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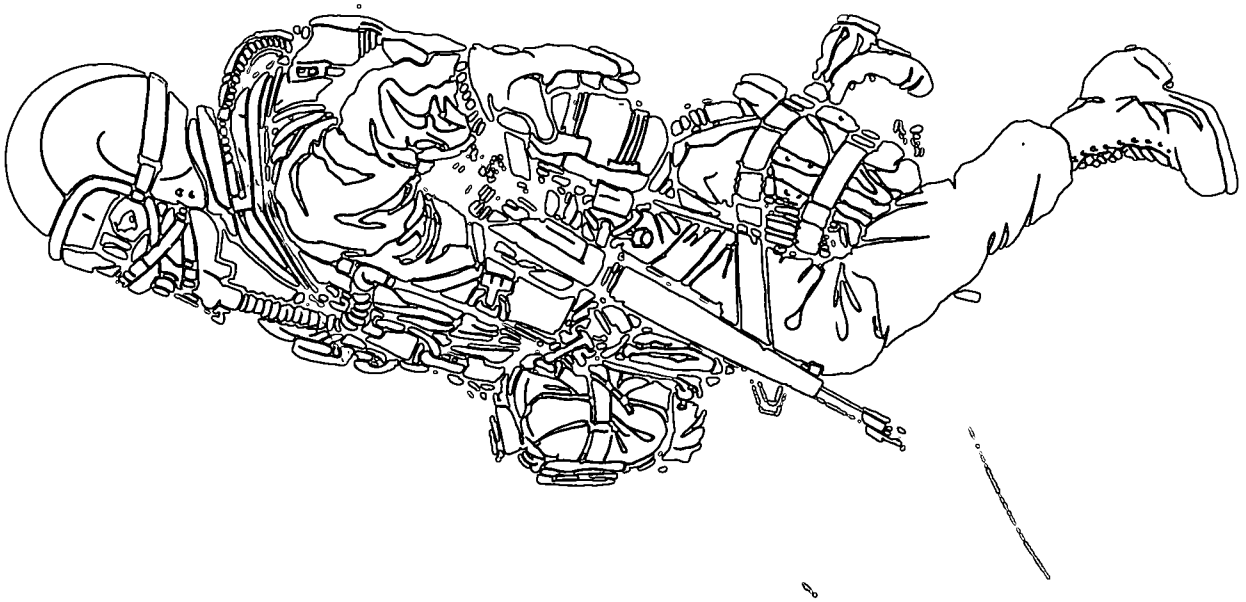
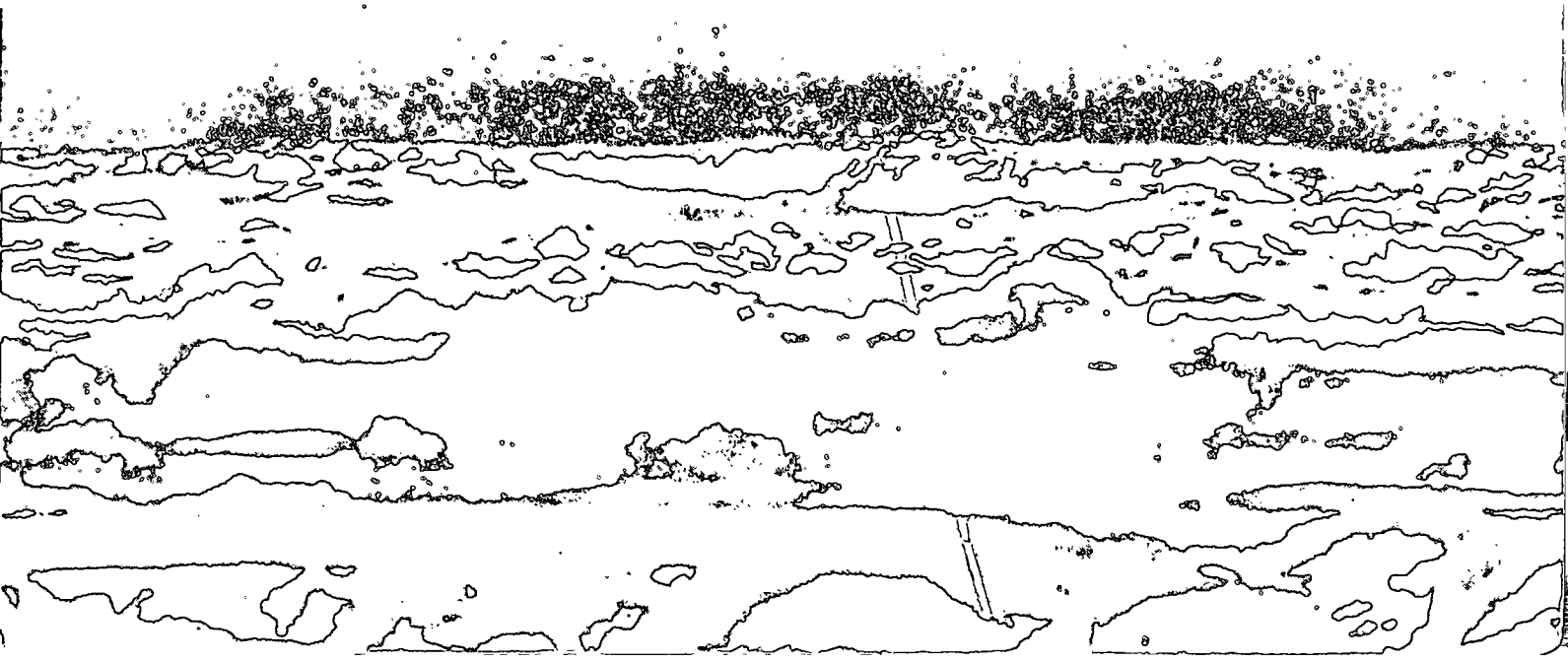
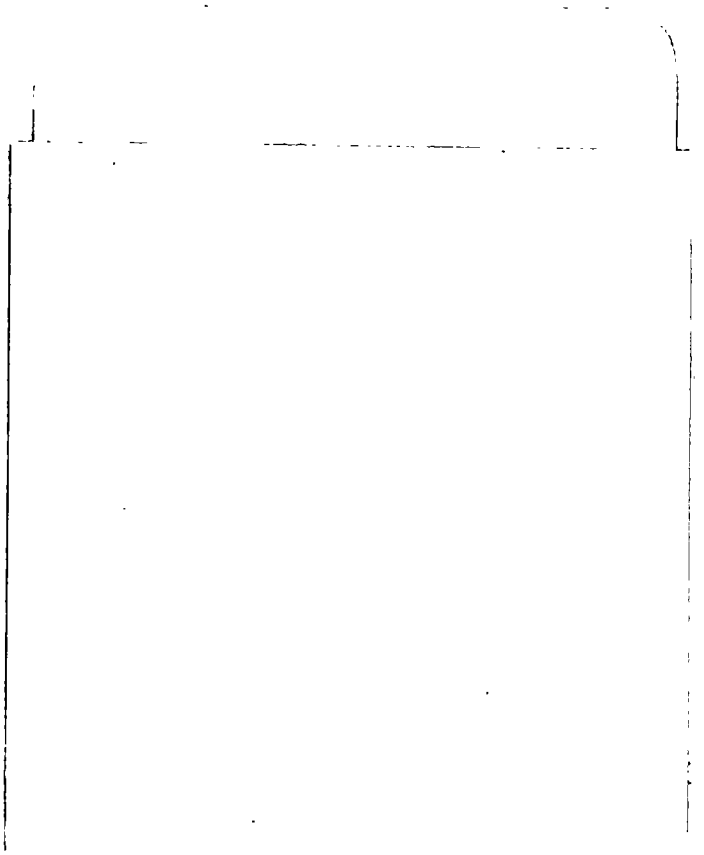


SPECIAL FORCES MILITARY FREE-FALL PARACHUTING





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DEPARTMENT OF THE ARMY
Washington, DC, 31 August 1977

SPECIAL FORCES MILITARY FREE-FALL PARACHUTING

This manual was developed by the US Army Institute for Military Assistance. We are always looking for new, innovative, quality ways of improving our doctrine and welcome your comments on the material contained in this publication. Please forward your comments to:

Commandant
US Army Institute for Military Assistance
ATTN: ATSU-TD-TL
Fort Bragg, North Carolina 28307

The use of the pronouns "he," "his," "himself," etc., in this manual includes both masculine and feminine genders. Any exception to this will be so noted.

*This FM supersedes FM (Test) 31-19, 30 July 1974.

FM 31-19

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MILITARY FREE-FALL PARACHUTING
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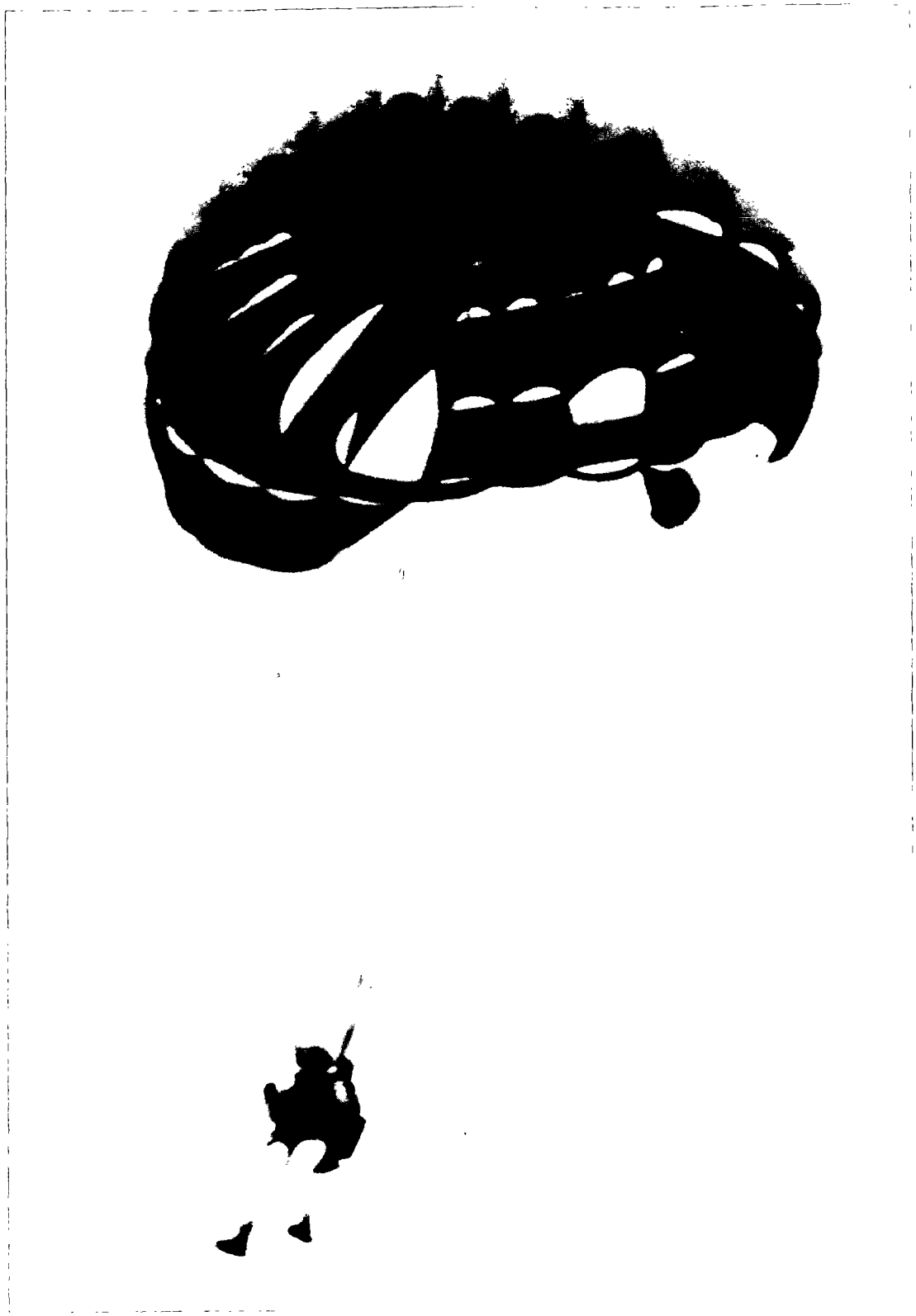


FOREWORD

Although parachutes and parachuting techniques have been advancing for the past 500 years, written history on parachuting is scarce and at times conflicting. During the early history of parachutes, all of the various models were attached to some sort of framework which held the canopy open. The parachutes were bulky and awkward to use, and had very little practical value.

During the 17th century, Sir Isaac Newton discovered that all bodies fall at the same rate of speed and that this speed increases at a uniform rate until a constant speed or terminal velocity is reached. Until recent years, however, it was commonly believed that man would lose consciousness or black out very quickly and could not survive a prolonged fall. It was thought that a man would twist, roll, tumble, and turn when falling, powerless to control himself.

The first human test of a free-fall parachute was conducted in 1919 by Leslie L. Irvin at McCook Field, Ohio. It was not a delayed free fall; Irvin cleared the aircraft at 1,500 feet and immediately pulled the opening cord. The parachute blossomed above him, and the test was a success.

The first delayed fall was in 1922. Lieutenant Harold R. Harris jumped from his disabled aircraft, had difficulty in finding his ripcord, and fell 2,000 feet before opening his parachute 500 feet above the ground. In 1934, Floyd Smith published an article in a commercial magazine outlining techniques developed to control the body during free fall, and the former beliefs about falling were discarded. The techniques described by Smith were basically the same as those used in free-fall parachuting today.

The French earnestly took up parachuting as a sport in 1949, and ten public sport parachuting centers were established throughout the country. The French refined and perfected the stabilized falling position. Free-fall techniques were brought to the United States in 1955 by Jacques Istel after he had visited France and observed the excellent parachuting being done there. Istel organized and trained the first US sport parachuting team to compete in international competition. He was retained by the US Army in 1957 to train a select group of seven military parachutists from the 77th Special Forces, Fort Bragg, in free-fall parachuting techniques.

The Strategic Army Corps (STRAC) Sport Parachute Team was founded at Fort Bragg, NC, in September 1959. During the early part of 1960, STRAC team members attended an oxygen orientation course at Wright-Patterson Air Force Base, Ohio, where they were introduced to the effects of oxygen shortages at high altitudes. STRAC team members also participated in a series of tests at Fort Bragg for the Continental Army Command to determine new rates of descent tables.

On the 16th of December 1963 at El Centro, California, 14 members of the US Army and US Air Force established a world record for a mass exit from 43,500 feet. No adverse effects were experienced.

The Department of the Army requires the capability for airdropping personnel and equipment from high altitudes. These personnel must maintain flexibility of in-air maneuver impossible with standard troop parachutes, and must be capable of operating at top efficiency immediately after landing. To meet these requirements, the Army has developed military free-fall techniques and equipment. The US Army Institute for Military Assistance (USAIMA), Fort Bragg, North Carolina, conducts a formal training qualification course. Personnel must satisfactorily complete this course before participating in military free-fall parachuting.

The Commandant, USAIMA, is responsible for the formulation of doctrine and other literature applicable to the training and employment of military free-fall parachutists.

CHAPTER 1

INTRODUCTION

PREFACE

One of the two major goals of all Special Forces training is the successful infiltration of designated areas with the maximum chance of survival and mission accomplishment. To attain this goal, Special Forces has developed a number of special infiltration techniques suitable to employment in an unconventional warfare situation. Military free-fall is one such technique.

PURPOSE

This manual provides commanders and staffs with a basic reference for the training and employment of military free-fall parachutists, and provides instructor personnel with technical and procedural information on training military free-fall parachutists. It is designed to support the air infiltration requirements identified in FM 31-20, Special Forces Operations; ARTEP 31-101, Army Training and Evaluation Program for the Special Forces Group (Airborne); and TC 31-20-3, Special Forces Air and Maritime Operations.

SCOPE

FM 31-19, Special Forces Military Free-Fall Parachuting, is divided into five chapters with four supporting appendixes.

Chapter 1 provides an introduction to the manual and includes the purpose and scope.

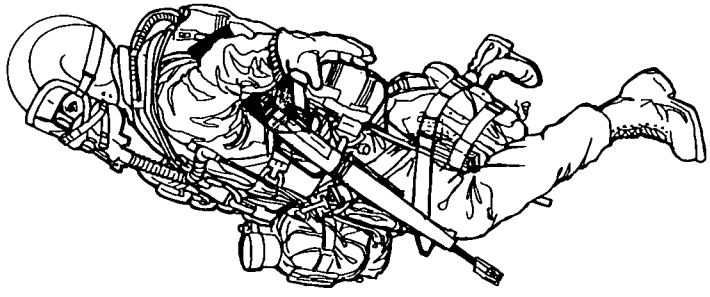
Chapter 2 outlines the tactical application of military free-fall techniques, including methods of delivering military free-fall bundles.

Chapter 3 describes the equipment required to perform military free-fall operations. Detailed checks and assembly procedures of the military free-fall kit are also explained in this chapter. It provides, as well, serviceability requirements for acceptance of the equipment.

Chapter 4 outlines the methods, equipment, and time required to train an individual to meet the basic requirements of a military free-fall parachutist.

Chapter 5 provides the requirements and a training guide to jumpmaster-qualify an individual who has successfully completed a recognized military free-fall course. Included are inspection procedures for all equipment and a type format for briefing the pilot. **Appendixes A, B,** and **C** support this chapter by outlining, in detail, the procedures for the jumpmaster personnel inspection, release point computation, and the aircraft inspection.

Appendix D contains a glossary of terms applicable to military free-fall training and operations.



CHAPTER

2 TACTICAL APPLICATION

When the tactical situation and mission requirements demand a clandestine penetration of selected areas, a preferred method may be the release of parachutists and cargo from high altitudes using free-fall parachute techniques to infiltrate an operational or objective area. Since unconventional warfare (UW) operations are normally conducted in areas without sophisticated air defense systems, military free-fall operations are particularly useful for clandestine infiltrations in UW situations. In such situations the greatest threat of compromise of air infiltration is ground observation and fire.

Free-fall parachute operations are generally characterized by flights over the objective area at altitudes not normally associated with parachute operations, and are normally conducted in darkness or twilight to reduce the chance of enemy observation or detection. The parachutists are released in space at a point which is calculated to allow them to land within their objective area. Maneuverable parachutes with automatic opening devices allow all detachment personnel to open at a predesignated altitude and land safely together as a tactical unit prepared to execute its mission. Although tactical military free-fall parachuting can produce highly accurate

landings, it is primarily a means of entering a designated impact area within the objective area. This type of drop can be made except under the most adverse weather conditions.

Free-fall parachuting is advantageous when:

- ○ Low level airdrop of personnel is not possible.
- ○ Landings with a high degree of accuracy are required or desired.
- ○ Immediate assembly of the infiltrating unit is required or desirable, especially in rough terrain or adverse weather.
- ○ The desired or available delivery aircraft cannot be used for conventional parachute operations (e.g., B-52 bomber and certain carrier-launched aircraft).
- ○ Clandestine infiltration is possible from a normal commercial air route.
- ○ Infiltration can best be conducted in conjunction with other air operations (e.g., as part of a bomber force, with infiltration conducted en route to or away from the target).
- ○ Simultaneous landings at multiple points on an objective are desired (e.g., seizure or attack of a key installation).
- ○ The safest delivery altitude, because of obstacles, is any altitude from 2,500 feet to 25,000 feet.
- ○ Infiltration during daylight is required and low level airdrop of personnel is impossible or inadvisable.

Military free-fall parachute techniques are applicable but not limited to:

Clandestine infiltration of operational detachments into unconventional warfare operational areas.

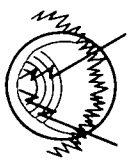
Infiltration of:

■ Individuals or small detachments for strategic reconnaissance and surveillance, or for special operations.	■ Assets or key operational detachment personnel or their replacements. ■ Pilot teams to contact resistance forces.	■ Pathfinder/combat control teams to provide terminal guidance for subsequent airborne operations.

Military free-fall techniques are not restricted to high altitude; they can be used at any altitude from 2,500 feet to 25,000 feet. Under special conditions, lower altitudes may be

considered. The same low-level en route flight to the drop zone used for conventional parachute operations can be used with the "pop-up" release technique. The aircraft does not have to reduce speed significantly to drop free-fall parachutists. An additional advantage is the fact that a 12-man free-fall detachment can exit an aircraft in a fraction of the time required for comparable static-line release. The dispersion pattern, therefore, will be comparably reduced, even without allowing for the increased maneuverability of the free-fall parachutes. A correspondingly smaller drop zone and shorter assembly time on the ground will be required, contributing to increased security. Even where relatively sophisticated air defense systems are a threat, countermeasures can be taken to offset their effectiveness. These include:

Escort aircraft armed with electronic countermeasure (ECM) equipment, air-to-air weapons and anti-radiation weapons.



Deception and standoff jamming techniques.

Remotely piloted vehicles (RPV) to decoy and deplete air defense systems. (In 1973 the Israelis used this technique. In one instance, one radio-controlled aerial target had some 30 air defense missiles fired at it, yet landed safely.)

When selecting the type of airborne operation to be conducted—conventional static line parachute infiltration; low altitude free-fall infiltration; or high altitude, low opening free-fall infiltration—all of the above countermeasures should be fully considered. In addition, an evaluation should be made of the enemy's capability to threaten each type of operation, ability of friendly forces to counter that threat, availability and capability of delivery and supporting aircraft, effects of weather, availability of personnel and equipment, and means of delivering accompanying equipment.

EQUIPMENT - 80 POUNDS PLANNING WEIGHT

Free-fall parachutists will have in their possession normal operating TOE equipment which will include TA clothing and equipment in keeping with the climatic conditions, food, and survival items. In addition, each parachutist will have a free-fall parachutist's jump helmet, goggles, and altimeter used for free-fall parachuting. All detachment equipment and supplies will be jumped and carried as individual loads. If selected items must be dropped as accompanying supplies, they will be packed in appropriate aerial delivery containers.

Various methods and techniques can be used to free fall equipment into operational areas:

- FF-2 timer and a ripcord deployed parachute.
- Power-actuated reefing line cutters and items of issue available to airborne units when shorter delays are necessary.
- High altitude bombing techniques for delivery of time-delay cargo parachutes.

Once the drop is in progress, free-fall parachutists will locate and follow the bundles to the ground, lessening the possibility of losing the equipment.

