimum use of hand lines. The priority in the initial attack is to open and secure rescue and escape paths and to keep any spilled fuel from igniting during rescue operations. When available, two rescue personnel will be at each entry point. They should enter and exit through paths maintained by the turrets and hand lines.

RESCUE ENTRANCES

7-68. The quickest way into an aircraft is through normal entrances. When this is not possible, rescue personnel will use emergency entrances or make cut-in entrances. Figure 7-3 shows aircraft access entrances.

Standard

7-69. Door configurations vary with aircraft type. Entrances may be located on either side or both sides of the fuselage. Aircraft door hinges are on the forward side and open outwardly. The opposite side of the door contains the latch mechanism. On most aircraft, the emergency-release mechanism is on the hinge side.

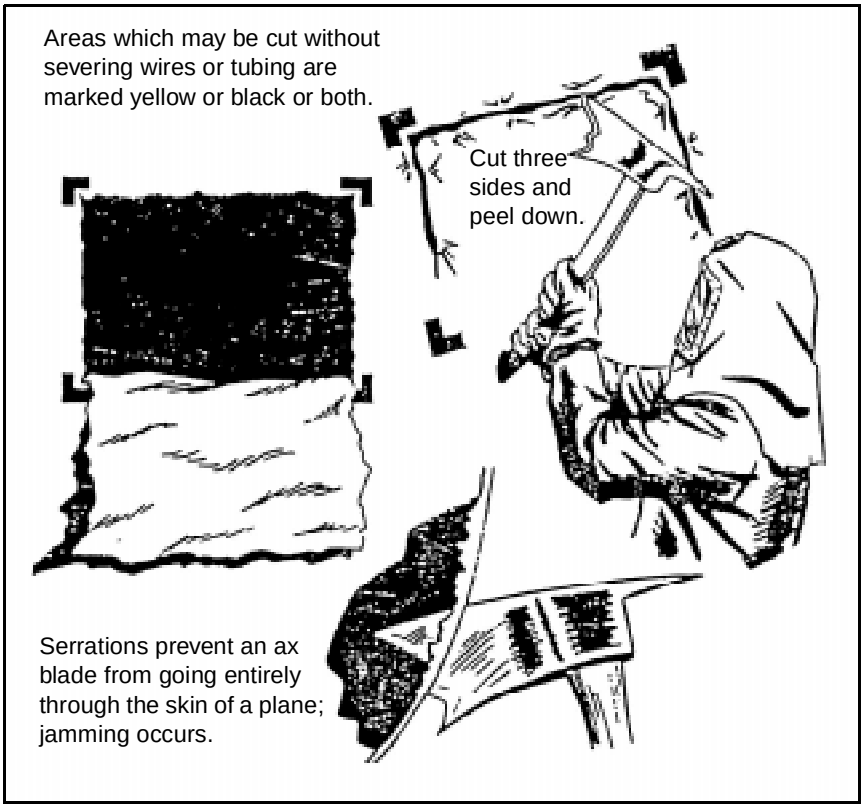

Figure 7-3. Aircraft access

Emergency

7-70. Some aircraft have escape hatches or escape panels made of thermoplastic polymer or metal. The hatches usually have an external release handle with the location and operating procedures marked on the adjacent surface of the fuselage. If the handle is inoperable or inaccessible, rescue personnel can use a crash ax and drive the pointed edge through the escape hatch or panel, close to the corner or edge. They will continue to use this procedure to knock out a section large enough for a swift entry.

Cut-In

7-71. Cut-in areas are indicated by broken yellow lines. These areas should be free of obstacles so that rescue personnel will not cut through heavy structural members or rupture fuel, electrical, or oxygen lines. Rescue personnel should cut fuselage skin carefully to prevent igniting fuel vapors. They will cut along three sides of the yellow lines and use the bottom as a hinge to pull the section outwardly (see Figure 7-4, page 7-18).