DROP ZONES

Free-fall infiltration envisages the selection of a drop zone in an area of low population density. While a desired impact point on the ground is jointly selected by the air support unit and the Special Forces unit, the success of the operation is not dependent on hitting this exact spot. Using the desired impact point as a reference, the high altitude release point (HARP) is calculated based on available weather data. During actual execution, current weather information may be provided either from the objective area or from the navigational equipment of the aircraft. This data may necessitate changing the HARP, desired impact point, or both. In any event, the jumpmaster is kept fully informed of the prevailing conditions, and he in turn keeps his jumpers informed. At the appropriate time, the jumpers exit the aircraft, employing free-fall techniques. The success of the infiltration depends on jumpers landing together within the operational area near the desired impact point.

Once the technique of infiltration is selected, rehearsals should be conducted if at all possible. Although these rehearsals must not interfere with the planning and preparation for the ground mission, it should be remembered that the unit must conduct a successful infiltration before it can accomplish its ground mission.

CHAPTER 3

3 THE MC-3 MILITARY FREE-FALL KIT

The MC-3 military free-fall kit contains all basic items necessary to perform military free-fall parachute operations:

- A main parachute assembly.
- A reserve parachute assembly.
- A helmet assembly and personnel oxygen system assembly.
- A rear-mounted rucksack assembly.

Gloves and jumpsuits are not included in the kit. Military issue gloves are sufficient, and jumpsuits are desirable but not necessary. A jumpsuit streamlines the parachutist's body for free-fall stabilization and provides protection for the mission-essential uniform which can be worn under the jumpsuit. Normally, mission-essential clothing will provide enough environmental protection for personnel during military free-fall operations.

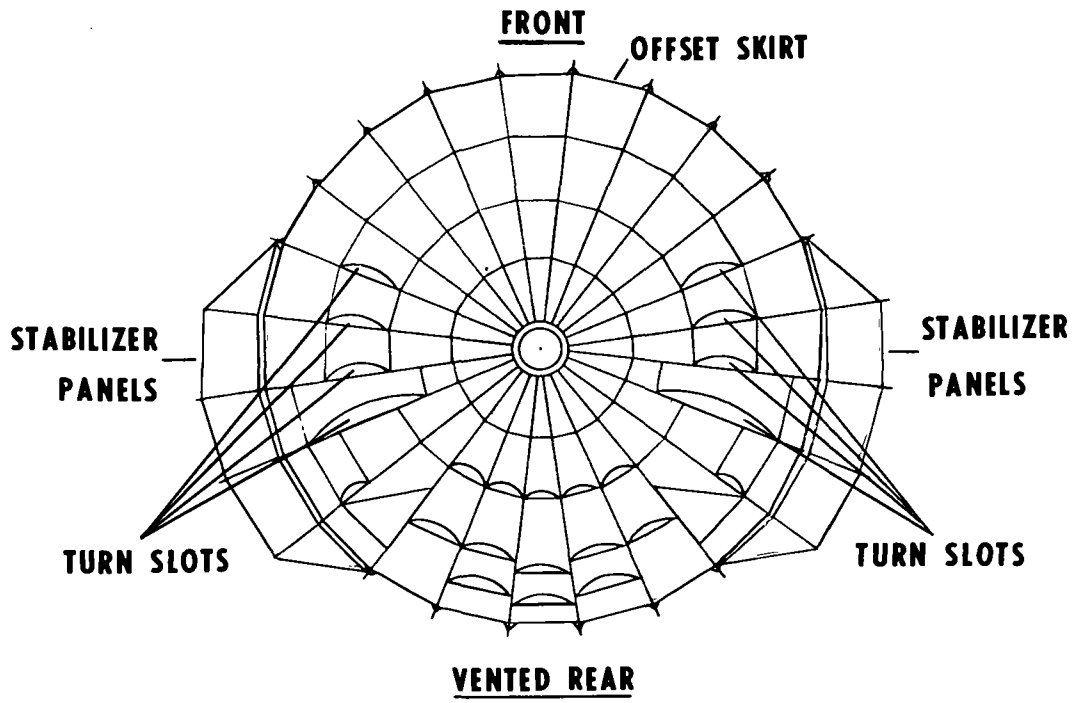
One of the first priorities is for you to become thoroughly familiar with your parachute equipment. Whenever you use this equipment, it should be inspected to insure that it fits and is worn correctly.

THE MAIN PARACHUTE ASSEMBLY

The main parachute assembly consists of:

- A 40-inch spiral vane pilot parachute and personnel parachute canopy sleeve assembly.
- An MC-3 canopy assembly.
- A pack assembly.
- A manual ripcord assembly.
- A harness assembly.
- An FF-2 automatic ripcord release assembly.

The Canopy Assembly



The main MC-3 parachute canopy is a 24-foot military free-fall back type parachute which may be deployed by either manual or automatic ripcord release. The canopy is aerodynamically designed with 17 vents in the rear and 4 turn slots on each side. The turn slots are louvers of the canopy material and protrude above the normal canopy curvature. Control lines, ending in toggles located on the rear of the front risers, are attached to the turn slots. Manipulation of these

toggles will control the volume and direction of air flow through the turn slots, allowing variation in the direction, forward speed, and rate of descent of the canopy.

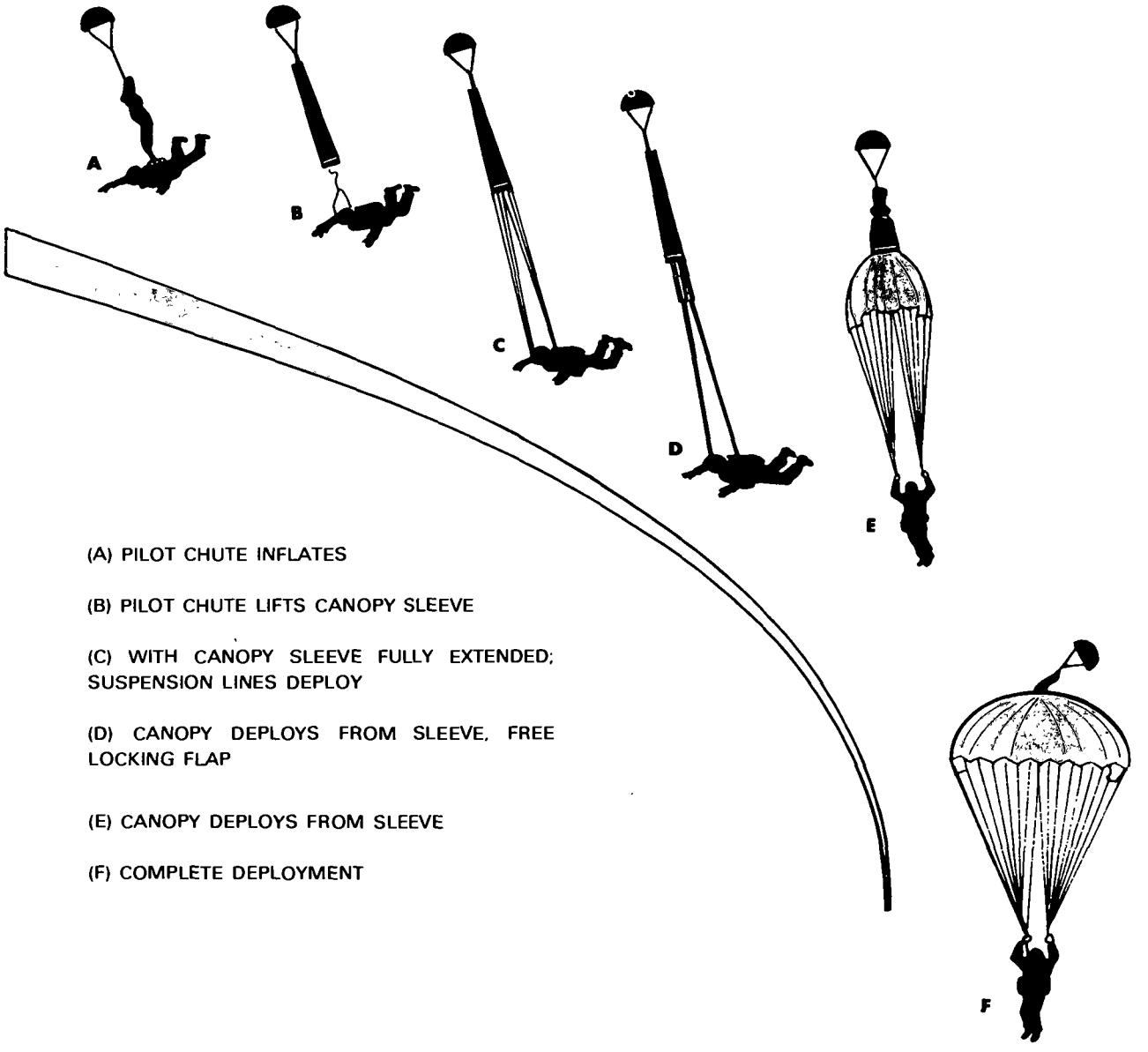
The skirt (the lower lateral band) of the canopy is designed so that the front will ride higher than the rear of the canopy. A center line attached to the apex pulls the apex down below the canopy curvature. Five stabilizer panels are attached to the skirt of the canopy on each side and extend below the skirt to contribute to the overall spread and stability of the MC-3 canopy. The canopy, when deployed, will take on an elliptical shape, developing a built-in thrust, or forward speed, of 13 miles per hour. The MC-3 canopy is packed inside a personnel parachute canopy sleeve and is deployed by means of a pilot parachute.

The Pack Assembly

The backpack container is semipermanently attached to the harness assembly with horizontal and diagonal back strap retainers. The four locking pins on the manual ripcord are thrust through four locking cones on the backpack to close the pack. Tension is provided by four pack opening bands which are routed behind the backpack and attached to eyelets on the side flaps of the backpack.

MC-3 BACKPACK ASSEMBLY

When the parachutist has fallen to the predesignated deployment altitude, he removes the manual ripcord handle from the ripcord pocket and extends his arm, pulling the ripcord cable through the cable housing and removing the locking pins from the cones in the backpack (or the FF-2 automatic release activates with the same results). With the locking pins removed, the pack opening bands pull the side flaps of the backpack assembly to the side, allowing the pilot parachute to inflate. The pilot parachute lifts the parachute canopy sleeve (with the canopy and suspension lines packed inside) from the backpack and extends the sleeve. When the sleeve is fully extended, the suspension lines deploy from the storage panel and free the locking flap. The canopy then deploys from the sleeve and inflates, completing the deployment sequence. A sleeve retainer line is attached to the sleeve bridle loop, to which the pilot parachute bridle is also attached, passes through the sleeve, and is connected on the other end to the canopy bridle loop, precluding the loss of the sleeve. The entire deployment sequence, from locking pin removal to canopy inflation, will normally occur within two and a half seconds.



DEPLOYMENT SEQUENCE

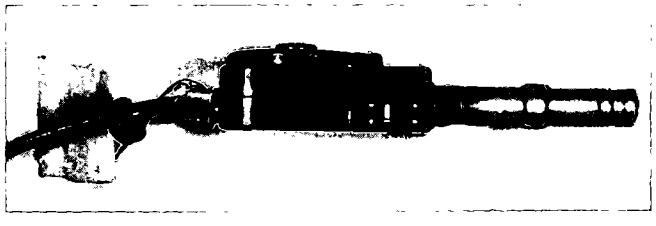
The Harness Assembly.

The troop back and chest personnel parachute harness assembly is mounted on a short-girth vest for easy donning and incorporates a sponge rubber backpad for comfort. The harness components consist of the two main lift webs with canopy quick release fittings and canopy release pads, elastic webbing retainers, two pack attaching slide fasteners, and two pack attaching webs. Three ejector type snap fasteners allow quick removal of the harness.

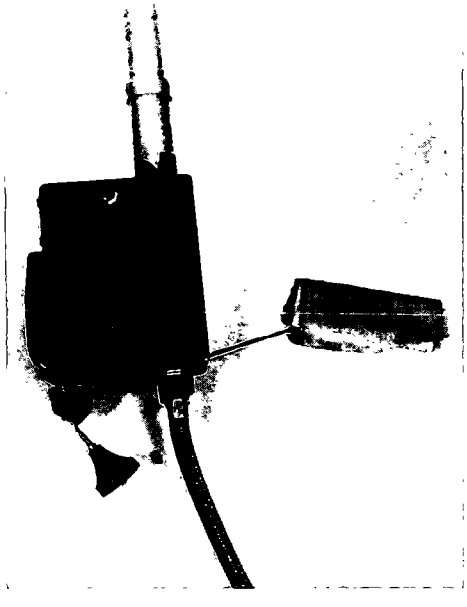
The harness has five points of adjustment: the chest strap, the two adjustable "V" rings on the leg straps, and the two friction adapters on the running ends of the diagonal backstraps. It should be adjusted to fit snugly, but should not restrict body movement. Adjust the harness as follows:

- Don the harness, check for body size, and remove the harness.
- Adjust the two main lift webs to body size, and make certain that the lift webs are even.
- Don the harness and fasten the chest and leg straps.
- Adjust the chest and leg straps, making certain that you can arch your back properly.
- Fold the excess webbing and secure it under the retainers provided on each strap.

The CRU 60/P oxygen connector plate is attached to the left main lift web above the chest strap. The manual ripcord handle pocket is affixed to the right main lift web, with the end of the ripcord cable housing tacked above it. Two "D" rings, integral parts of both main lift webs, are located below the chest strap and serve as points of suspension for the reserve parachute. The two equipment rings are integral parts of the saddle portion of the main lift webbing and are used for attaching the equipment lowering line. The FF-2 automatic ripcord release is attached to the left diagonal backstrap of the harness.



FF-2 AUTOMATIC RIPCORD RELEASE



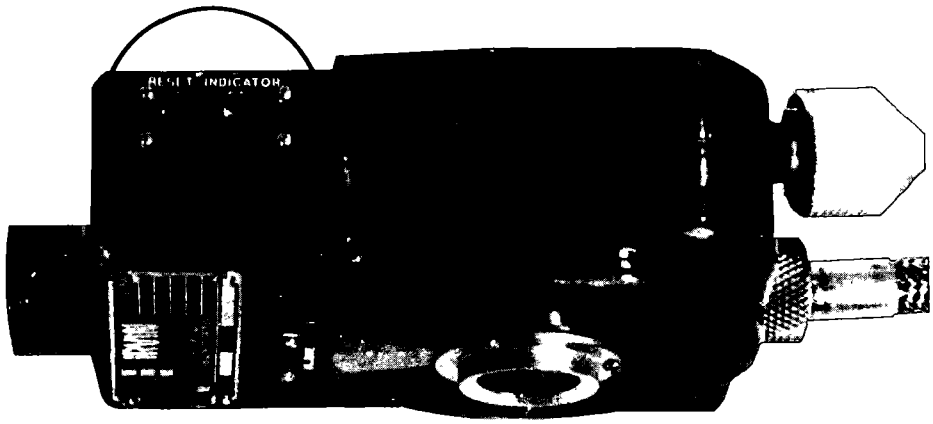
FF-2 Automatic Ripcord Release Assembly.

The FF-2 automatic ripcord release assembly, commonly called the Hite Finder, is designed to open a free-fall personnel parachute automatically at a safe altitude should the parachutist fail to pull the manual ripcord. The response of the assembly is dependent upon presetting the

instrument for the barometric pressure at the desired activation altitude, computed in millibars, above the intended drop zone. The release is mounted in an alloy case, at the bottom of which is a cylindrical housing which contains the main spring, a plunger, and a barrel cap. On one side of the release case is a slotted screw used to set the activation altitude, and on the opposite side is an access hole, covered by a threaded plug which is used for resetting the time-delay mechanism. The arming pin assembly which is used to manually activate the time-delay mechanism of the release is located on the top. Also located and fitted on top of the release case is the power cable and housing assembly which pulls the parachute ripcord pins in the instrument's operational sequence.

WARNING: PRIOR TO AND FOLLOWING THE INSTALLATION OF AN FF-2 AUTOMATIC RIPCORD RELEASE ASSEMBLY ON A FREE-FALL BACK PARACHUTE ASSEMBLY, CHECK THE RESET INDICATOR TO INSURE THAT A PARTIAL RUNDOWN OF THE TIMING MECHANISM HAS NOT OCCURRED DUE TO ANY INADVERTENT MOMENTARY WITHDRAWAL OF THE ARMING PIN.

The reset operation can be checked using the "RESET INDICATOR" window located immediately below the rounded face of the release case.

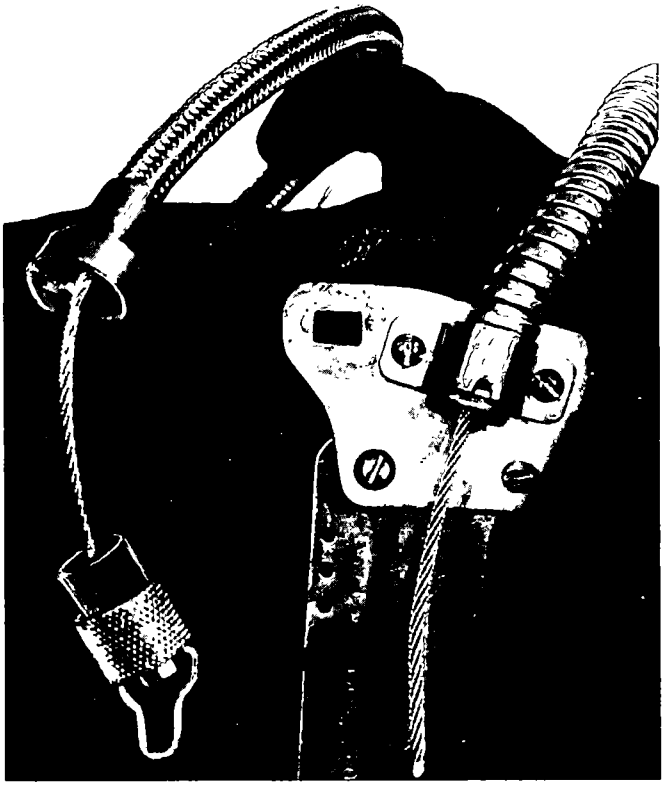


RESET INDICATOR WINDOW

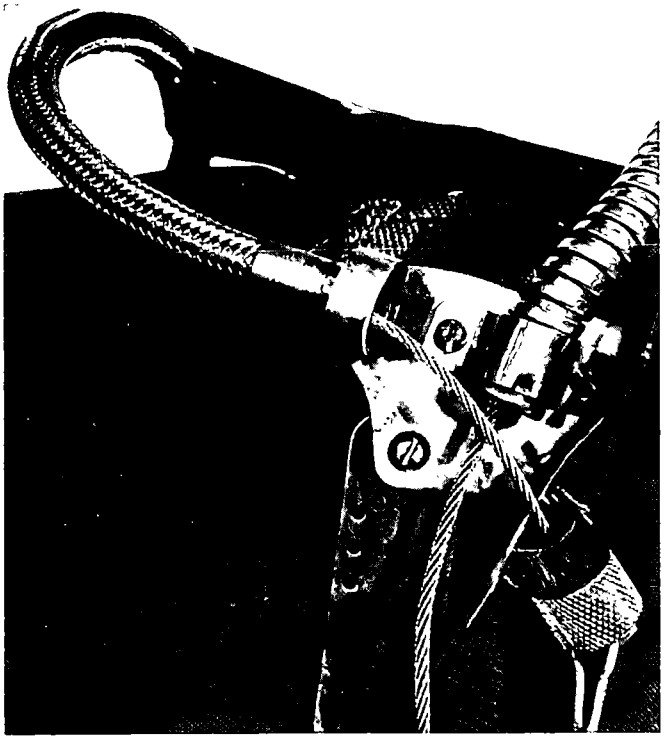
Visually check the window, above which is marked "RESET INDICATOR" on the release casing, and observe the location of the two white marks. If the release time-delay mechanism has been reset, the two marks will be aligned. If the lower, movable, mark is offset more than the width of the indicator, the time-delay mechanism has not been reset. This prohibits any immediate use of the release assembly. Replace a release assembly which **has not** been reset with another which has been reset, or reset the time-delay mechanism of the original release as required.

INSTALLATION OF FF-2

In most cases when the parachute is issued, it will have the FF-2 installed. The release fits into a stowage pocket specifically designed to contain it. If you should have to install the release, slip the FF-2 into the stowage pocket attached to the parachute harness, making sure that the adjustment screw, millibar window, and reset indicator can be seen through the openings provided. Stow the individual release log record inside the pocket between the release casing and the side of the pocket with the attaching webs (the side next to the parachute). The cylindrical housing will extend through a hole designed for it in the bottom of the pocket. Secure the release by passing the release retaining web across the center of the casing top and closing the pocket closing flap over it so that the affixed hook and pile (VELCRO) fasteners mate.

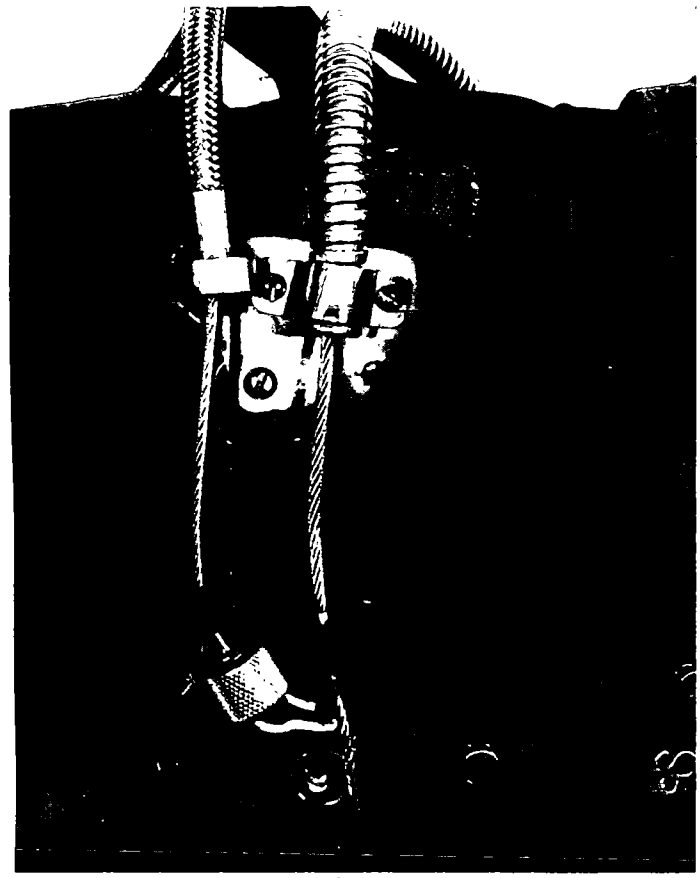


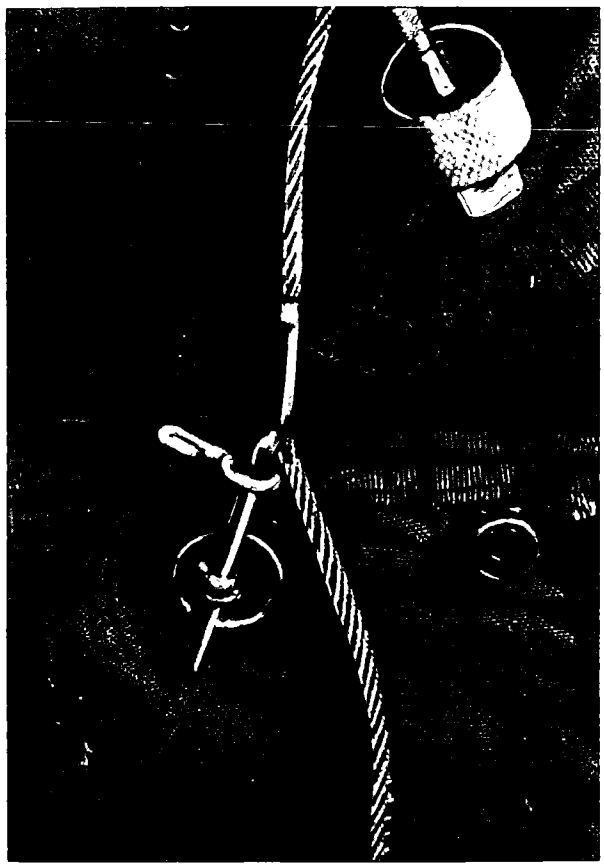
Pass the upper end of the arming cable and housing assembly through the power cable sleeve on the inside of the left upper end of the pack. Attach the release pocket to the pocket attaching strap at the center of the left side of the pack by using the elasticized attaching webs.

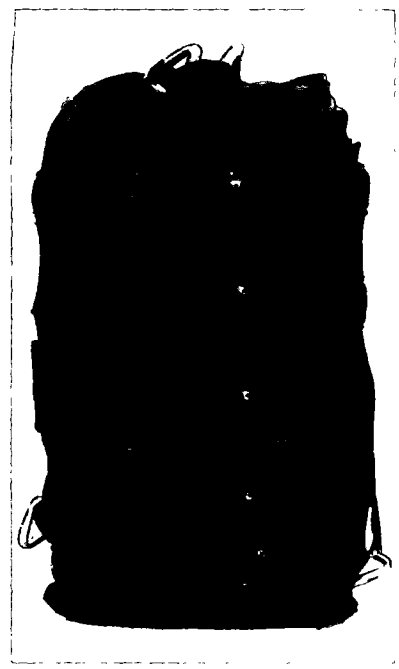


Pass the upper end of the arming cable and housing through the power cable retaining loop at the upper end of the pack, and route it toward the ripcord housing plate. Rotate the power cable housing end 90° clockwise to lock the key in the slot and secure the housing to the plate.

Unscrew the knurled locking nut on the upper end of the power cable and remove the withdrawal hook from the slotted retainer. Install the withdrawal hook on the first ripcord locking pin above the first locking cone with the closed, rounded end of the hook under the ripcord cable and against the upper end of the pin. Insure that the hook **does not** go around the cable. Reinstall the open end of the hook in the hook retainer slot and secure it to the retainer by screwing the knurled locking nut back across the retainer. Close and secure the ripcord housing plate protector flap and the ripcord protector flap.





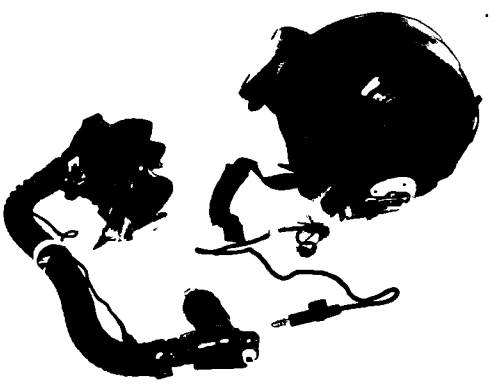


WARNING: DUE TO THE EXPOSED MOUNTING LOCATION OF THE FF-2 AUTOMATIC RIPCORD RELEASE, TAKE EXTREME CARE IN THE HANDLING, STORAGE, AND TRANSPORTATION OF AN MC-3 BACK STEERABLE PARACHUTE

If you should be required to remove the FF-2 from the parachute, slip the ripcord locking pin out of the hook without unscrewing the knurled locking nut. Never unscrew the knurled locking nut from an uncocked release. Reverse the other steps above, unlocking the cable housing from its plate and slipping the power cable and housing through the loop and sleeve.

THE HELMET ASSEMBLY

JUMPER'S HELMET, MASK, AND GOGGLES



JUMPMASTER'S HELMET, MASK, AND GOGGLES

The MC-3 flying helmet is used for free fall. There should be a bayonet fastener receptacle or each side of the helmet for attaching the oxygen mask. The helmet designed for the jumpmaster will incorporate earphones and a boom microphone for communication with the aircraft's crew. Helmets and masks for personnel other than jumpmasters should not be equipped with communication equipment.

Standard driving goggles are provided to protect the parachutist's eyes from wind, sunlight, and debris. Check goggles to insure that the lens is clear and that your vision will not be obstructed by any scratches.

Goggles are installed on the helmet by securing the headstrap to the two headstrap retainers on the back of the helmet. The headstrap should also be tacked to the helmet.

PERSONNEL OXYGEN SYSTEM ASSEMBLY

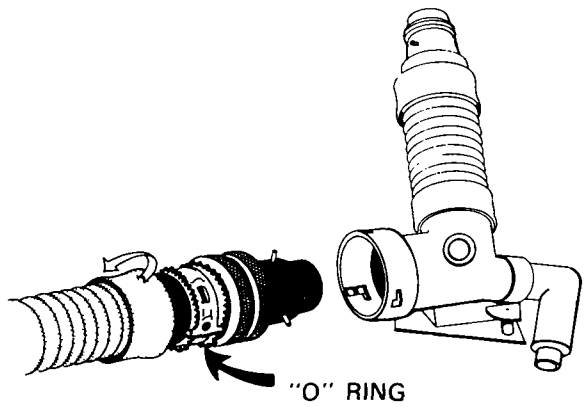
The personnel oxygen system consists of an oxygen mask, a CRU 60/P oxygen connector, and an oxygen bottle assembly. One of the most essential pieces of equipment you will use is the MBU3P oxygen mask. This pressure-type mask comes in small, medium, and large sizes. It should fit snugly and must be airtight. The mask has four points of adjustment located on the front for a snug fit. The oxygen mask for jumpmasters incorporates a microphone for communication with the aircraft crew.

Select the mask which most closely follows your facial contours when you hold it to your face with little or no effort.

Check the mask carefully to insure that the straps are complete. Each strap should have a bayonet-type fastener attached to the adjustment harness for quick disconnecting.

Check all the rubber parts to make sure they are not broken, torn, or dry-rotted.

Inspect the oxygen mask-to-regulator connector to insure that it has a rubber O-ring, which may be white or green in color.



Next, inspect the inhalation valves inside the mask to insure that they are properly seated and have covers with the arrows pointing down.

Before you fit your mask, insure that your helmet chin strap is adjusted so that the helmet will fit snugly. Put on your helmet and mask, inserting each bayonet fitting on the mask into the second locking position on the receiver on your helmet. Pass your fingertips over the exit slots on the back of the receiver. The ends of the bayonet fitting should **not** protrude when the bayonets are in the second locking position. Adjust the mask straps until the mask is snug and as comfortable as possible on your face.

Test and adjust the mask as follows:

1. Connect a hose from the M2900 oxygen console to the CRU 60/P connector on the end of your mask hose. Set the A-14 regulator on the console on the normal setting. Check the mask for proper valve operation by breathing normally. If the valves stick or do not operate properly, return the mask to the oxygen NCO for replacement.

2. Turn the pressure dial on the A-14 regulator to the first "click" under the 41M setting, and adjust your mask straps to eliminate any leaks which may be present. **Do not** use the bayonet adjustment at this point.

3. After you have satisfactorily adjusted your mask to 41M pressure, turn the A-14 regulator dial to 43M and use the bayonets to adjust for leaks. The pressure check at the 45M setting on the A-14 regulator should be made in the same manner.

When you have confirmed holding pressure at the 43M and 45M settings, readjust the bayonets to the second locking position to maintain a 41M pressure for routine oxygen flights. Whenever decompression occurs above 40,000 feet, however, you should immediately use your bayonet adjustments to prevent mask leaks. Never tighten your mask more than necessary to maintain the pressure to which it will be subjected.

If leaks occur between the face-form and your face, check to see if you have the proper mask size. Try a smaller size if necessary. If leakage still occurs, loosen the two adjusting screws and move the bayonets in the rotating feature of the receivers until the mask fits properly.

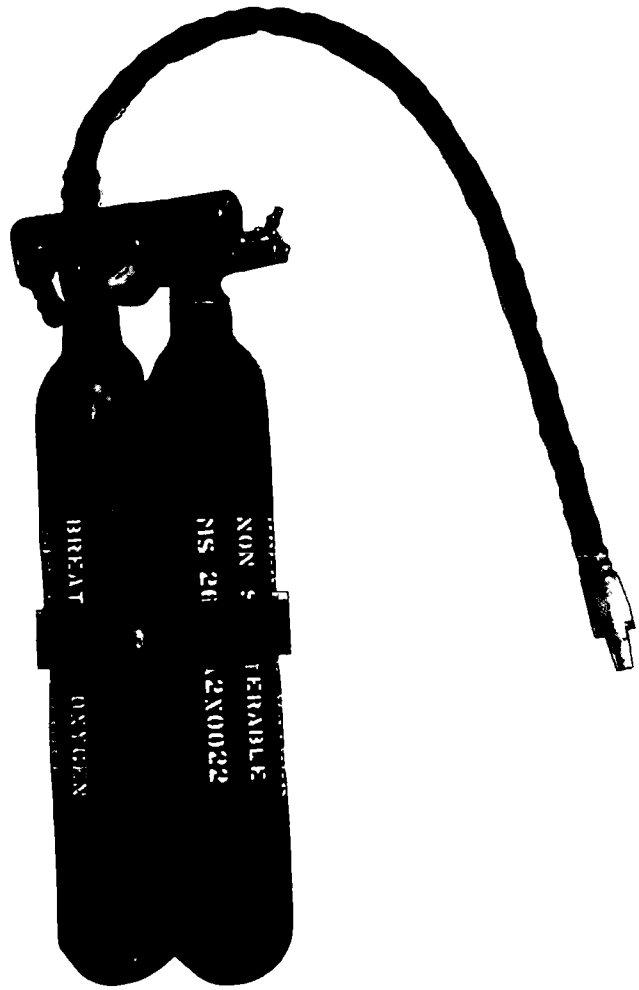
You can, if necessary, clean your mask. Wipe the mask off carefully and gently with gauze pads or some other **lint free** wipe dampened with 70 percent isopropyl alcohol (rubbing alcohol). If alcohol is not available, use a solution of soap or mild detergent and water, and then swab the mask again with wipes dampened in clear water. Allow the mask to air-dry out of the sun. Store the mask in a plastic bag, if possible, away from extreme heat. Oxygen masks should be turned in for more extensive cleaning when necessary.

The MBU3P oxygen mask can be supplied with oxygen from a walkaround bottle, the M-2900 oxygen console, the aircraft oxygen supply, and the bailout bottle assembly.

WARNING: DO NOT SMOKE WHEN OXYGEN IS BEING UTILIZED.

The oxygen (or "bailout") bottle assembly consists of two oxygen cylinders secured together with a double-bottle clamp, and a manifold assembly which has an "ON-OFF" control switch, a standard pressure gauge, a refill valve, and a valve-to-connector hose assembly. When assembled for use, the cylinders must be secured with the double-bottle clamp.

The two steel cylinders of the oxygen bottle assembly are of shatterproof, high pressure design. When attached to the manifold assembly, the connected cylinders have an operating range of between 1800 and 2200 pounds per square inch (psi), and will provide a parachutist oxygen for approximately 15 minutes. Once activated, the bottles can be turned off if necessary.



The pressure gauge is located at the center of the manifold assembly, and is used to show the oxygen pressure of the cylinder assembly. The gauge has a movable indicator and a scale divided into red and black segments. Although the scale has only two marked psi indication points (1800 and 2500), other pressure indication points may be approximated; for example, when the indicator on the gauge cuts the second "L" of "FULL," the pressure is approximately 2000 psi.

The "ON-OFF" control switch is located on one end of the manifold, and is spring-loaded for positive lock in either the "ON" or "OFF" position. To activate the assembly, pull the control switch outward to clear the "OFF" position, move it to "ON" and release it so that it locks into the notch. The assembly may be turned off in the same manner.

WARNING: TO PREVENT MOISTURE AND CONTAMINANTS FROM ENTERING THE ASSEMBLY SYSTEM, THE "ON-OFF" SWITCH ON A DOUBLE-BOTTLE OXYGEN CYLINDER ASSEMBLY MUST BE IN THE "OFF" POSITION WHEN THE ASSEMBLY IS NOT IN USE.

The valve-to-connector hose assembly consists of a length of noncollapsible high-pressure hose with a bayonet connector which attaches the hose to the CRU 60/P oxygen connector mounted on the parachute main lift web. The other end of the hose is clamped to the manifold outlet.

The refill valve, equipped with a dust cover, is located on one end of the manifold, and permits servicing (filling) of the cylinders.

WHENEVER YOU DRAW A BAILOUT BOTTLE, CHECK THE FOLLOWING:

- The bayonet connector should be spring loaded.
- The rubber hose should be free of cuts or deterioration.
- The on-off control should be operational and in the "OFF" position.
- The gauge reading should be between 1800 and 2200 psi.

WARNING: ANY DEFICIENCY NOTED IS CAUSE FOR REPLACEMENT OF THE BOTTLE.

Double-bottle oxygen cylinders are installed in a pocket attached to the chest reserve parachute packtray. Normally, they are already installed when the reserve parachute is issued, but if it should be necessary for you to do it yourself, first check to insure that the pressure gauge indicates between 1800 and 2200 psi. If the cylinder pressure is below 1800 psi, replace it with a full cylinder; if the cylinder assembly shows pressure of over 2200 psi, activate the cylinder and "bleed" the pressure down to 2200 psi.

OXYGEN BOTTLES INSTALLED

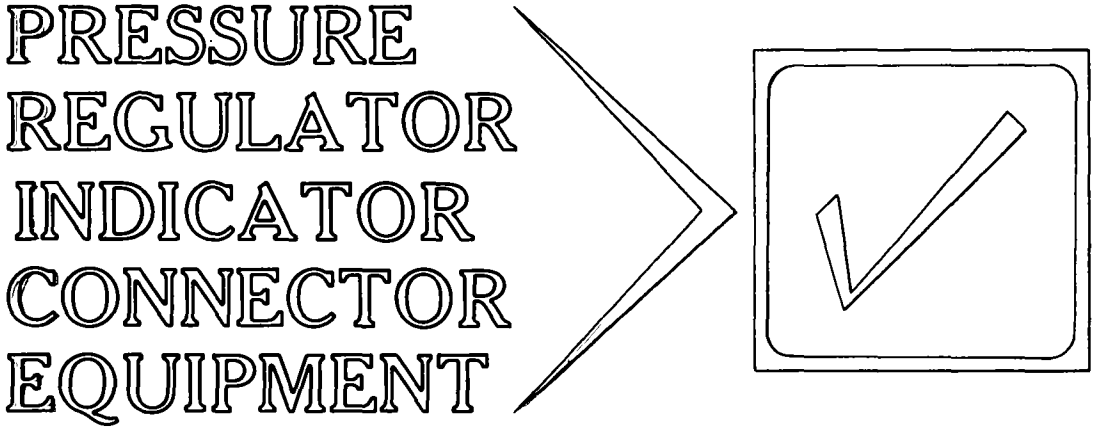
WARNING: DO NOT DISCHARGE OXYGEN FROM A DOUBLE-BOTTLE OXYGEN CYLINDER IN THE PRESENCE OF OPEN FLAMES OR ELECTRICALLY CHARGED WIRES OR UNITS.

Insert the lower end of the oxygen cylinder assembly into the pocket, and pass the long end closing flap over the manifold, with the pressure gauge extending through the slot in the flap. Pass the lower side closing flap up over the side of the cylinder. Secure the end closing flap to it with the affixed hook and pile (VELCRO) fastener. Bring the other side closing flap tightly up over the cylinders and secure the three flaps together with the flap hook and pile fastener.

EQUIPMENT CHECKLIST

Before each jump, check your oxygen cylinders and mask-to-regulator connector. Check the connection of the bayonet-type fitting on the end of the oxygen cylinder hose and the mask-to-regulator connector. Leave the two connected so that the equipment will be ready for immediate use.

Many hypoxia accidents have occurred because a parachutist failed to make frequent and adequate checks of his oxygen equipment. The points to be checked on every flight using oxygen may be remembered by reference to the word, "PRICE." Make sure you cover each point.



THE RESERVE PARACHUTE ASSEMBLY

The reserve parachute used with the MC-3 system is a standard 24-foot diameter troop-chest reserve personnel parachute, deployed by means of a 30-inch diameter vane type pilot parachute with an ejector disk (kicker plate). It is secured around the parachutist's body by means of a reserve parachute attaching strap and reserve parachute connector strap, and is suspended from the two "D" rings on the main lift webs of the harness assembly.

The reserve parachute attaching strap has a triangle link attached to each end and when installed on the main back parachute, forms half of the reserve parachute restraint strap assembly. Usually, the attaching strap is already installed when the main MC-3 parachute is issued. If, however, it is necessary for you to install the attaching strap, proceed as follows:

Position the back parachute with the harness facing up.

Raise the pack back cushion and open the horizontal backstrap retainers.

Center the attaching strap over the pack between the horizontal backstrap retainers.

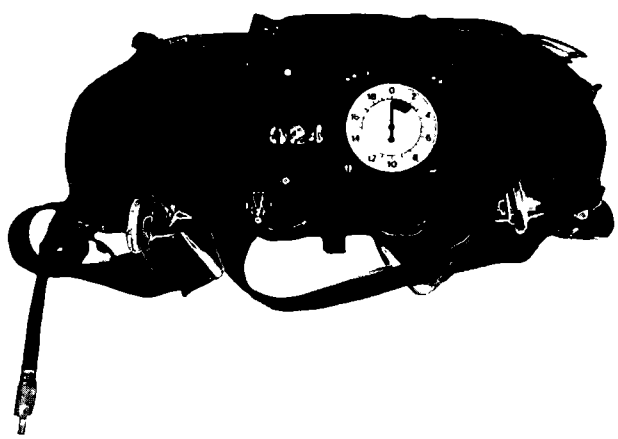
Pass each triangle link end of the strap through the fourth pack opening band slot located at each side of the backpack assembly.

Pass the loose end of each horizontal backstrap retainer down through the adjacent loop formed in the attaching strap and reattach each retainer in the original location.

Resecure the pack cushion to the pack.

The reserve parachute connector strap has a quick ejector snap attached to each end and is installed on a packed chest reserve personnel parachute by passing one end of the strap through each of the four waistband retainer webs on the back of the reserve packtray and centering the strap length on the packtray. The quick ejector snaps fasten to the triangle links on the attaching strap to encircle the parachutist's waist snugly.

Position the reserve parachute at the center of your body so air will flow evenly over the upper and lower portions of your body. Secure it firmly with the reserve restraint strap (located at the bottom of the main backpack) to prevent shifting during free fall. Position the instrument mount on the reserve parachute so you can see it easily at all times.



THE ALTIMETER

The altimeter, contained in a metal bracket assembly, is normally mounted on the top of the reserve parachute when it is issued. There are several types of altimeters in use, some simple and some complicated, but the purpose of each is the same: to indicate altitude above the ground. The nonsensitive type altimeter generally used for free fall is marked in increments of 250 feet,

numbered every 2,000 feet, 0 being zero feet and the 20,000 feet indicator representing 20,000 feet. It has only one needle, which moves across the face of the altimeter. A small red light with a protective cover is provided for night operations. The "on-off" switch for the altimeter light is located on the side of the metal mounting bracket.

The nonsensitive altimeter is a reliable piece of equipment, but should not be roughly handled. Before being placed in service, the altimeter must be put through a test chamber in accordance with TM 10-1670-264-13. If accidentally dropped or after a hard landing, the altimeter should be rechambered.

ALTIMETER ATTACHMENT

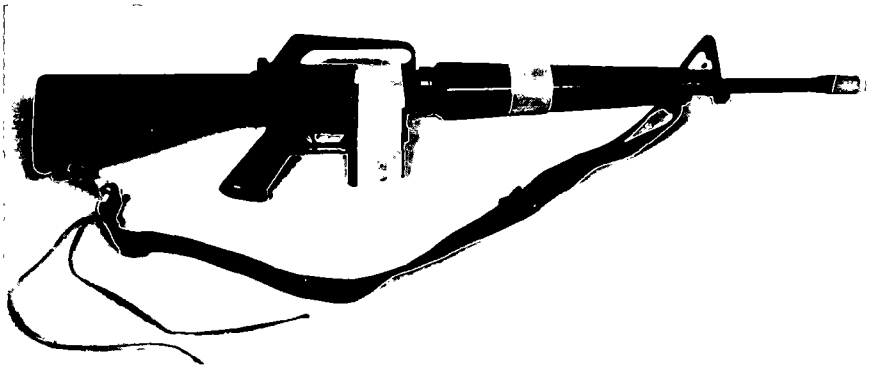
Although the altimeter generally is installed on the reserve parachute when the reserve is issued, it may sometimes be necessary for you to install it yourself. Unsnap and open the ripcord protector flap on the packed reserve to expose the pack opening spring bands. Unhook each of the pack opening spring bands from the top. Pass the loose end of each band through the appropriate accommodating slots in the base of the altimeter bracket. Center the altimeter bracket on top of the reserve parachute pack, and rehook the bands in the original hooking location.

WEAPONS

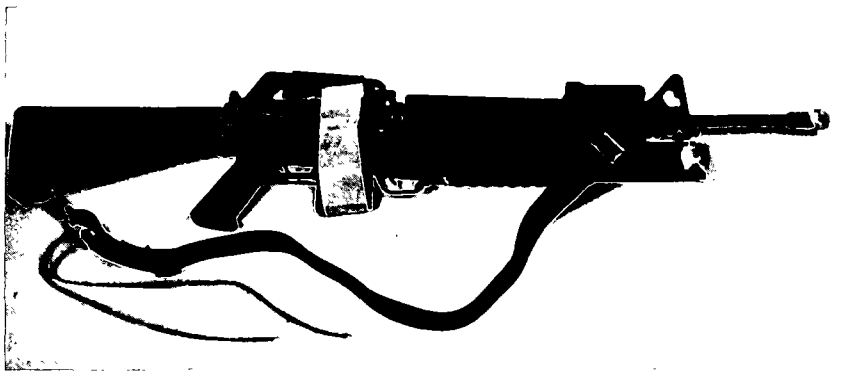
Individual weapons are normally carried secured to the parachutist's left side. Take care to insure that sharp edges are covered and that the muzzle is taped to prevent clogging upon landing.