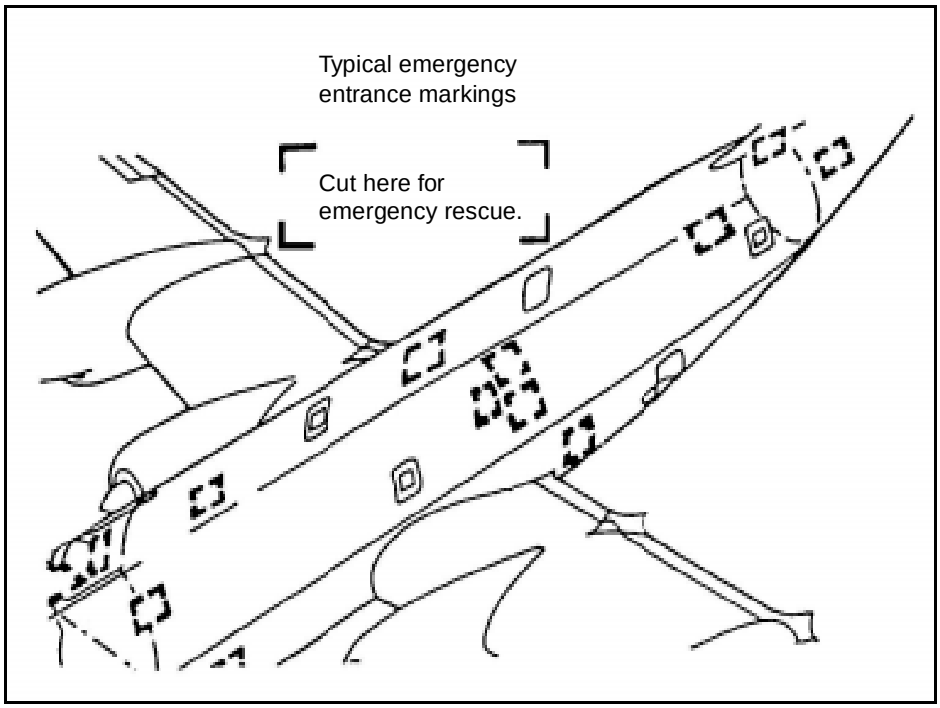

Figure 7-4. Emergency cut-in areas

VICTIM RESCUES

7-72. After gaining entrance, rescue personnel should locate and determine the condition of injured victims. If they cannot control hazards, they must evacuate the victims immediately. If evacuation is not possible, rescue personnel should attempt to keep the fire away from trapped victims. They must be careful when removing victims pinned in wreckage to prevent aggravating existing injuries or causing additional ones. If possible, they should obtain medical advice before moving injured victims. To remove a victim from the aircraft, one rescuer works from within or on the aircraft and another rescuer stays on the ground. The rescuer on the aircraft removes the victim from the aircraft and hands the victim to the rescuer on the ground. Together they carry the victim to safety.

7-73. All Army aircraft have seat belts and many have shoulder harnesses. Seat belts and shoulder harnesses are constructed of strong, webbed material and are difficult to cut. Rescue personnel must be familiar with the release mechanisms of these belts and harnesses. Figures 7-5 and 7-6 show different seat belts and shoulder harnesses. Figure 7-7 shows how to cut a harness.