The preparation steps are somewhat different for the M-16 rifle and the M-203 grenade launcher.

M16 RIFLE
PREPARED FOR RIGGING



M203 GRENADE
LAUNCHER PREPARED
FOR RIGGING



To prepare the M-16 rifle, extend the sling to its full length and tape the keeper in place. Tape the muzzle to prevent clogging upon landing. Tape the inserted magazine and upper hand guards to prevent their loss. Fold the adhesive side of the running end of the tape together and press to form a quick-release pull tab for ease in removal.

To prepare the M-203 grenade launcher, extend the sling to its full length and tape the keeper in place. Remove the quadrant sight and tape the muzzles of the M-16 and M-203 to prevent their clogging upon landing. Tape the magazine to the receiver and tape the M-203 barrel assembly to the handguard and sight assembly so that the barrel latch is covered. Fold and press the adhesive side of the running end of the tape together to form a quick-release pull tab.

JUMPER WITH RIGGED M-16 RIFLE

Position either weapon by slinging it over your left shoulder, muzzle down, and rotate it so that the pistol grip faces your rear. Route the sling under your left main lift web and over the chest strap. Place the reserve parachute restraint strap over the weapon and secure it to the V ring of the backpack to secure the weapon to your side.

Secure the weapon further with one 18-inch tiedown of ¼-inch cotton webbing (80-lb test) or a like item. Secure the tiedown to the rear sling swivel with a girth knot, then tie it with a bow knot to the pack attaching loop as close to the canopy release assembly as possible.

If you are also carrying a pistol, holster the pistol and move the holster to the right side of the pistol belt. Tape the holster closed and secure the pistol to the pistol belt with a lanyard.

REAR MOUNTED RUCKSACK ASSEMBLY

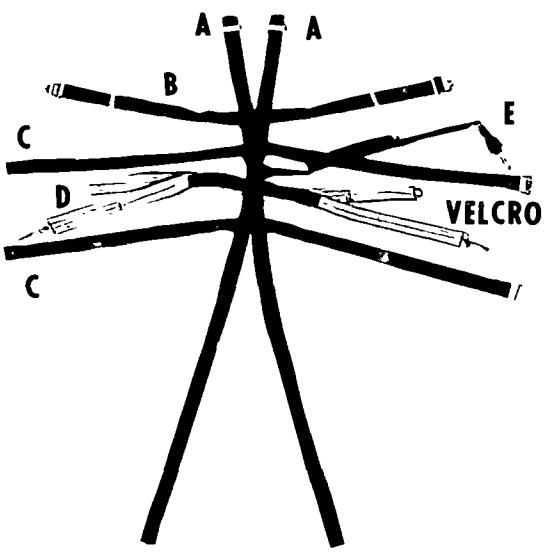
The rucksack is a general purpose item which may be used to carry designated combat equipment. It is equipped with adjustable carrying straps which permit it to be carried in the same manner as a field pack.

The free-fall parachutist normally jumps with the equipment and weapons he carries on the mission. The load carried should be as light as possible and consist of only the equipment, weapons, and ammunition needed until resupply can be effected. All items of individual combat equipment, except life preservers, are carried in the rucksack during military free-fall jumps.

Insert items of equipment into the rucksack and place padding between the load and the front portion of the rucksack (the portion with external pockets). The front of the rucksack will be in contact with the ground when properly rigged, and the padding will prevent damage to the equipment carried in it. Use enough padding to avoid metal-to-metal, metal-to-wood, or wood-to-wood contact between items of equipment packed in one container. In the interest of safety and comfort, do not attach hard, bulky, or irregularly shaped items where they will come in contact with the back of your thighs or buttocks. When necessary, attach equipment on the front or sides away from the five points of contact in a parachute landing fall. Package weapons and equipment loads by operating units. For example, a radio and its battery pack are jumped as one load because the loss or temporary separation of one part makes the other inoperable. Tape exposed snaps, hooks, and other sharp projections on your clothing and equipment with masking tape.

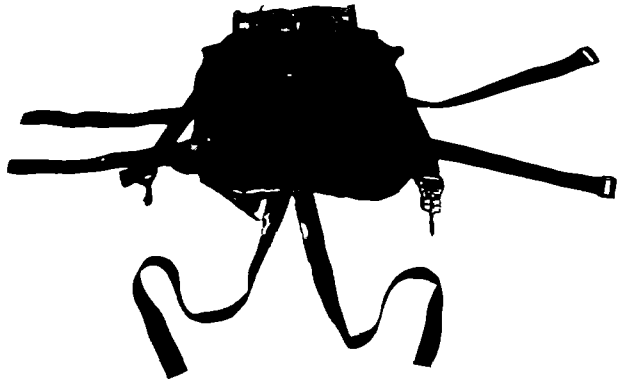
RMRS HARNESS

A Diagonal locking strap
B Anchor strap
C Lateral locking straps
D Leg strap
E Lowering line

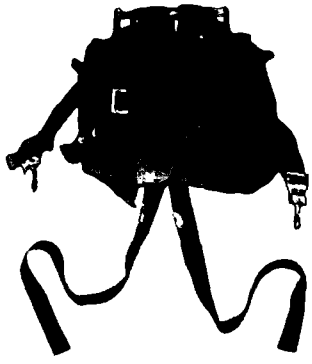


Rigging the rucksack requires the use of a special harness assembly, which is attached to the rucksack using the following procedures:

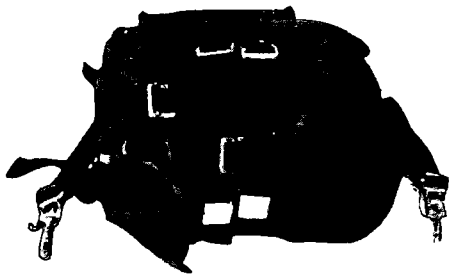
- Tighten and secure all straps on the rucksack.
- Position the rucksack with the frame up.
- Position the harness on the rucksack frame with the friction adapters on the diagonal locking straps at the bottom of the frame and the running ends of the locking straps at the top of the frame. Route the friction adapters of the diagonal locking straps under the base of the rucksack frame. Route the anchor strap and lateral locking straps under the shoulder straps and the rucksack frame.
- Turn the rucksack on its back and route the running ends of the diagonal locking straps around the long axis of the rucksack. Secure them to their respective friction adaptors which protrude from beneath the bottom of the rucksack frame. Using one turn double of Type III nylon cord (550 cord) or two turns double of ¼-inch cotton webbing (80-pound tape), tie the two diagonal locking strap friction adaptors to each other, leaving a space of about 8 inches between the two adaptors.
- Tighten the lateral locking straps and the securing strap around the rucksack and secure them to their respective friction adaptors.
- Fold and secure the running ends of all straps to themselves with tape or tie them with ¼-inch cotton webbing.
- Turn the rucksack upright. Attach an adjustable lug to each end of the anchor strap, and attach a quick-release snap to each lug. Insure that the quick-release assemblies are attached so that the straps will not be twisted when you have attached the harness. Position quick-release snaps so that the latch handles will be away from you.
- Attach the lowering line. Route the loop end of the lowering line under the diagonal locking straps between the lateral locking strap and the anchor strap. Pass the running end of the lowering line through the loop and tighten it. "S" fold the remainder of the lowering line and secure it in the self-storing pocket sewn to the lowering line. Secure the shoulder straps to the rucksack frame with ¼-inch cotton webbing (80-pound tape). The rucksack is now ready for mounting.



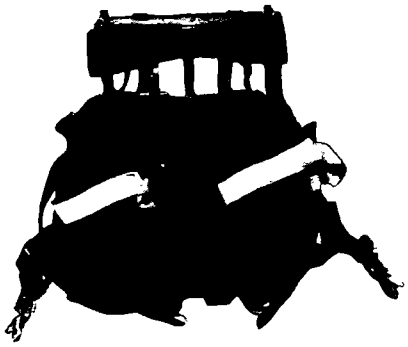
RUCKSACK FRAME POSITIONED ON HARNESS



LOCKING STRAPS SECURED TO THEIR RESPECTIVE FRICTION ADAPTORS



DIAGONAL LOCKING STRAPS SECURED

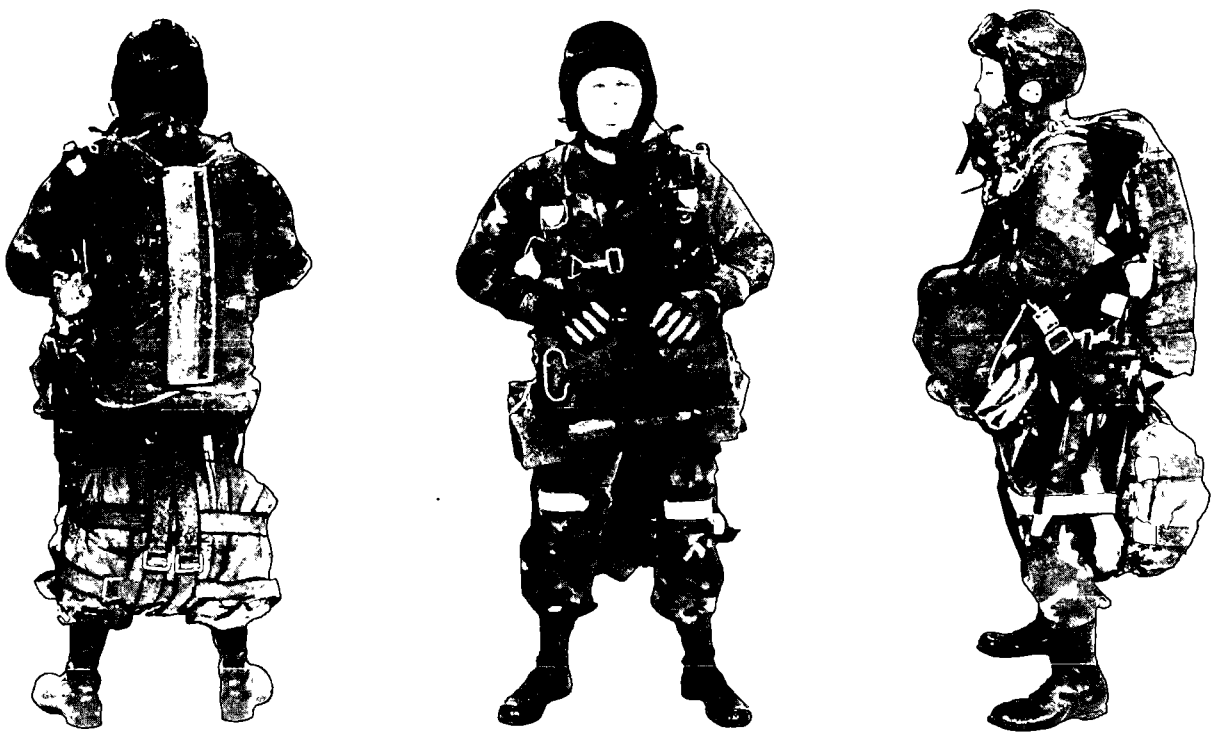


RIGGED RUCKSACK

ATTACHING RUCKSACK TO MILITARY FREE-FALL (MFF) PARACHUTIST

When you are rigged with your main and reserve parachutes and weapon, place the rucksack bottom up with the frame side against the back of your legs. Attach the anchor strap quick-release snaps to your left and right reserve D-rings, and tighten the straps to bring the rucksack as close to your backpack as possible. Route the leg straps around your legs and fold the outside strap over the inside strap so that the fit is very snug. Attach 8-inch loops of Type III nylon cord (550 cord) to each latch handle.

CAUTION: INSURE THAT THE RUCKSACK RIDES SNUGLY AGAINST THE BOTTOM OF THE MAIN PARACHUTE AND THE PARACHUTIST'S BUTTOCKS. THE RUCKSACK MUST BE AS TIGHT AS POSSIBLE.

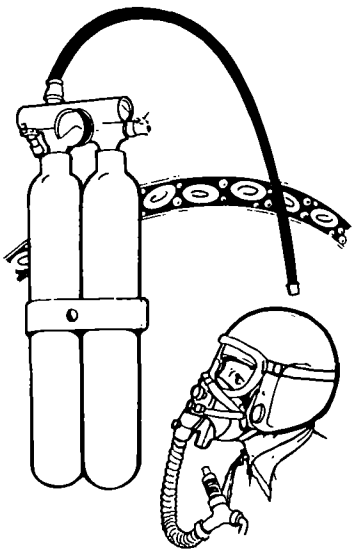


Attach the quick-release end of the lowering line to your right main lift web equipment ring on the parachute harness. Insure that the lowering line follows the shortest route from the rucksack to the equipment ring without encircling either leg or other webbing.

NOTE: BECAUSE THE RUCKSACK IS ATTACHED TIGHTLY, A MODIFIED FROG POSITION WITH THE BACK IN A DEEP ARCH SHOULD BE USED DURING MFF EXIT FROM AIRCRAFT. AFTER PARACHUTE DEPLOYMENT, PULL THE LEG STRAP QUICK-RELEASE TABS TO RELEASE THE LEG STRAPS. AT APPROPRIATE ALTITUDE, PULL ANCHOR STRAP QUICK-RELEASE SNAP LATCHES TO DEPLOY RUCKSACK TO THE END OF THE LOWERING LINE AFTER YOUR LAST TURN PRIOR TO LANDING.

CHAPTER

4



GROUND TRAINING

Military free-fall ground training is designed to train jumpers in the skills, techniques, and use of equipment needed to safely and successfully perform military free-fall parachute jumps. It has several phases and is closely supervised by instructor personnel.

SECTION I. PHYSIOLOGICAL TRAINING

Oxygen is as essential to the high-altitude parachutist as his parachute. Since a thorough understanding of the problems encountered in the use of oxygen at high altitudes is required, all free-fall trainees must attend a physiological training course conducted by a US Air Force physiological training unit. The course includes a pressure chamber simulated flight to operational altitudes with a rapid descent to simulate free fall, the care and use of oxygen equipment, repair of oxygen equipment, effects of exposure to high altitudes on the human body, and the measures to be taken when symptoms of certain conditions occur. Those personnel who must maintain free-fall proficiency must attend refresher physiological training as necessary.

SECTION II. EFFECTS OF EXPOSURE ON THE HUMAN BODY AT HIGH ALTITUDES

On delayed free-fall drops, the jumpmaster and parachutists must be familiar with oxygen requirements. When oxygen is to be used, due consideration must be given to the amount of equipment being carried, the amount of energy expended, and the pre-breathing time required.

Pre-breathing time is that time spent prior to boarding the aircraft for a high-altitude drop when the parachutists and jumpmaster breathe 100 percent oxygen. The recommended periods of time to be spent pre-breathing 100 percent oxygen are:

Above Sea Level	Pre-breathing Time
Drop Altitude	Upon Boarding Aircraft
10,000 ft to 18,000 ft	No minimum time
18,001 ft to 25,000 ft	30 minutes
25,001 ft and above	1 hour

THE MOST SIGNIFICANT STRESSES PLACED ON THE BODY AT HIGH ALTITUDES ARE DUE TO:

LOWERED TEMPERATURE. Normal cold weather clothing, gloves, and helmet afford the parachutist adequate protection against reduced temperatures up to about 45,000 feet.

LOWERED BAROMETRIC PRESSURE. Increasing altitude results in a reduction of the total pressure on the body and a reduction of the partial pressure of oxygen. Reduced oxygen is dangerous because it begins to have an appreciable effect at relatively low altitudes and may rapidly produce unconsciousness. When ascending through the atmosphere, the ambient pressure decreases. As this happens, the oxygen available to the lungs, blood, and tissues decreases and causes a condition referred to as hypoxia (oxygen deficiency). Symptoms of hypoxia may include: dizziness, light-headedness, numbness, tingling, blurred vision, tunnel vision, fatigue, headache, nausea, apprehension, mental confusion, false sense of well being, bluing of skin (particularly noticeable on lips and nail beds), increased rate and depth of breathing and loss of coordination. Proper use of oxygen equipment will produce recovery from hypoxia. One hundred percent oxygen delivered under positive pressure may be required. Breathing rate and depth should be normal, that is, an inhalation/exhalation cycle should take 4 to 5 seconds. The aircraft commander should be notified of the nature of the incident.

Hyperventilation is a condition in which the respiratory rate and depth are abnormally increased in response to fear or anxiety. Through a chain of events, this overbreathing results in restricted blood and oxygen supply to the brain. Because hyperventilation results in hypoxia to the brain, the symptoms are quite similar to those induced by altitude hypoxia. Treatment of either hypoxia or hyperventilation is identical. Again, 100% oxygen delivered under positive pressure may be required. Maintain NORMAL rate and depth of breathing, advise aircraft commander, and descend to below 10,000 feet.

Trapped gas problems can occur when the body is exposed to changes in pressure. Various body cavities (middle ears, sinuses, stomach and intestines, teeth) contain gases which attempt to expand within the cavities during ascent. Of the cavities mentioned, problems with clearing (ventilating) ears and sinuses occur most frequently. Air within the ears and sinuses

will expand and escape from the cavities during ascent. However, during descent the parachutist must reintroduce air into the cavities to equalize with ambient pressures. This is accomplished by yawning, swallowing, moving the jaws, or most effectively by closing the mouth and closing the nostrils with fingers and blowing to increase pressure in back of throat and nasal passageways (valsalva maneuver). Nasal spray may be helpful in opening ducts leading to sinuses and middle ear cavities. A special note of caution concerns the use of 100% oxygen and the middle ear. Following a flight during which 100% oxygen is used, the ears must be cleared several times using the valsalva maneuver to prevent subsequent ear blocks due to oxygen absorption by tissues surrounding the middle ear cavity.

Gases within the stomach and intestines will expand during ascent. Distention of the abdominal area will occur and may cause discomfort if not relieved. This problem can be minimized by avoiding gas forming foods for approximately 24 hours prior to flight and by belching or passing flatus during ascent. Tooth pain is occasionally experienced during ascent. Gases are sometimes present within and near the tooth due to an infectious process. Expansion of these gases creates pain. Descent followed by dental treatment will correct the problem.

Evolved gas disorders (decompression sicknesses) may occur during ascent when total pressure on the body is reduced. These disorders occur because gases (especially nitrogen), which are normally dissolved in the body fluids and tissues, tend to form bubbles. The following disorders and associated symptoms indicate gas has evolved from solution.

1. Bends: Deep dull radiation pain due to bubble formation within or near the joints.

2. Chokes: Burning pain at or near the base of breastbone (sternum), shortness of breath and an ineffective nonproductive cough due to bubble blockage of blood flow in the lungs.

3. Skin Symptoms: Itching, tingling, numbness and sometimes a mottled appearance to the skin (purplish splotches usually occurring on the chest).

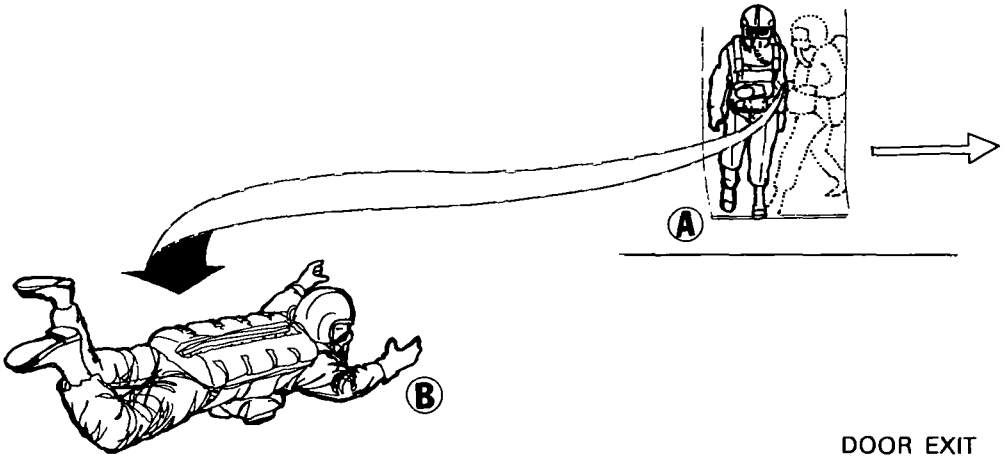
4. Central Nervous System Disorders: Symptoms of CNS disorders may include dull wavy, spotty vision, dizziness, vertigo, loss of ability to speak or hear, loss of coordination, local or general weakness, mental confusion, headache, and a shock like state.

Treatment includes 100% oxygen, immediate descent, lie down and minimize movement. Upon reaching ground level, obtain medical assistance, preferably by a flight surgeon. Prebreathing 100% oxygen immediately prior to flight and continuing on pure oxygen during ascent removes nitrogen from the body and is an effective method of preventing evolved gas decompression sickness. This prebreathing process must not be interrupted and must be continued until transferring to the bail-out oxygen system. Breathing ambient air or breathing an oxygen-air mixture (Automix Lever on NORMAL) will allow nitrogen to be reintroduced into the body.

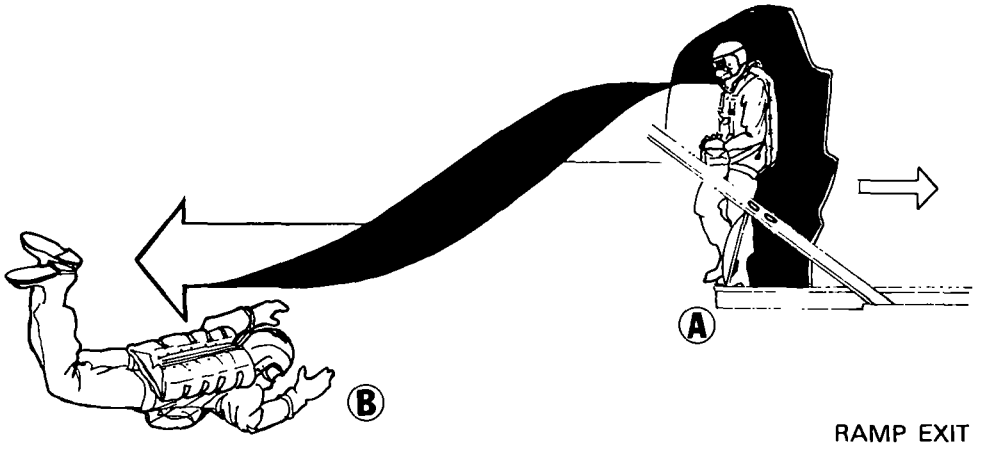
SECTION III. EXIT PROCEDURES

Experience in exiting from different types of aircraft will contribute to your rapid stabilization upon exit. In free-fall parachute training, all jumps will normally be from the troop door or ramp of a cargo-type aircraft. In training the only two jump commands used for either individual exits or a mass exit are STAND BY and GO.

DOOR EXITS. On the command STAND BY, the first man moves to the vicinity of the jump door, approximately 1 meter away. At the command GO, make a good pivot on either your left or right foot, depending on the door, swing out of the aircraft facing in the direction of flight, and immediately assume a modified frog position. In a mass exit, subsequent parachutists will exit in the same manner as rapidly as possible without assuming the stand-by position.



DOOR EXIT



RAMP EXIT

RAMP EXITS. On the STAND BY command, stand on the ramp facing the rear of the aircraft approximately 4 inches from the end of the ramp. When the jumpmaster gives the command GO, exit the ramp with a slight hop, and turn, assuming a modified frog position facing the direction of the aircraft's flight path.

The mock door is a replica of the cargo and passenger compartment of a troop carrier aircraft and is used to teach jumper control inside the aircraft just prior to exit, exit procedures, and body control immediately upon exit. The mock door may be either the fuselage of a condemned aircraft or an open platform with uprights simulating doors and the ramp. Mock door training apparatus should include seats, doors, and ramp that are approximately the size of those of an aircraft.

CONDUCT OF MOCK-UP TRAINING. For exit procedures from mock-up door and ramp, jumpers will be divided into two groups. Each group will form a line, and on command, four jumpers from each line will move into the mock trainer and be seated. All jumpers inside the mock trainer will react to all procedure signals and jump commands given by the jumpmaster, and will exit the mock trainer properly and assume a modified frog body position. Each will be critiqued on the spot by control personnel. The jumpers will then go to the rear of the opposite line for experience in exiting the other side of the aircraft. Half of the students should exit from the right side door and half from the left side door, or half from the right and half from the left side of the ramp. Each group has its own control and supervisory personnel.

SECTION IV. BODY STABILIZATION

A jumper must be able to exit the aircraft, rapidly assume a stable body position, fall on a designated heading, and manually deploy his main parachute without losing stability. Improper or unstable body position may be hazardous to both the unstable jumper and others in the air and cause considerable dispersion prior to canopy deployment, hindering or prohibiting assembly in the air and on the ground.

The table-top body stabilization training and suspended harness (free-fall) apparatus are used extensively for teaching free-fall stability.

TABLE-TOP BODY STABILIZATION TRAINING. Any table top or flat surfaced material approximately 40 inches wide can be used for table-top body stabilization training. The standard riggers pack table, for example, is excellent. The table-top body stabilization training teaches the student control of his body from the time he leaves the door or ramp of an aircraft until he receives opening shock created by the opening of his main parachute. Control personnel should observe and critique the students during the conduct of training.

Students lie on their stomachs on the table, arms and feet off the table. At the command STAND BY, they assume the modified frog position and hold it for a 10-second count.

MODIFIED FROG POSITION. To assume the modified frog position, arch your back and throw your head back. Extend your arms horizontally, elbows bent and hands eye level. Turn your palms down, spread your fingers, and cup your hands slightly. Separate your legs about shoulder width, and bend your knees in a relaxed position as far as the conformation of your body will allow.

Even though the modified frog is the preferred body position for exit and free fall, minor stability problems occasionally arise during the first seconds. When these problems occur, the use of the semi-delta position will generally remedy them.

MODIFIED FROG POSITION

SEMI-DELTA POSITION. The semi-delta position is used to recover from uncontrollable situations. Extend your body in a straight line with your legs slightly apart and your feet pointed downward. Extend your arms and hands straight, with your hands away from your body at approximately a 45° angle, slightly to the rear.

SEMI-DELTA POSITION

SECTION V. MANEUVERS DURING FREE FALL

BODY TURNS. To execute a body turn, twist the upper trunk of your body to the direction of the desired turn, leaving your head and arms in the stable fall position. When you have turned to the desired heading, stop the turn by twisting your upper trunk in the opposite direction in the same manner. As soon as the turn has been countered, return immediately to the stable fall position.

LEFT BODY TURN

PUSH TURNS. Push turns are faster than body turns. From a modified frog position, look in the direction in which you wish to turn and extend the corresponding hand toward the earth. If you wish to turn right, for example, look to your right, and, still looking in that direction, extend your right hand toward earth. The further you extend your hand down, the faster the turn will be. To counter the turn, look in the other direction, extend your other hand toward earth until the turn is countered, and resume the modified frog position.

RIGHT PUSH TURN

GLIDE. A glide is a controlled lateral movement of the free-faller during descent, and is used to allow the parachutists to assemble during free fall.

From the modified frog position, bring your elbows in to your sides until your forearms form a 90° angle with your body. Straighten your legs and rotate your shoulders up and forward so that your upper body forms a cup in which the air is caught. The angle of your legs to your body will determine the speed of the glide. The straighter your legs, the faster the glide. Recover to the modified frog position.

NOTE: WHEN USING A GLIDE, TAKE CARE TO PREVENT A COLLISION WITH ANOTHER JUMPER.

GLIDE

ALTIMETER CHECK. Perform altimeter checks periodically to determine your altitude above the ground. Glance down at the top of the reserve parachute, keeping your chin in the vicinity of your collar bones, to check your altimeter. Do not break your arch or change the basic body position as this will cause stability problems. Prolonged observation of the altimeter will cause you to backslide or glide forward unnecessarily.

PULL. The pull is normally executed at an altitude of 3,000 feet above the ground. Look at the ripcord handle, located in the right main lift web, at the same time bending both elbows to bring both your hands on a line with the ripcord handle. Pull the handle from the ripcord pocket with the thumb of your right hand, and allow the handle to rotate over the remaining fingers. Then extend both arms forward and up, activating the main parachute. The pull is smoothly executed in a continuous movement to a cadence of **LOOK, GRAB, PULL.** After checking the canopy, slip the ripcord handle over your wrist until after landing.

NOTE: IN THE EVENT OF MALFUNCTION OF THE MAIN CANOPY, DISCARD THE RIPCORD PRIOR TO ACTIVATION OF THE RESERVE PARACHUTE.

SECTION VI. CANOPY CONTROL

The overall objective of military free-fall training is to land personnel and equipment of a tactical organization intact and compact to accomplish the assigned mission. To this end, the free-fall parachutist must know and employ the principles and governing factors of canopy control as they relate to use of the MC-3 canopy.

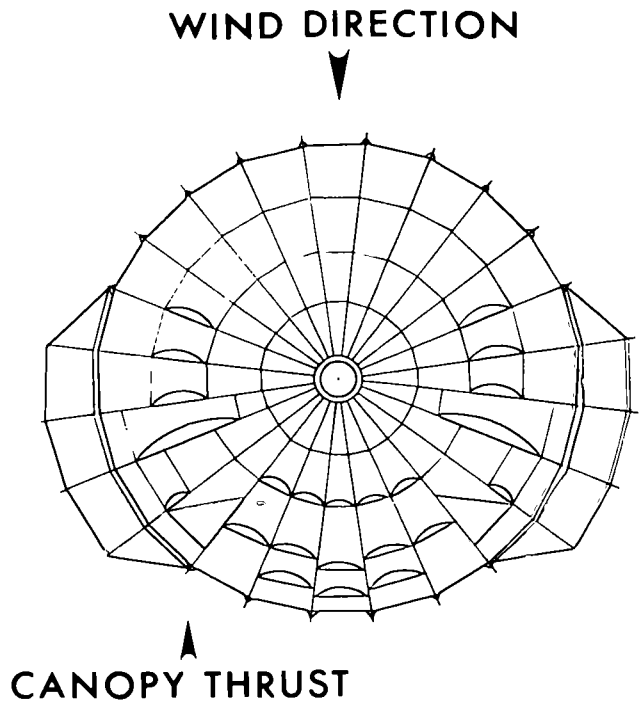
Movement of the MC-3 canopy is controlled primarily by wind action, direction of canopy thrust, and manipulation of the control toggles.

Wind direction and approximate velocity must be known first since the direction of your canopy's thrust, as determined by your toggle manipulation, will be in relation to wind action. The 13 miles-per-hour thrust of the MC-3 is generated by the shape, design, and aperture placement of the canopy. The escape of trapped air through the 17 rear vents and 8 turn slots provides the canopy thrust. By specific manipulation of the toggles, you may distort the canopy turn slots and cause the canopy to turn, and vary forward speed and rate of descent.

Canopy control involves the coordination of wind direction and velocity, canopy thrust and design, and your own selective manipulation and distortion of the canopy.

HOLDING MANEUVER

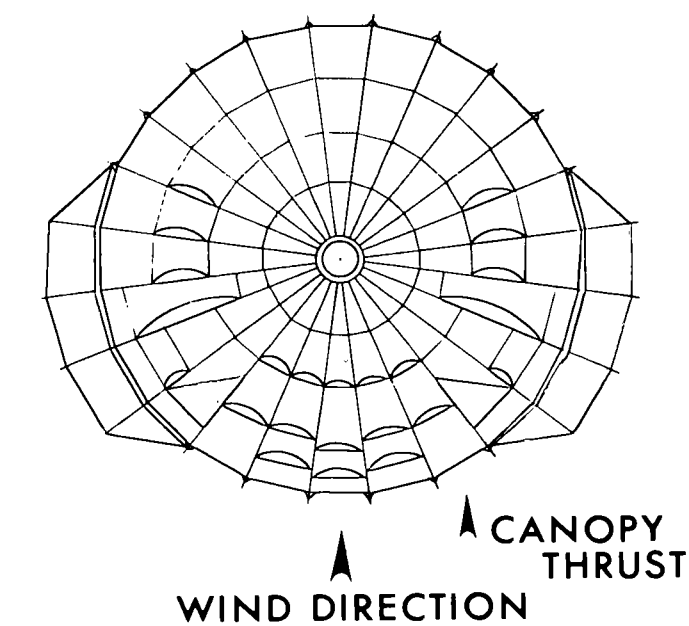
Pointing the canopy into the wind, or "holding," applies the canopy thrust directly against the wind. This has the same effect as reduced wind velocity and retards canopy movement.



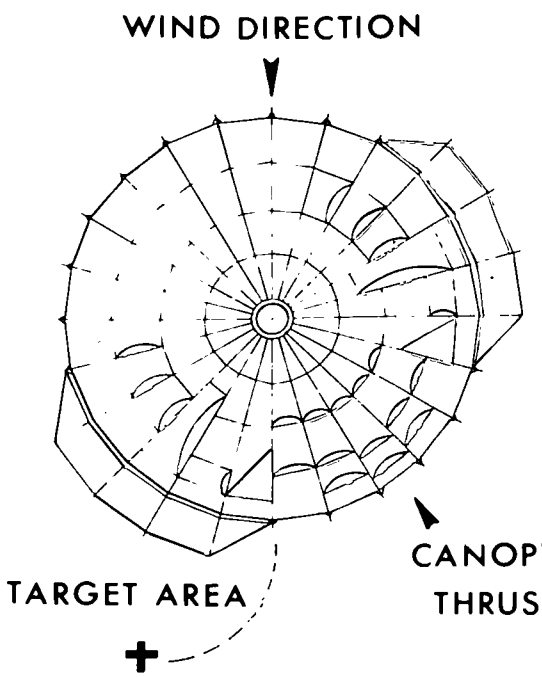
HOLDING MANEUVER

RUNNING MANEUVER

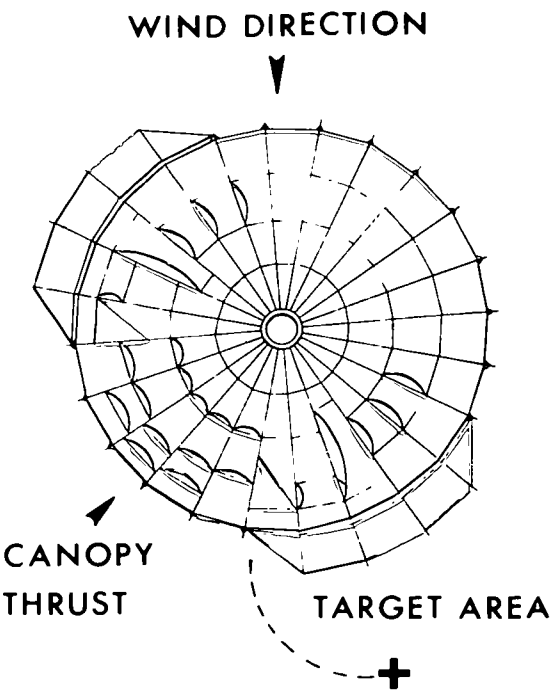
If the canopy is pointed with the wind, the combined thrust and wind velocity produce increased speed of canopy movement, called "running."



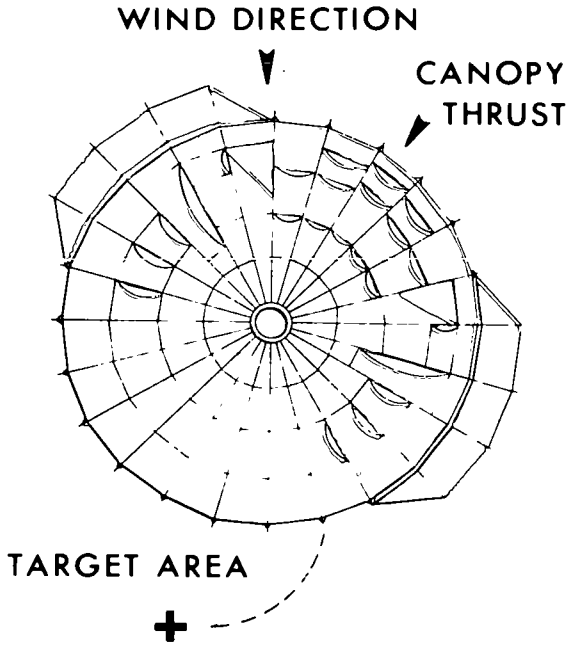
RUNNING MANEUVER



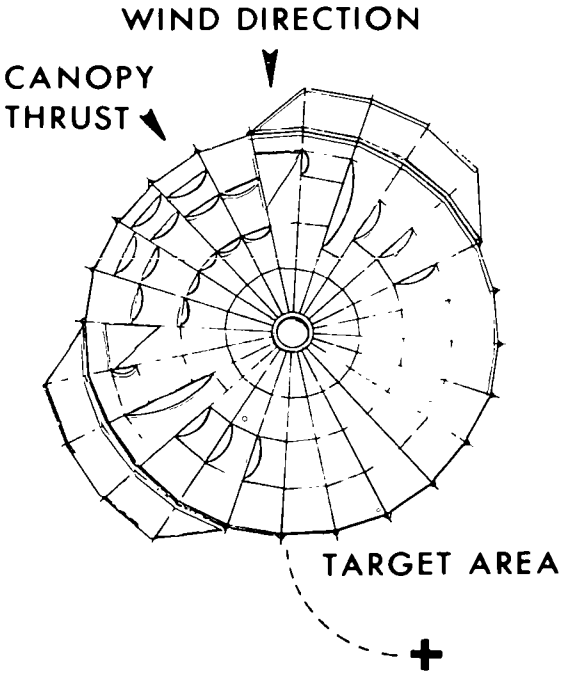
CRABBING TO THE LEFT WHILE HOLDING



CRABBING TO THE RIGHT WHILE HOLDING



CRABBING TO THE RIGHT WHILE RUNNING



CRABBING TO THE LEFT WHILE RUNNING

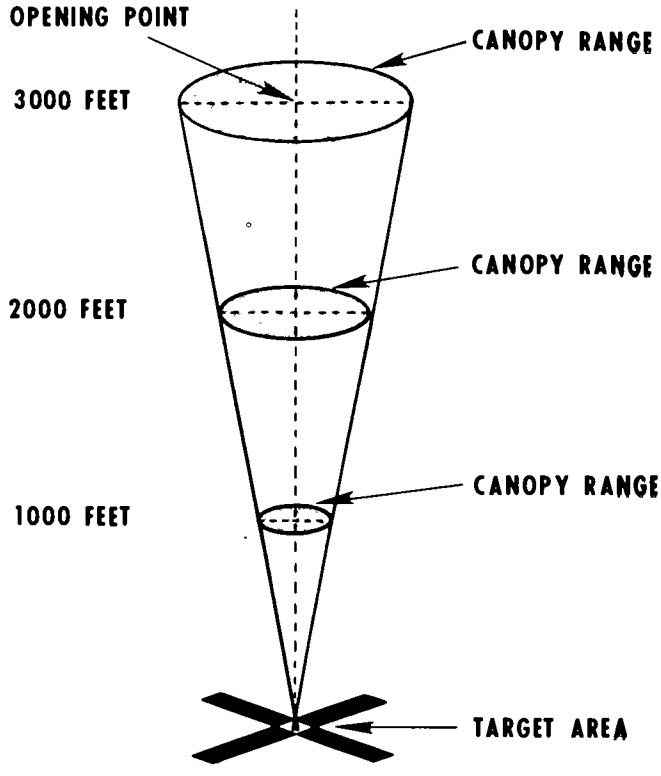
"Crabbing" is accomplished by pointing the canopy at any given angle to the wind direction. The force of the wind from one direction and the thrust of the canopy at an angle to it will move the canopy on a course at an angle to the direction of thrust. The angle of movement varies with the wind velocity and the angle at which the canopy is pointed. A canopy pointed at a downwind angle makes a sharper angle than one pointed upwind.

The course you will follow (direction of movement) in maneuvering toward the target area is determined by the effective canopy range and the windline.

The effective canopy range if the maximum distance from which the canopy can be maneuvered into the target area from a given altitude. It is greater at high altitudes and decreases proportionately at lower altitudes, forming a cone-shaped area. Changes in wind direction and conditions may cause this range to shift in any direction.

A windline is an imaginary line extending upwind from the target area to the opening point and can be marked by ground references. Accurate reference points are essential to effective parachute maneuver.

Pick a ground reference point on the windline halfway between the opening point and the target area. This point will be your first checkpoint, and with correct canopy manipulation, can be reached in half the opening altitude. The second checkpoint will be a reference point halfway between the first checkpoint and the target area, and should be reached in half the remaining altitude. Maneuver directly to the target area after reaching the second checkpoint.



EFFECTIVE CANOPY RANGE

The MC-3 parachute is a highly maneuverable canopy capable of 360° turns in 3 to 5 seconds under normal conditions. Its maneuverability is derived from your utilization of its capabilities of varied forward speeds and rate of descent, turns, and across-wind movement, either singly or in combination.

Under normal conditions, speed and rate of descent may be varied by the utilization of the canopy's brakes.

NO BRAKES

The maximum canopy thrust for maneuvering is obtained by using **no brakes**. The toggles are in position behind the front risers.

NO BRAKES

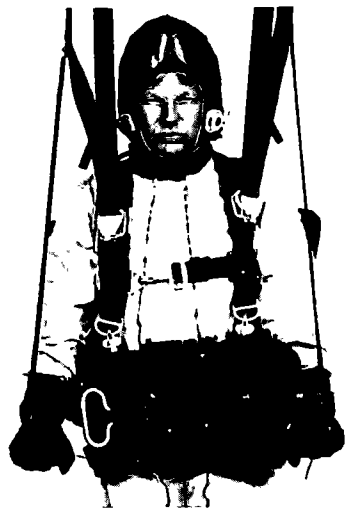
HALF BRAKES

Grasp the toggles and pull them down to approximately shoulder height for the **half-brakes** position. The canopy speed will decrease to about 7 mph thrust, and rate of descent will decrease.

HALF BRAKES

FULL BRAKES

Pull the toggles to full arms length for **full-brakes** position. The canopy stops moving forward, but the rate of descent increases. In the full-brakes position, the canopy is actually on the verge of a stall.



FULL BRAKES

A stall occurs when the toggles are pulled below the full-brakes position. Your canopy will have no forward speed, and may even move somewhat to the rear. The rate of descent is increased to a hazardous degree. Fully raising or releasing the toggles will return the canopy to maximum thrust.

Turns may be made using either the half-brake or stall positions. Normally, all turns will be made from the half-brake position.

NORMAL LEFT TURN

NORMAL LEFT TURN

Left turns are made by raising and lowering your right toggle in a similar manner.

If a faster turn is necessary, you may use the stall turn.

NORMAL RIGHT TURN

NORMAL RIGHT TURN

To turn the canopy to the right, raise the left toggle while keeping the right toggle at full brake. The rate of the turn will depend on the amount the left toggle is raised. You may stop the turn by returning the toggle to half-brake.

Maneuvering the parachute requires more than simply rotating the canopy. A properly executed parachute maneuver requires correct canopy manipulation to combine the force of the wind and the thrust of the canopy to move the parachute in a given direction. You may have to hold into the wind, run with the wind, or crab to the left or right while holding or running.

To hold into the wind, rotate your canopy until it is facing into the wind. Manipulate the toggles to maintain the position. To crab to either direction while holding, rotate the canopy slightly in the direction in which you want to move. Rotating the canopy too far may cause it to become wind-cocked and move with the wind. As your canopy begins to move in the desired direction, manipulate toggles to keep it in position until the maneuver is complete.

To run with the wind, rotate your canopy until it is pointed downwind. Manipulate the toggles to maintain the canopy in position. To crab while running, rotate the canopy slightly in the desired direction and maintain the position until your maneuver is completed.

To land using the MC-3 parachute, face your canopy into the wind and raise the control knobs fully. Continue manipulation of the toggles until you make contact with the ground, then release them and make a proper parachute landing fall.

WARNING: LANDING WHILE FACING IN A DIRECTION OTHER THAN INTO THE WIND RESULTS IN HIGHER LATERAL MOVEMENT AND INCREASED RATE OF DESCENT, INCREASING THE PROBABILITY OF INJURY UPON IMPACT.