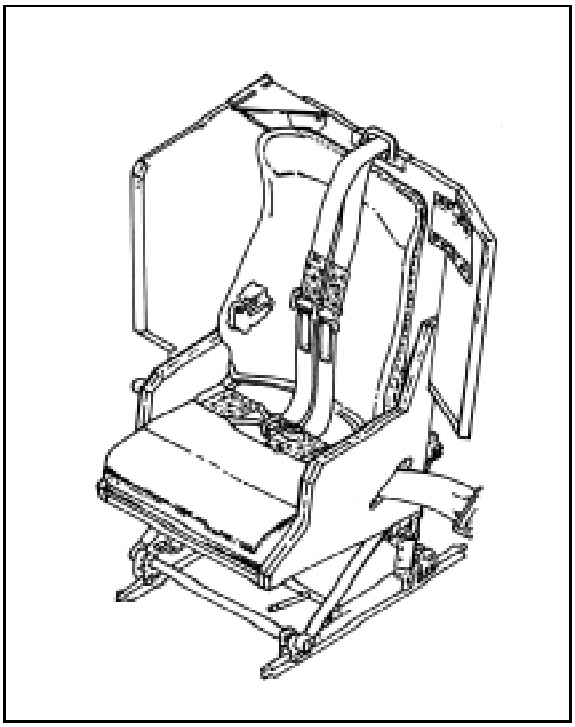

Figure 7-5. Seat belt and harness

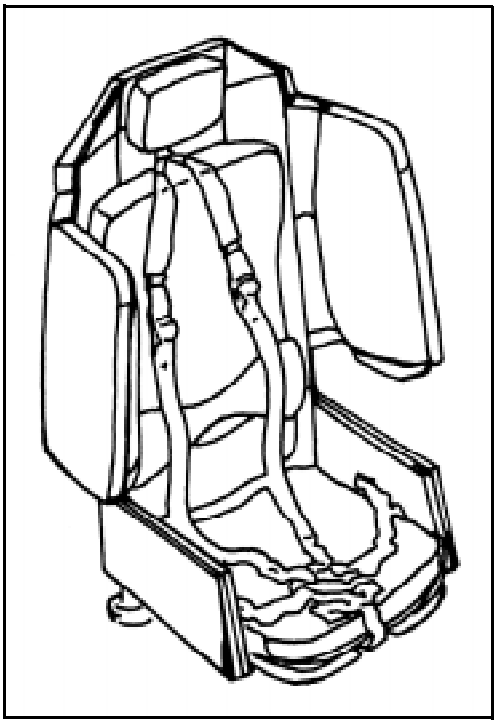

Figure 7-6. 5-point harness

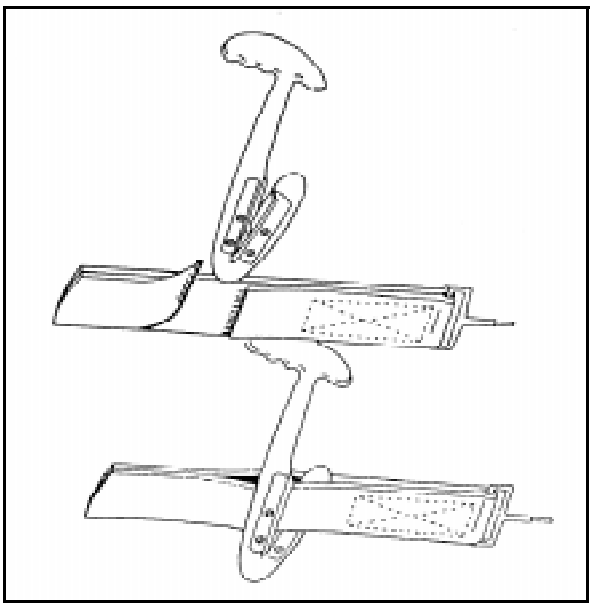

Figure 7-7. Cutting a double harness

EXTINGUISHMENT AND OVERHAUL

7-74. Extinguishment usually occurs after rescue personnel complete rescue operations. Tankers or backup crash trucks assist in applying water or extinguishing agents. Light and air units and wreckers or cranes are used when necessary. Rescue personnel must overhaul all aircraft, even if fire does not occur. Overhauling includes—

- Inspecting the aircraft thoroughly to ensure that no hidden dangers remain.
- Securing the electrical system and disconnecting the batteries.
- Tagging, removing, and relocating bodies. (Medical authorities usually perform this function.)