A Guide to Good Canopy Control

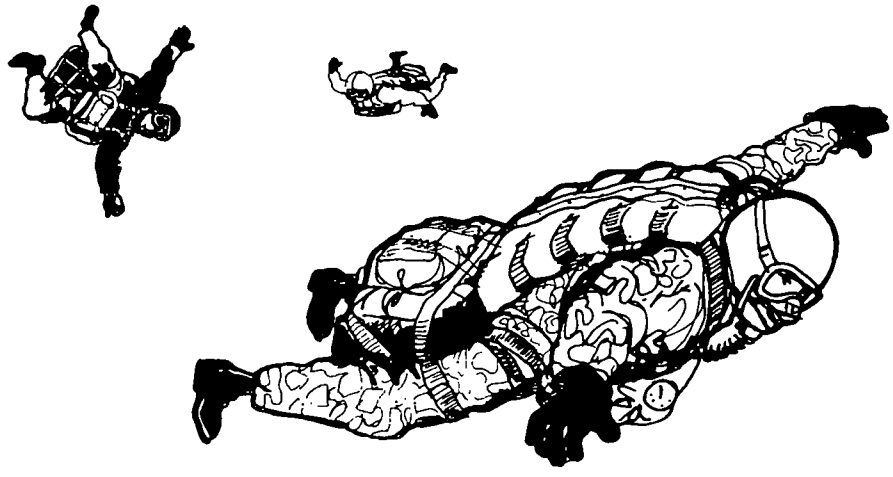
For correct canopy control and accuracy of maneuver toward your target area, remember to:

- Check canopy and ground position after opening.
- Keep a sharp lookout for other jumpers.
- Check altitude and ground reference point at which your canopy opens.
- Pick out intermediate ground references.
- Determine wind direction.
- Use the upwind toggle to rotate your canopy.
- Check the holding pattern of your canopy.
- Locate the windline and determine the direction in which you want to move.
- Always maneuver toward the windline.
- Check your progress at half- and three-quarter-way points, and make necessary adjustments.
- Turn into the wind at a minimum altitude of 100 feet.
- Control your canopy all the way to the ground.
- Always land facing into the wind.
- Always execute a parachute landing fall (PLF).

SECTION VII. GROUPING

Body stabilization, canopy control, and free-fall maneuver techniques are all used in grouping. The primary purpose of grouping is to enable military free-fall jumpers to land together as a tactical unit. To accomplish this, jumpers exit the aircraft together, assemble and fall together during free fall, open their main parachutes together, and land assembled. Grouping may be broken down into three areas: during exit, during free fall, and under canopy.

EXIT. Jumpers must insure that they get a fast, tight, controlled exit to cut down on lateral dispersion and lessen the need for lateral movement during free fall.

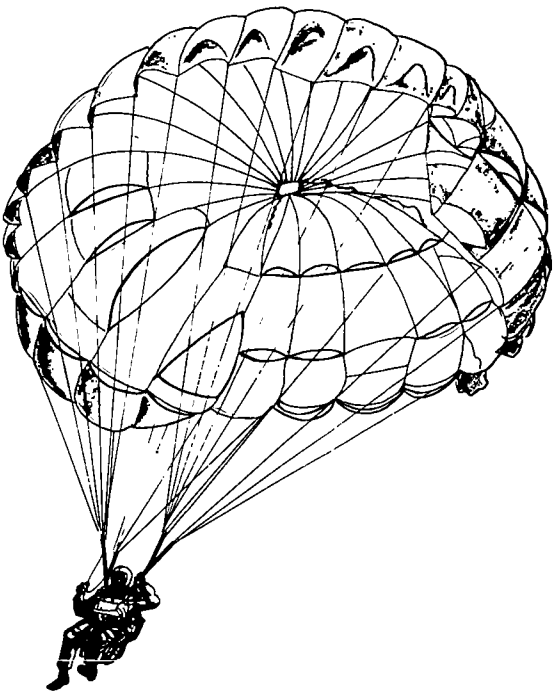


One man will be designated as group leader and marked for recognition. A panel on his main backpack for daylight operations or a light at night will serve to mark him. Whether the exit is to be by ramp or door, the jumpers should stand as close together as possible, with the designated group leader in front of them.

On the jumpmaster's command if visual spotting is used, or on the green light when electronic spotting is employed, all the jumpers will exit the aircraft as fast and close together as possible.

FREE FALL. Immediately upon exit, each jumper will assume the modified frog position and hold it until he has completed the 10-second count. During the free-fall phase, the group leader is responsible for maintaining a stable fall on the desired heading while staying below the other group members. He will take up a heading on his preselected opening point and move toward it using the slow glide. All the other jumpers will take a heading on the group leader and move toward him using either the slow or fast glide. Group members must take

care not to fall directly over other group members and must remember that the LOW MAN HAS RIGHT-OF-WAY. The desired lateral distance between jumpers in free fall is 20 to 25 meters, and an aggressive attitude toward closing lateral distance must be maintained in order for the group to be able to open together. The 20 to 25-meter distance will allow room for safe deployment of main parachutes. If jumpers should enter clouds, all lateral movement stops until they fall clear of the clouds.



UNDER CANOPY. After opening their main parachutes, the jumpers will fly their canopies to assemble on the group leader or the low man.

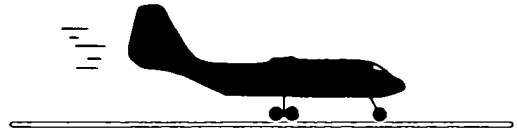
If a jumper should fall below the designated group leader, he becomes the group leader and assumes those responsibilities. The remaining parachutists will assemble on him. In the event of a malfunction and reserve deployment, the reserve will become the group leader, and all other jumpers will assemble on him.

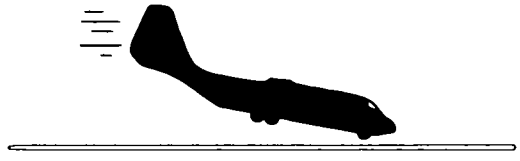
The group leader will home in on the desired impact point (DIP) and land as close to it as possible. If he determines that he cannot reach the DIP, he should select another impact point within his range and home in on that. The other jumpers attempt to land their parachutes within 25 meters of the group leader. The tight landing allows for rapid assembly and movement from the DZ.

SECTION VIII. EMERGENCY PROCEDURES

EMERGENCY PROCEDURES. Emergencies of various types may arise during the conduct of any airborne operation. You must learn to recognize an emergency situation and know the proper action to take should one occur. Emergencies may occur in the aircraft before takeoff, during takeoff, and flight, prior to normal exit and in the air during free fall. Danger areas and emergency procedures are:

AIRCRAFT CRASH DURING TAKEOFF. Certain precautions are always taken before takeoff to insure the greatest degree of safety in the event of a crash during takeoff. The precautions and procedures you should employ are as follows:





Before Takeoff:

- Learn the locations of emergency exits and how to open them.
- Secure all loose items.
- Wear helmet.
- Fasten seatbelt securely.

Just Prior to Crash:

- Tighten Seatbelt.
- Lean toward the forward part of the aircraft and brace for the crash.

After Crashlanding:

- Clear the aircraft as soon as it stops and move well away from it in case of fire or explosion.
- Check and make sure all men are away from the wreckage.
- Report to headquarters by any means available.

MAIN OR RESERVE PARACHUTE DEPLOYMENT IN THE AIRCRAFT. If you are seated when either your main or reserve parachute deploys, remain seated. Call the deployment to the attention of the jumpmaster, activate canopy releases, and start removing your parachute and equipment while remaining seated.

If your main or reserve canopy prematurely deploys while you are standing, immediately grab the canopy at or near the skirt to keep it from inflating, and try to gain control of the pilot chute. The jumpmaster or other jumpers will have to assist you to the front of the aircraft and help you in removing the deployed parachute.

IF YOU ARE STANDING IN THE VICINITY OF THE DOOR OR ON THE RAMP AND YOU EXPERIENCE A PREMATURE DEPLOYMENT, GET OUT. EXIT IMMEDIATELY. An immediate exit is your only course of action to minimize or avoid serious injury.

THE EMERGENCY EXIT. Emergency exits should be as prescribed in the local airborne SOP or as prescribed by the jumpmaster in coordination with the air crew. Emergency procedures may be as follows:

If you are below 500 feet above ground level (AGL), prepare for a crash landing.

If you have at least 500 feet AGL, but no more than 2,000 feet AGL, exit and deploy your reserve immediately.

Between 2,000 feet AGL and 3,000 feet AGL, exit and immediately deploy your main parachute.

Above 3,000 feet, you may be required to arm your timer or exit before timers are armed. In either case, free fall to 3,000 feet and deploy your main canopy.

IN-AIR EMERGENCIES IN FREE FALL. After exit, you may be exposed to in-air emergencies in free fall. Normally, deploying your reserve parachute in the prescribed manner will take care of most in-air emergencies, but there are certain times when this procedure will not work. If a jumper at a lower altitude deploys his canopy directly below you while you are still in free fall, immediately initiate a turn to avoid being directly over the deployed parachute.

WARNING: THE LOWER PARACHUTIST HAS RIGHT OF WAY IN MILITARY FREE-FALL PARACHUTE OPERATIONS.

Emergencies may also occur at opening altitude when there is a complete malfunction of the parachute, a partial malfunction, or a minor deployment problem.

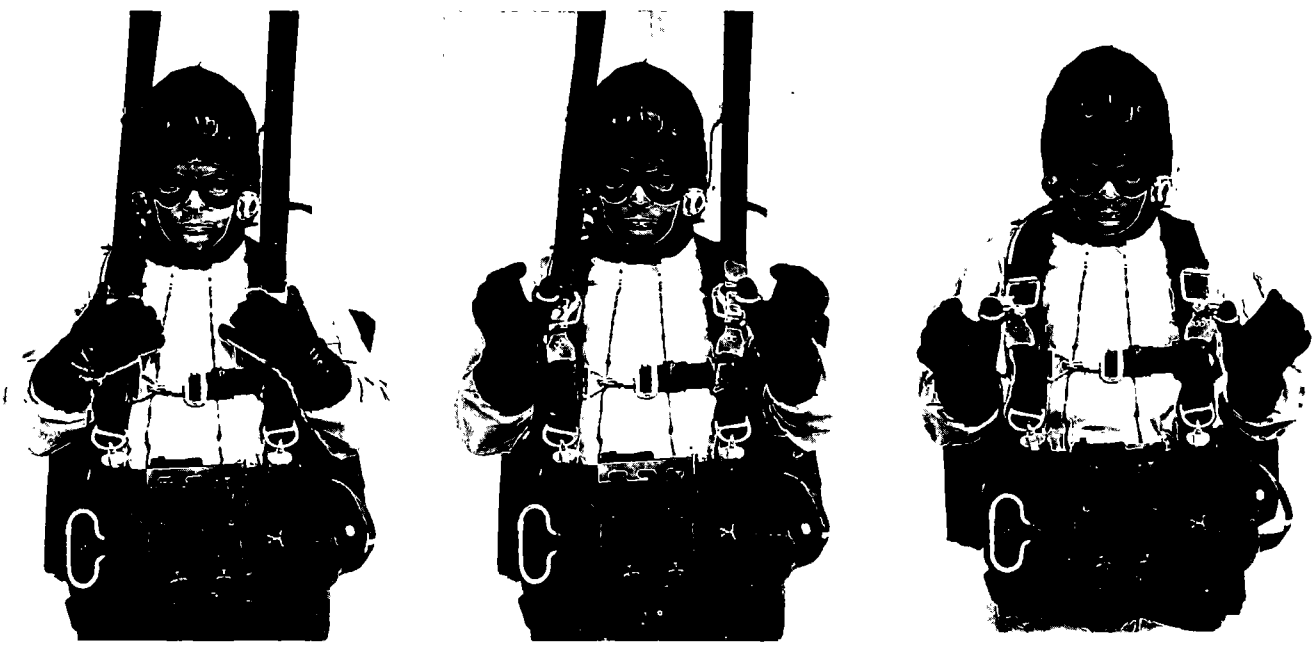
A complete malfunction occurs when the canopy remains in the packtray after the ripcord has been pulled. In the event of a complete malfunction, **DO NOT WASTE VALUABLE TIME IN ATTEMPTING TO CUT AWAY THE MAIN CANOPY PRIOR TO ACTIVATING THE RESERVE.** Look down at the reserve ripcord handle and pull it with the right hand immediately. Do not waste time trying to assume a specific body position. Check your canopy. If your main canopy should come out of the pack as a result of opening shock of the reserve, grasp the risers of the main canopy and pull it in as rapidly as possible gathering it in your arms or between your legs. Prepare to land. Grasping the suspension lines of the reserve with both hands and pulling yourself upright as in doing a pullup will give you a better landing position. Land, executing a parachute landing fall.

A partial malfunction occurs when the pack opens but the canopy does not fully or properly deploy. Because of its design, the MC-3 can have unusual malfunctions. Partial malfunctions may include streamers, semi-inversions, severe control line entanglements, and stabilizer hang up. The reserve procedures for partial malfunctions are the "cutaway" and the "controlled method of reserve deployment."

A "wad" or canopy "ball" indicates a severe control line or other internal entanglements. A stabilizer hang up occurs when a set of stabilizer panels do not fully deploy, and results in rapid spinning and increased rate of descent. In either of these cases or if you have a major deployment problem, are in a rapid spin which cannot be corrected, or if your rate of descent is more than it would be with a T-10 reserve, you must decide whether or not to execute a cutaway.

After checking your canopy and attempting, if feasible, to clear your malfunction, check your altimeter. The decision of whether or not to cutaway must be made no lower than 1800 feet AGL.

Because the MC-3 is a sensitive and precision-type canopy, and serious malfunction creates such a degree of spinning and increased rate of descent, a cutaway prior to activation of the reserve parachute above 1600 feet AGL is ESSENTIAL in order to avoid the possibility of serious injury or death.



Begin the cutaway **no lower than 1600 feet AGL. DO NOT WASTE VALUABLE TIME WITH REPETITIOUS EFFORTS TO CLEAR A MALFUNCTION.**

Throw away your main ripcord. If you cannot pull it through the cable housing, tuck the handle securely behind your right main lift web to avoid the possibility of the reserve or pilot chutes becoming entangled with the loose handle.

Place your legs and feet together and open both safety covers of the canopy release assemblies simultaneously with both hands.

Lock your thumbs in the lanyard cable releases.

Keeping your eyes on the reserve ripcord handle, pull vigorously forward and downward on the cable releases.

DO NOT ATTEMPT TO RESTABILIZE IN FREE FALL. PROTECT THE OPEN CANOPY RELEASE ASSEMBLIES BY PLACING YOUR LEFT ARM ACROSS THE RELEASES AND IMMEDIATELY PULL THE RESERVE RIPCORD VIGOROUSLY WITH YOUR RIGHT HAND AND THROW IT AWAY.

Check your canopy and canopy drift.

Prepare to land. Pull yourself upright by the suspension lines for a better landing attitude, and land, executing a good PLF.

REMEMBER - DO NOT ATTEMPT TO DEPLOY A RESERVE UNDER A PARTIAL MALFUNCTION OF THE MC-3 WITHOUT FIRST ATTEMPTING A CUTAWAY, UNLESS YOU ARE BELOW 1600 FEET AGL.

A malfunction resulting in a high rate of descent without spins, or one encountered below 1600 feet should be dealt with through the **"CONTROLLED METHOD OF RESERVE DEPLOYMENT":**

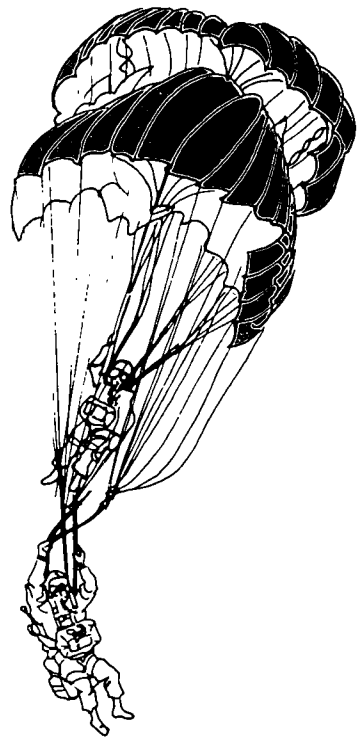
Place your left hand over the ripcord protector flap.

Pull the reserve ripcord and discard it.

Assist the opening of the pack flaps and gain control of the reserve parachute.

Lift the entire reserve canopy overhead at full arm's length and throw it down and directly away from your body as vigorously as possible.

If the main and reserve parachutes entangle, attempt to inflate the reserve by pulling on the reserve suspension lines.



A midair entanglement involving high-performance canopies requires immediate action. First, check your altitude. If you are above 1800 feet AGL, attempt to free yourself from the other canopy. You may find, upon freeing yourself, that your main canopy has lost some or all of its lift, and you may feel as if you are back in free fall. Your canopy may require several hundred feet to reinflate. If it does not reinflate, initiate the appropriate partial malfunction procedures immediately. If you are unable to free yourself from the other canopy and are above 1800 feet, one jumper must cutaway. The jumper whose canopy is giving least support or is higher should execute cutaway, but the decision should be made and agreed upon by both jumpers immediately. If you are still entangled and below 1600 feet, both jumpers must make an immediate joint decision as to which one will hand deploy his reserve by the controlled method of reserve deployment.

If you have a minor deployment problem, do not activate your reserve parachute, but take appropriate corrective action.

SLEEVE AND/OR PILOT CHUTE THROUGH MODIFICATION, CONTROL LINE, OR TURN SLOT. If the sleeve and/or pilot chute should slip through a turn slot or loop around a control line, compensate for the resulting canopy turn by pulling on the opposite control knob or line until the turn is corrected and the canopy flies straight.

BROKEN CONTROL LINE OR MINOR CONTROL LINE ENTANGLEMENT. Should one of your control lines be broken or inoperable, you can steer with the opposite control line and by pulling the rear riser on the same side as the broken line. This will have, essentially, the same effect as pulling the control line, but will not be as positive.

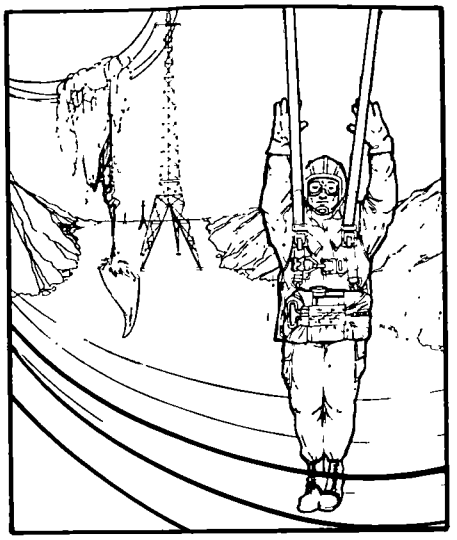
FRONTAL CLOSURE. Occasionally during deployment the front of the canopy skirt will tuck under the rear. Although this should clear itself in a second or two, pull down on one or both control knobs and the front will open.

PILOT CHUTE HESITATION. If you are in a nearly perfect flat and stable body position, the air flow around you may be so uniform as to create a partial vacuum preventing the pilot chute's inflation. If you pull your ripcord and feel your pack open, but do not experience opening shock within 2 seconds, look over your shoulder to see if you have a pilot chute hesitation. Generally, just turning to look will break the vacuum and remedy the hesitation. Consider any other irregularity a partial malfunction and initiate appropriate emergency procedures immediately.

EMERGENCY LANDING PROCEDURES.

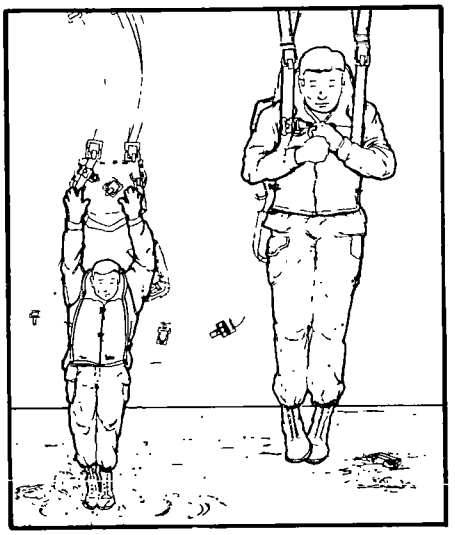
WIRE LANDING

If you determine that you will land in high tension wires, begin preparations for a wire landing. Keeping both feet together and toes pointed downward will allow you to slide through the wires. If you make contact with the wires, keep your hands high on the inside of the front risers, your chin on your chest, and your body well arched. Begin a rocking motion of your body by pushing forward on the front risers to help keep you from becoming entangled in the wire. Prepare to make a normal PLF.



WATER LANDING

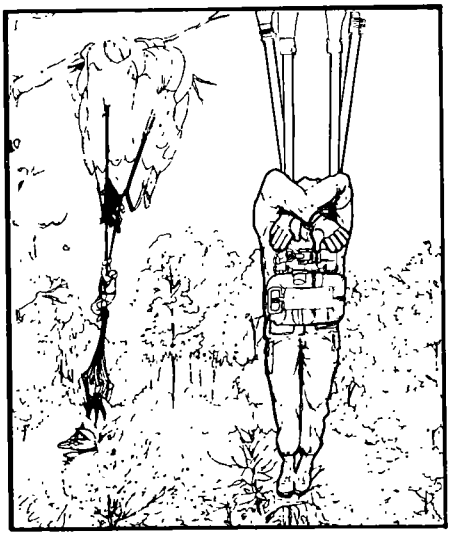
When you determine that you will land in a body of water, begin preparations for a water landing. The first step is to pull the saddle of your harness well under your buttocks and sit back in the harness. Discard your headgear and unfasten the snap connector and restraint strap on the left side of your reserve. Release all tiedowns but the upper ones on your weapons. If you are jumping with equipmemt, jettison all items secured to the harness which may hinder harness removal in the water. Grip the opposite main lift web with one hand and free your leg straps with the other. Upon contact with the water, throw both your arms upward, arch, and slide out of the harness. Keep in mind, however, that the water may be only a few inches deep, and be prepared to make a PLF if necessary.



When jumping with the B-5 type (Mae West) life preserver, you must take care that the preserver is inflated only after the harness is removed. The force of inflation, restricted by the harness, may crush a jumper's ribs. The gas release valves of the B-7 life preserver are activated in the air.

TREE LANDING

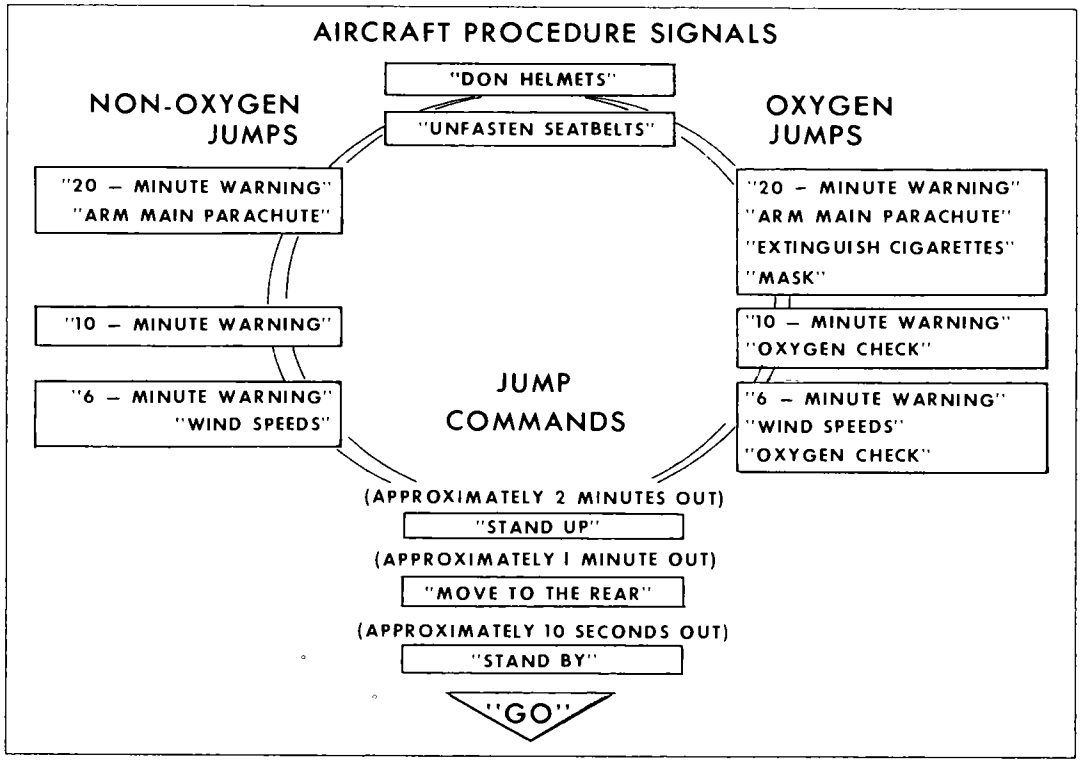
If you see that you may land in the trees, put your feet and knees together and point your toes downward. Pull your goggles down over your eyes and place your hands under the opposite armpits, palms facing outward and



elbows high. Rest your head on your arms so you will be able to protect your face and eyes from branches. You will be able to see what is below you by looking under either elbow. Prepare to make a PLF if you should go through the trees or miss them. Do not lower the rucksack if you are jumping with equipment. The rucksack can hang in one tree and your canopy in another, leaving you dangling between the two.

SECTION IX. AIRCRAFT PROCEDURES AND JUMP COMMANDS

Aircraft noise and the use of the helmet and oxygen mask require that all aircraft procedures and jump commands be given by arm and hand signals rather than by verbal means. The MFF parachutist, therefore, must constantly observe the jumpmaster, be thoroughly familiar with the signals, and respond immediately to each.

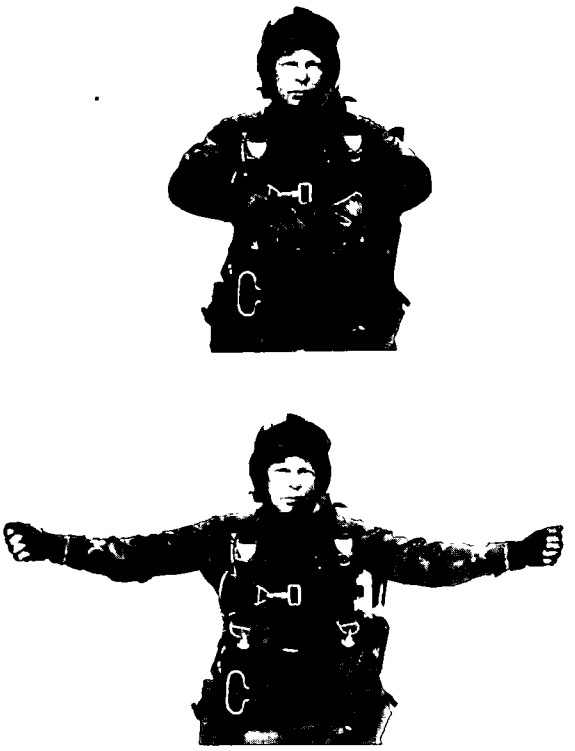


The signals used between takeoff and the 2-minute warning are classified as procedure signals.

"DON HELMETS."

The first procedure signal is "DON HELMETS," usually given approximately 1 minute prior to takeoff or during engine runup, although it may be given at any time during the flight. The jumpmaster extends his arms out to his sides parallel to the floor at shoulder height, palms up, and bends his arms at the elbows several times so that his fingers tap the sides of his helmet. Upon receipt of this signal, don your helmet, fasten the chin strap, fasten your seat belt, and prepare for takeoff or landing.

NOTE: ANY TIME "DON HELMETS" IS SIGNALLED, DON HELMET, FASTEN CHIN STRAP, AND FASTEN SEAT BELT.



"UNFASTEN SEAT BELTS."

When the aircraft reaches an altitude of 1,000 feet, the jumpmaster extends both arms to the side at shoulder level and brings his hands together in front of his body several times, simulating unfastening an imaginary belt. This signal is "UNFASTEN SEAT BELTS," and means that you may remove your seat belt and helmet and relax, while remaining constantly alert to the actions of the jumpmaster. You may eat or smoke if it is allowed on the flight.

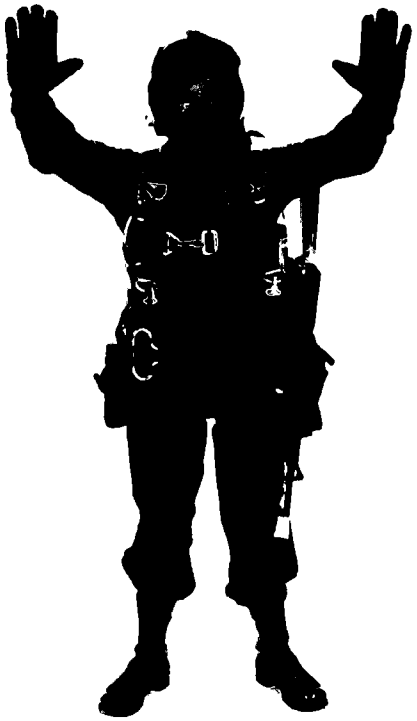
TIME WARNINGS

Time warnings are relayed to keep parachutists informed of the time remaining prior to the drop. The jumpmaster receives the time warnings from the pilot and relays them by bending his elbow and positioning his forearm horizontally in front of his face. With the opposite index finger he taps or points to his wrist and indicates the time by displaying the appropriate number of fingers, each finger representing 1 minute. Time warnings are generally given at 20 minutes, 10 minutes, and 6 minutes.

From the 20-minute warning on, procedures and jump commands differ for oxygen and regular MFF jumps.

ARM MAIN PARACHUTE

20-minute warning: Helmets are donned and secured, and any additional equipment which accompanies you is attached and checked. At an altitude of at least 2,500 feet above the altitude set on the automatic ripcord release, the jumpmaster gives the signal for "ARM MAIN PARACHUTE" by placing his left hand close to his left hip, and then extending the arm fully forward at approximately a 45-degree angle. This signal directs you to remove the arming pin from the automatic ripcord release and hold it up so that it can be checked to insure that the release is armed and has not activated. The signal to disarm (reinsert arming pin) is given by reversing the "ARM" signal.



TEN MINUTES (OR KNOTS)

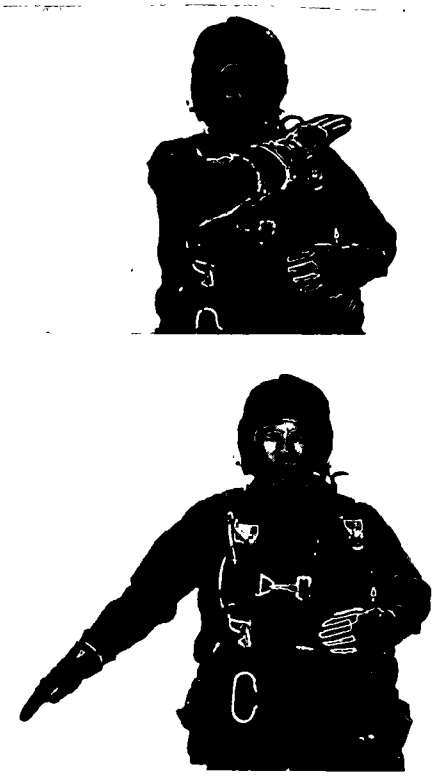
10-minute warning: No action is required of you at this time.

SIX MINUTES (OR KNOTS)

6-minute warning: The red caution light is turned on, the door or ramp is opened, and the jumpmaster begins to orient himself with the ground and look for the drop zone.

WIND

Wind speeds: The jumpmaster relays the ground wind speed by placing the heel of his hand under his chin and blowing across his palm and closed fingers. He then flashes his fingers in the same manner as for time warnings, each finger representing one knot.



WIND GUSTING

To indicate gusting winds, the jumpmaster first indicates the lower wind velocity, then places an arm across his body and brings it down in a vigorous outward diagonal slash across the front of his body, and finally indicates the higher wind reading.

Normally, at the 2-minute warning the green light is turned on. The 2-minute warning alerts the jumpmaster that the aircraft is approximately 2 minutes from the release point and that it is time to give the first jump command.

OXYGEN JUMPS

Oxygen Check. The oxygen check signal is given after the 20-, 10-, and 6-minute warnings and at any other time the jumpmaster deems necessary. The jumpmaster extends his arm to the front, fingers clutched in a fist with the thumb extended upward to indicate an oxygen check. If you have no oxygen problems, return the signal to the jumpmaster. If you have an oxygen problem, extend your arm to your front with your palm down.

20-minute warning: Normally at this time the aircraft is pressurized to 10,000 feet cabin pressure. Don and secure your helmet and attach and check any additional equipment to accompany you. The signal "ARM MAIN PARACHUTES" will be given.

The jumpmaster will grind the knuckles of one hand into the palm of his other hand at about chin level to indicate that all cigarettes are to be extinguished prior to activation of the main oxygen source.

As all parachutes are checked to insure that no premature deployments have occurred, the assistant jumpmaster passes out an oxygen hose to each jumper and indicates the individual's regulator. Hook your hose to the oxygen connector and wait for the next signal. The jumpmaster places his thumb on the right side of his face and rotates his palm and fingers across his nose and mouth as in masking. This is the signal to mask. Put on your oxygen mask and make sure that the oxygen hose is not kinked and that the mask straps are not twisted. The jumpmaster will call for an oxygen check.

10-minute warning: The aircraft should be completely depressurized. No action other than an oxygen check is required of you.

6-minute warning: The red caution light is turned on, the aircraft door or ramp is opened, ground winds are relayed, and an oxygen check is made.

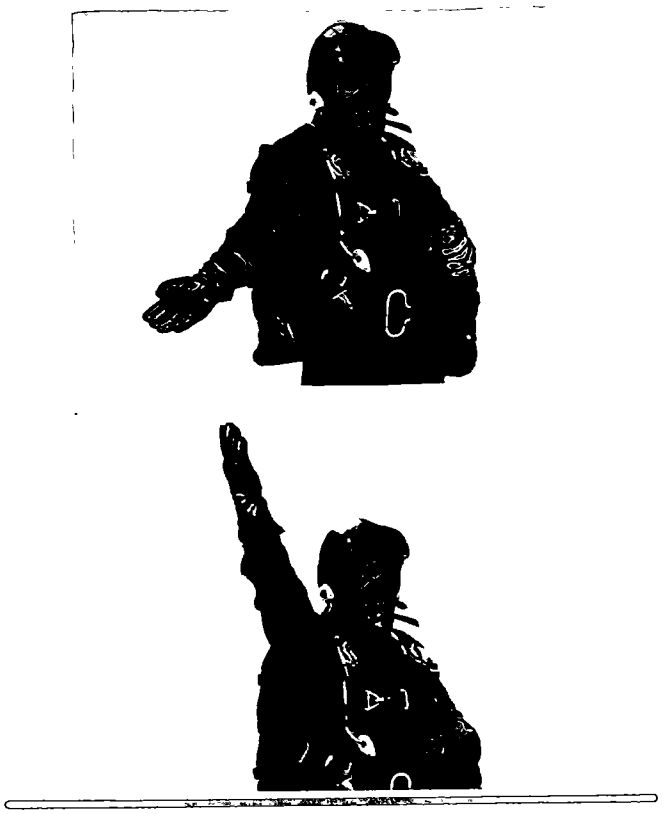
Jump commands begin at the 2-minute warning and continue through exit of the aircraft in the same manner as for non-oxygen jumps.

EXTINGUISH SMOKES

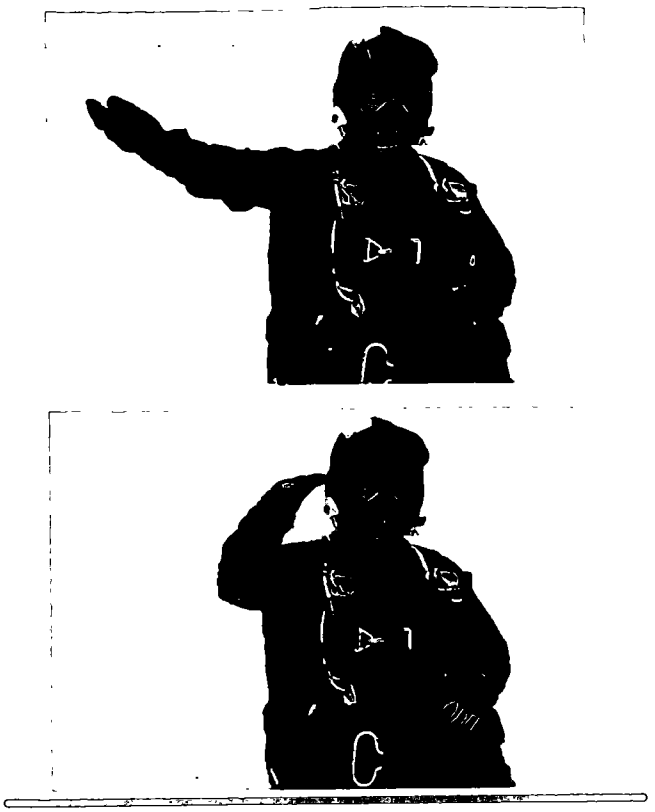
MASK

OXYGEN CHECK

STAND UP



MOVE TO THE REAR



"STAND UP." The jumpmaster extends his arm, elbow locked and palm up, and rotates it up between shoulder and head level to signal "STAND UP."

"STAND UP." Stand up, check your equipment and the bottom pin of the parachutist in front of you, pull down your goggles, and snug down your reserve. Two additional actions are required of you at this time. First, place your right hand on the "ON-OFF" control of the dual oxygen cylinder, and, second, grasp the oxygen hose next to the CRU 60/P.

"MOVE TO THE REAR." At approximately 1 minute prior to reaching the exit point, the jumpmaster extends his arm straight out toward the jumpers, elbow locked at shoulder level, and waves his forearm alongside his head toward the rear. This is the second jump command, "MOVE TO THE REAR." All parachutists exiting will move to within 1 meter of the edge of the jump door or ramp.

"MOVE TO THE REAR." Activate your bailout bottle and when you feel the surge of oxygen from the bottle, disconnect from the console, loop your hose around your regulator, and move to within 1 meter of the edge of the jump door or ramp, whichever is being used.

STAND BY

"GO"

"STAND BY." Approximately 10 seconds prior to exit, the jumpmaster forms a fist with either hand, thumb extended, and brings the arm, elbow locked, upward from beside his leg to a horizontal position parallel to the floor to signal the command, "STAND BY." To signify that you are ready, return this signal to the jumpmaster. All parachutists on "STAND BY" will move to the edge of the jump door or ramp and keep their eyes on the jumpmaster if he is spotting, or on the jump lights if the exit is to be electronically computed by the Adverse Weather Aerial Delivery System (AWADS). If the exit is electronically computed, the green jump light will be turned on at the exact point of exit.

"GO." The fourth jump command is "GO," given by the jumpmaster and/or the green light. Providing the green light is on, the jumpmaster signals the command by extending his arm at shoulder level, hand alongside his head, and thrusting vigorously toward the exit. Exit the aircraft as rapidly as possible.

ABORTS.

The jumpmaster has the responsibility and authority to abort any pass when an unsafe condition exists inside or outside the aircraft or on the drop zone. Should it become necessary to abort a pass after the parachutists are near the exit, the jumpmaster will slowly turn away from the exit, face the front of the aircraft, and walk slowly toward the front, shaking his head from side to side. When an abort signal is given, return to your seat and sit down. Reconnect to the oxygen console and deactivate your bailout bottle.

SECTION X. RECOVERY OF THE MC-3 PARACHUTE

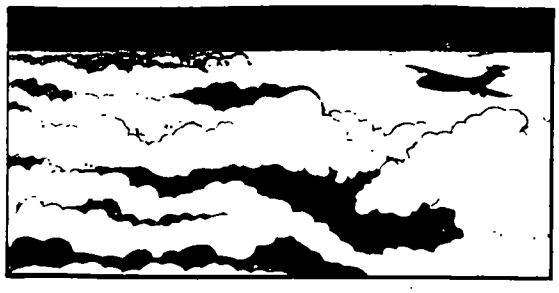
There are two accepted methods of recovering the MC-3 parachute assembly. The preferred method requires the use of an aviator's kit bag, but the alternate method may be used when a kit bag is not available. In either case, you should attach your ripcord handle to the chest strap of your harness before you remove the harness; this prevents the loss of the ripcord handle. Remove the harness and, before allowing it to touch the ground, reinsert the arming pin into the FF-2 automatic ripcord release to preclude misplacement of the pin and the introduction of dirt or debris into the release.

To recover the MC-3 parachute assembly, stretch the entire assembly, from the pilot chute to and including the pack and harness, out on the ground. Move to the pilot chute end of the canopy sleeve and pull the sleeve retainer line through the sleeve until the bridle loop is even with the top of the sleeve. Fasten the bridle loop to a handy object or have someone hold it while you pull the canopy sleeve down over the canopy. Taking care not to damage the canopy sleeve by trying to push too much material into the opening, pull the sleeve down to the point where no canopy material is exposed. Move back to the bridle and drape the pilot chute over your shoulder. Place your thumb through the bridle loop and "S" fold the canopy and suspension lines until you arrive at the risers. Place the folded canopy and suspension lines into the kit bag, and place the pilot chute on the ground next to the bag. Remove the FF-2 automatic ripcord release from the harness if you are required to do so. Place the packtray and harness assembly into the kit bag on top of the canopy and suspension lines with the comfort pad facing up to protect the FF-2. Place the pilot parachute into the kit bag and snap the fasteners located on the kit bag. DO NOT USE THE SLIDE FASTENER (ZIPPER), SINCE THE TEETH CAN DAMAGE ANY PROTRUDING FABRIC.

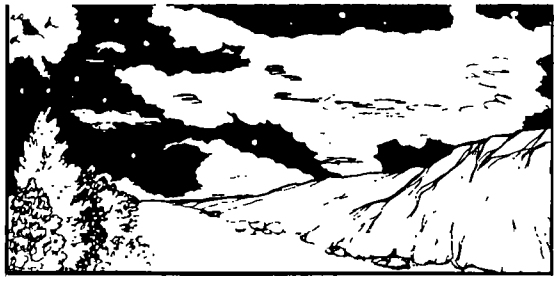
To recover the MC-3 parachute by the alternate method, follow the same steps as for the preferred method through drawing the sleeve over the canopy. Then, drape the pilot parachute and the sleeved canopy over your shoulders, and coil the suspension lines into one of your hands, making an approximately 2-foot coil. Fold the risers into the open packtray and place the coiled suspension lines on top of them. "S" fold the sleeved canopy into the packtray, making each "S" fold approximately the same length as the packtray, and allow the pilot parachute to extend beyond the top of the tray. Close the side closing flaps over the entire contents and secure the flaps in place with the pack opening bands.

Do not put your oxygen mask on the ground during recovery. Moisture caused by breathing and temperature change during descent will cause sand and debris to stick to the mask, making it harder to clean.

SECTION XI. SPECIAL FREE-FALL OPERATIONS



CLOUDS aid free-fall infiltrations by reducing ground observers' capabilities to detect infiltrating personnel. If you enter clouds during free fall, stop all maneuvering immediately and use stable fall techniques. Continue assembly in free fall after you have cleared the base of the clouds. If you remain in clouds for the entire free fall, activate your parachute at the designated altitude, face the canopy downwind, and fly at half-brakes. Follow the same procedures if you should enter clouds after deployment. Execute no other canopy maneuvers until you have cleared the base of the clouds, when normal grouping techniques may be initiated or continued.



NIGHT OPERATIONS by an infiltrating unit reduce the possibility of detection. For night operations, the free-fall kit will contain a lighting device which will be either a steady light or a strobe light. These lights should be attached to backpacks so that they can be seen during free fall and should be turned off immediately after landing. Lights must be visible for 3 nautical miles on jumps in airspace strictly under FAA control, but are not required on operations conducted in restricted airspace such as that on most military installations. All efforts to group in free fall and under canopy may be made on night operations, but more vigilance is required of individual jumpers. If a lighting device should totally fail on a night free-fall operation, you have two alternatives. First, see if you can positively observe another parachutist. If you can, activate your main parachute when you observe his opening. If you can observe no other parachutist to use for reference, exercise your second alternative: When you reach opening altitude, activate your main parachute immediately and concentrate on trying to land on the desired impact point.

INTENTIONAL WATER JUMPING has the advantage of using a drop zone which will leave no impact impressions. Moreover, the parachutes are readily concealed by submersion, and the chance of discovery becomes remote. The B-7 underarm-type life preservers should be worn during intentional water jumps, or when performing free-fall operations within 1 mile of a body of water. Activate your life preserver with the compressed gas cylinders immediately after checking your canopy upon deployment. If the gas cylinder fails to inflate the life preserver, you may inflate it through the oral inflation valve. Face your canopy into the wind prior to impact with the water surface, and prepare to do a normal PLF if you should land on a submerged object. Upon contact with the water, activate both canopy releases to free the canopy. The harness and equipment can be removed after boarding a watercraft or upon reaching shore.

Any or all of these special free-fall operations may be encountered on a particular jump.

SECTION XII. OXYGEN EQUIPMENT

WARNING: OXYGEN WILL ALWAYS BE USED WHEN ALTITUDES ABOVE 10,000 FEET ARE TO BE MAINTAINED FOR MORE THAN 30 MINUTES.

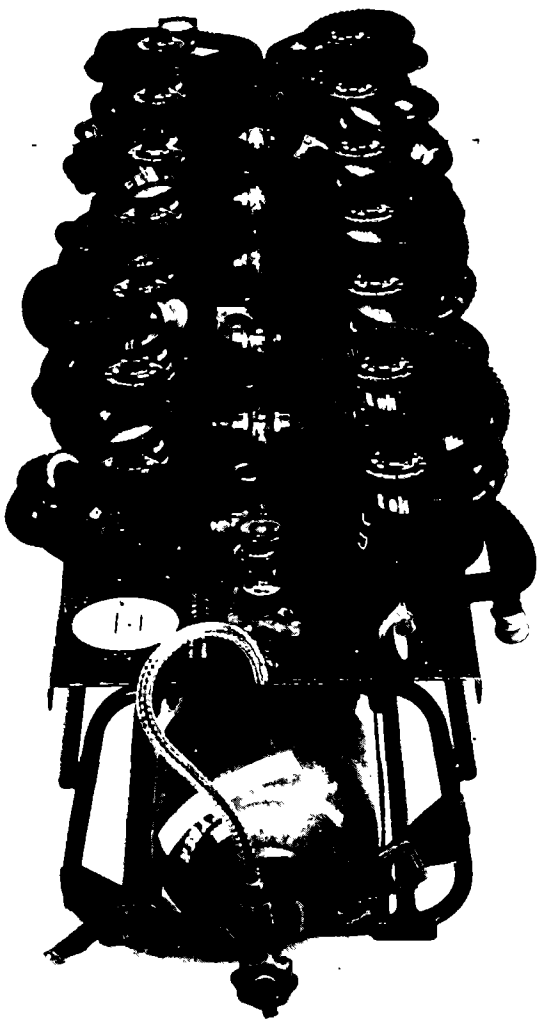
When you handle oxygen equipment, certain techniques and procedures must be followed to avoid the danger of explosion and to prevent damage to the equipment.

WARNING

DO NOT	SMOKE WHEN OXYGEN IS BEING UTILIZED.
DO NOT	DROP OR BANG THE OXYGEN CYLINDERS
DO NOT	USE OR ALLOW THE PRESENCE OF OIL OR GREASE AROUND OXYGEN UNDER PRESSURE.
DO NOT	TRANSPORT OXYGEN CYLINDERS WITHOUT VALVE CAP

THE OXYGEN CONSOLE. The model 2900 oxygen console is a portable console with 14 A-14 pressure demand regulators and hoses to provide oxygen to parachutists en route to the drop zone. The console is centrally positioned in the aircraft, accessible to all parachutists, and is fed by a large high-pressure oxygen cylinder. Mission and oxygen requirements, however, may demand the addition of more cylinders.

WARNING: DO NOT USE THE PRESSURE DEMAND OXYGEN SYSTEM ABOVE 43,500 FEET.

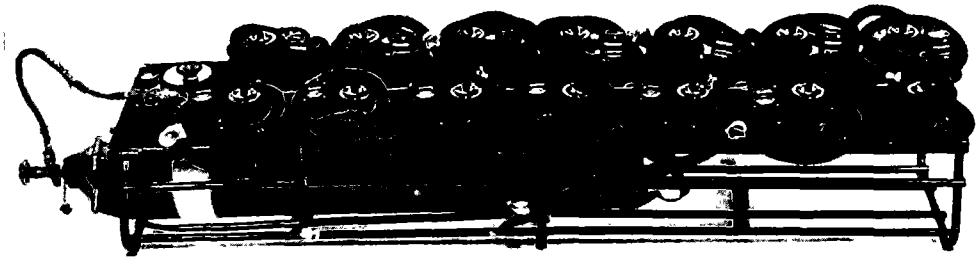


WARNING: THE PORTABLE OXYGEN CONSOLE AND PERSONNEL OXYGEN CYLINDERS WILL BE SERVICED WITH AVIATORS' BREATHING OXYGEN, TYPE 1, MIL-O-27210 ONLY.

Each oxygen cylinder will supply adequate oxygen for 14 parachutists for approximately 1½ hours at 30,000 feet altitude. Since the console is the most sensitive piece of equipment in the inventory, nothing should be put on top of it. The hoses should be coiled around the regulators or curled into special pockets which may be attached to the sides of the console.

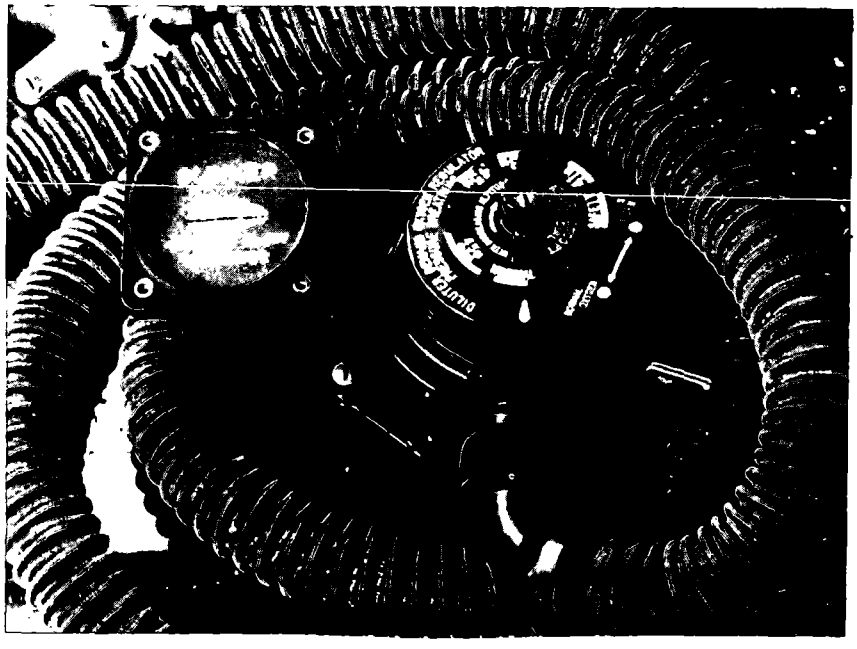
Since the maximum pressure which can be used with the M2900 oxygen console is 1800 psi, the high-pressure cylinder used for filling bailout bottles can be utilized once the pressure in it is reduced to 1800 psi. Replace the high pressure oxygen cylinder in the M2900 oxygen console when the pressure reading is 800 psi or lower. Turn off the outside source shutoff valve which controls the oxygen supply to the console and disconnect the flexible hose assembly from the cylinder. Loosen the two straps around the cylinder and slide it straight out of the front of the console.

Slide the new cylinder into the console in the same manner, valve opening up for easy fitting of the flexible hose assembly. Insure that the cylinder is well seated in the strap. Place the second strap over the valve assembly and secure it to the console to keep the cylinder from moving back and forth and causing the metal flexible hose assembly to work loose. Reconnect the flexible hose assembly to the cylinder and open the outside source shutoff valve. (There is, additionally, a line shutoff valve which is used to fill walkaround bottles from the main oxygen supply.)



The Model 2900 oxygen console is activated by the oxygen safety NCO at an altitude of 10,000 feet. All automix levers on the individual pressure demand regulators will be placed in the *normal oxygen* position. The 100 percent oxygen position is used for such personnel as the jumpmaster, assistants, or oxygen safety NCO's, or when an altitude of 29,000 feet is reached.

A14 REGULATOR



On the face of the A-14 regulator, there are six settings: NORMAL, SAFETY, 41M, 43M, 45M and 45M ABOVE. You will normally use only the first three of these positions. The NORMAL position is generally used for altitudes up to 20,000 feet, and the 41M positions for most of higher altitudes with which you will be concerned. The SAFETY position is for emergency conditions.

The oxygen flow indicator (blinker) is positioned on the console beside each individual regulator so that each parachutist can monitor it. It indicates to each parachutist that he is receiving oxygen and his rate of breathing. It blinks only on inhalation.

Before each high-altitude flight, make the following checks on the portable oxygen console:

Oxygen supply pressure gauge check. Check the oxygen supply pressure gauge for indication of 1800 psi.

Regulator blowby check. Position diluter level to *normal oxygen* position. Blow gently into the open end of the mask-to-regulator tubing. There should be continued resistance to gentle blowing. Repeat the procedure with the diluter lever set at *100% oxygen* position.

Oxygen flow indicator check. Position the diluter lever to *normal oxygen* position. Inhale gently. The flow indicator should blink when oxygen flows through the system upon inhalation. Repeat the procedure with the diluter level set at *100% oxygen.*

Diluter lever check. Before takeoff, set the diluter lever to the *normal oxygen* position.

Hose purging. The oxygen hoses must be purged prior to use to remove any foreign material in them. Set the regulator control to the 43M setting, point the regulator hose away from your face, and release two or three bursts of oxygen through the hose. Connect the mask-to-regulator connector to the regulator hose and repeat the procedure.

INDIVIDUAL OXYGEN STATIONS. Some aircraft are equipped with individual oxygen stations for each parachutist. When these stations are used, the same checks as those conducted on the portable oxygen console are conducted and the procedures are the same.

DUTIES OF THE OXYGEN SAFETY MAN. An oxygen safety man is required in each aircraft when oxygen is being used during free-fall operations. He must be a qualified free-fall jumpmaster who has had physiological training.

The oxygen safety man:

Checks all oxygen equipment prior to enplaning.

Distributes oxygen hoses on one side of the aircraft. The jumpmaster or his designated representative distributes the hoses on the opposite side of the aircraft.

Insures that all parachutists are properly attached to the oxygen supply on the jumpmaster's command.

Insures that all parachutists are receiving an adequate supply of oxygen.

Makes periodic checks of all oxygen equipment during flight.

Continually checks parachutists for symptoms of hypoxia.

On order from the jumpmaster, assists the parachutists in switching from individual oxygen outlets to personnel oxygen cylinders, and insures that each cylinder has been activated.

Stays with any parachutist suffering from oxygen sickness or one who has been unable to jump, lands with the aircraft, and assists the parachutist as required.

SECTION XIII. JUMP TRAINING

Jump training should commence upon completion of the ground training phase. There is no established or prescribed minimum or maximum number of jumps, but after approximately 20 free-fall jumps, including at least one oxygen jump, one jump with equipment, and one jump during hours of darkness, the average student can successfully accomplish a free-fall mission as a jumping team member.

INDIVIDUAL JUMPS. After nine jumps, the average student should be able to stabilize and maintain a heading on a ground reference point or direction. Instructor personnel should observe the students in the air during the initial jumps and critique them on an individual basis. Upon completion of the individual's initial jumps and as a prerequisite to continued training, the student must pass a graded exercise: satisfactorily exit the aircraft, attain and maintain a designated heading, execute 360-degree turns to the left and right, fall stable, and execute a stable pull at the prescribed altitude.

GROUPING. The remaining jumps should be made from an altitude of 17,500 feet with grouping exercises started immediately and continued throughout the duration of the course. Oxygen equipment, individual weapons, and equipment are added as the individual participates in the grouping exercises. Landing within 100 meters of the group leader during 70 percent of all grouping exercises is mandatory for satisfactory completion of the free-fall course. Upon completion of jump training, an individual is capable of executing high-altitude jumps using oxygen equipment, with individual weapon and equipment, day or night, and landing close to a desired impact point.

CHAPTER 5

5 JUMPMASTER TRAINING

The jumpmaster is the senior-qualified free-fall parachutist on board the aircraft, or his designated representative, and must be qualified by special training and free-fall experience to perform his duties.

There is only one Army jumpmaster in any one aircraft. He has command authority over, and responsibility for, all airborne personnel in the aircraft regardless of rank. He is responsible for inspection of the aircraft and personnel, the enplaning and safe jumping of personnel, and the dropping of air delivery containers. The jumpmaster's responsibility includes insuring that all free-fall parachutists aboard the aircraft observe flight safety regulations and comply with instructions from the pilot.

The jumpmaster's duties and responsibilities begin immediately upon notification that he is to be jumpmaster, and terminate only after all personnel and equipment are returned to the control of the unit commander upon completion or cancellation of the airborne operation. He may designate as many personnel as he deems necessary to assist him in the conduct of the airborne operation, and may assign any task he deems appropriate to those designated personnel. While the jumpmaster may delegate the necessary authority to those personnel, he assumes full responsibility for their actions.

Generally, the jumpmaster's duties fall into four major areas: in the unit area, at the departure airfield, during flight, and on the drop zone.

DUTIES IN THE UNIT AREA

The jumpmaster's first duty in the unit area is to **obtain the manifest and conduct manifest call.** The manifest (DA Form 1306) will list each jumper's name, rank, social security account number, and parent unit. It will also state the date, type of jump, type of aircraft, location of drop zone, and altitude. The jumpmaster's full name, grade, and social security account number will appear in the appropriate block.

Check each jumper's name against the manifest list. If a jumper is to be added to the manifest, fill out the appropriate information on all copies of the form and continue the entry count. If a jumper is to be deleted from the manifest, draw a line through the entire entry and initial the line.

Check the manifest for accuracy. After the MACO briefing, close the manifest out by drawing a line under the last entry, and sign all copies.

Sign the following statement which must be typed or overprinted on DA Form 1306 or attached to it: "I certify that all passengers listed on this manifest have been inspected, and no unauthorized weapons and explosives were found."

Draw any additional air items necessary for the jump. You will normally sign for all of these items, which may include aerial delivery containers to be rigged. If an oxygen jump is scheduled, the jumpers must draw bailout bottles, and you will need to take the oxygen consoles and the accompanying oxygen bottles. Insure that all bailout bottles are serviceable and that masks are properly fitted and in good condition. Inspect all equipment to insure serviceability, and replace defective equipment if necessary.

The FF-2 Automatic Opening Device should be inspected as follows:

1. Inspect the body, cable housing, cable, and locking pin V-ring for obvious damage.
2. Insure that the arming pin is inserted and locked.
3. Check the RESET INDICATOR window to insure that the indicator marks are aligned. If they are not aligned,
   - Remove the arming pin.
   - Remove screw from reset access hole.
   - Insert reset key in access hole and wind in direction of arrow approximately one turn.
   - Remove reset key. Reset indicator should align.

NOTE:

If indicators do not align on the first attempt, five more attempts may be made to align them. If, after six attempts to align the reset indicator, alignment is not satisfactory, reject the automatic ripcord release as unserviceable.

Check the millibar window.

Check the slotted adjustment screw on the millibar window for ease of operation.

Check the stowage pocket for obvious damage.

Using the cocking stirrup with arming pin insert, insure that the automatic ripcord release is cocked.

Rucksacks should be properly rigged, and each jumper should know how to properly rig any weapons which he may carry when jumping. Insure that each jumper is in the proper uniform with all the equipment he will need for that particular jump—oxygen apparatus, helmet, goggles, gloves, altimeter, etc.

The MACO briefing should be given in accordance with Airborne SOP/regulations after the inspection is completed. Local regulations and SOP's will state precisely what information must be covered in a military free-fall MACO briefing. Normally, you will be given the elevations of the drop zone and the departure airfield during the MACO briefing, and from this you can derive altimeter settings.

Conduct pre-jump training to include a review of the characteristics of the type of aircraft to be jumped, the type of exit (door or ramp) and the seating arrangements. Review the procedure signals and jump commands, describing each and explaining the required actions for each. Keep in mind that all signals and commands on an oxygen jump must be visual. Explain emergency procedures on board the aircraft, during free fall, and under canopy, including accidental activation of the main or reserve parachute in or near an open door or ramp, cutaway procedures, and activation of the reserve parachute in case of a malfunction of the main parachute. Each jumper should also make a minimum of two PLF's, one forward and one to the rear.

DUTIES AT THE DEPARTURE AIRFIELD

Report to the DACO (Departure Air Control Officer) at the departure airfield for any changes in the status of the jump. Make sure that the necessary transportation is there or arranged, and that communications are available between the DACO and the DZSO (Drop Zone Safety Officer).

Obtain or update your information on barometric pressure on the drop zone, and data on wind velocity and direction over the drop zone at 1,000-foot intervals from the ground to opening altitude and at 2,000-foot intervals from release altitude to opening altitude. From the barometric pressure you may derive the setting for the automatic ripcord releases, and from the wind data you can calculate the desired release point as in appendix B.

The pilot briefing is normally conducted by S3/G3 section to insure that the jumpmaster and the pilot and other involved personnel all understand when, where, and what is to be done. The pilot briefing could be several days in advance of the operation, hours prior to the flight, or just prior to boarding.

The jumpmaster/pilot checklist provides a ready reference for items to be covered and understood by both the pilot and jumpmaster. The following items should be discussed with the pilot prior to conducting a military free-fall operation. Depending on the mission, additions and/or deletions may be necessary.

SAMPLE

SAMPLE JUMPMASTER/PILOT CHECKLIST

a. Desired drop altitude (AGL). _____ ☐
b. Drop zone being utilized. _____ ☐
c. Desired direction of flight. _____ ☐
d. *Proposed release point. _____ ☐
e. Number of passes over drop zone. _____ ☐
f. Number of jumpers per pass. _____ ☐
g. Drop zone wind velocity obtained from DZ prior to drop. _____ ☐
h. Type of exit (door or ramp). _____ ☐
i. *Door being utilized for spotting. _____ ☐
j Desired altitude of aircraft on final approach (i.e., aircraft level, compensate for drift of aircraft, etc.). _____ ☐
k Discuss time warnings, 20-min, 10-min, 6-min (you may request additional time warnings as an aid). _____ ☐
l Give pilot a copy of the manifest with the total number of jumpers. _____ ☐
m *Explain corrections for guiding aircraft. _____ ☐
n *Explain strike report. Have pilot relay strike report to jumpmaster after each pass. _____ ☐
o Discuss ground to air radio frequency and/or visual signals. _____ ☐
p Discuss the use of caution/jump lights. _____ ☐

*Visual jumpmaster release only.

During **the pilot/jumpmaster briefing,** all concerned must understand how the AWADS method of jumping and the visual spotting method will be conducted. Especially significant is the visual spotting method wherein the jumpmaster directs the aircraft over the release point. Understanding the relationship of the proposed release point, the door being used for spotting, signals and corrections for guiding the aircraft to the release point, and the use of the caution/jump lights is necessary for a satisfactory exit from the aircraft.

The FF-2 automatic ripcord release, unlike its predecessors, may be set by the jumper and checked by the jumpmaster. It may be set prior to boarding or during a flight, but it must be set prior to the removal of the arming pin.

To compute the millibar setting for the FF-2, the jumpmaster must know the barometric pressure to within one-tenth of an inch on the intended drop zone. The barometric pressure may be obtained from any weather reporting facility capable of determining the barometric pressure in the desired area.

Using the **computer,** align the index with the drop zone barometric pressure to the closest one-tenth of an inch. Align the movable index on the arm of the computer with the desired automatic ripcord release activation altitude. Normally, the automatic ripcord release activation altitude will be 500 feet below the planned manual activation altitude, but it may be used as the primary means of main parachute activation, especially for equipment drops, by computing the activation for the planned opening altitude. Read the millibar setting below the movable index. Recompute to verify the setting. After verifying the millibar setting, have the jumpers set the millibar setting on the automatic ripcord release by turning the slotted adjustment screw. Computations and settings are determined to the closest one millibar.

WARNING: THE SAFE TO ARM ALTITUDE FOR THE FF-2 AUTOMATIC RIPCORD RELEASE IS 2,500 FEET ABOVE THE SET ACTIVATION ALTITUDE.

Insure that jumpers set the automatic ripcord release. Using the difference in altitude between the drop zone and the airfield, calculate the settings for the altimeters. If the drop zone altitude is 500 feet, for example, and the airfield altitude is 200 feet, the altimeter should be set at minus 300 feet to correspond to zero on the drop zone. If the airfield is 200 feet higher than the drop zone, altimeters should be set at plus 200 feet.

Next, **conduct** the aircraft inspection in accordance with appendix C. While you inspect the aircraft, the assistant jumpmaster can have the troops don their parachutes and equipment and prepare for the jumpmaster personnel inspection.

Check with the pilot and crew for any changes that may have occurred since the pilot briefing. Select a recognizable terrain feature close to the computed release point on your map. This terrain feature will mark the actual release point. Describe that point to the pilot so he can visually align the aircraft from the cockpit. The desired track to the release point should be into the wind if possible. This will reduce ground speed and the pilot will not have to crab the aircraft to maintain the track.

If you are going to oxygen altitude, you will **supervise the loading of the oxygen and oxygen consoles** at this time.

After you have completed your aircraft inspection, the jumpers should be ready for your personnel inspection in accordance with appendix A. Remember that you must inspect each jumper and his equipment, and, if you are to jump, you and your equipment must be inspected. Since it takes approximately 1 minute per jumper for inspection, judge your time accordingly so that you will be sure to make your station time.

A plane-side briefing is given just prior to loading or may be given immediately after loading. Update the personnel on any changes, and cover all actions from the 20-minute warning through assembly on the drop zone. If you did not do so during the MACO briefing, brief the parachutists, in detail, on the possibility of an abort. Establish the exit order and tell the jumpers whether they will exit on the green light or on your command.

The pilot will assemble all personnel who will be aboard the aircraft during the flight and will give his safety briefing. He will outline and describe emergency procedures, the rules in force aboard his aircraft, and will indicate what actions and activities are permissible among the jumpers. Part of your duties is to see that he is obeyed.

Station time is that time when all jumpers and equipment are seated aboard the aircraft with seat belts fastened, helmets on, ready for takeoff. You must insure that station time is made. Once aboard the aircraft, your next duty area is during flight.

Insure that you have communications with the pilot and/or navigator, either by intercom or through the loadmaster. You must have communications if you are going to jump on visual release.

DUTIES ABOARD THE AIRCRAFT

Orientation during flight is one of the jumpmaster's most important duties. Coordinate with the navigator to map out your checkpoints utilizing the navigator's planned route, and have him relay the checkpoints to you as the aircraft crosses them.

Keep the jumpers informed of the location of the aircraft at all times. If the aircraft were to go down or if you had to make an emergency exit on an operational mission, accomplishing the mission could depend on your knowledge of your location.

Timely and proper issuance of the procedure signals and jump commands, accompanied by correct reactions by the parachutists, allows the jumpmaster to maintain complete control and assures successful execution of the airborne operation. Give good, distinct visual signals.

The first procedure signal, "DON HELMETS" is given approximately 1 minute prior to takeoff, but may also be given at any time it becomes necessary during flight. The jumpers will secure their helmets, check to insure seat belts are fastened, and prepare for takeoff or landing.

Give the next signal, "UNFASTEN SEAT BELTS" after the aircraft has reached an altitude of 1,000 feet. This signal allows the jumpers to remove their seat belts and relax. The pilot will have informed you if the jumpers are to be allowed to eat or smoke on the flight.

At the "20-minute warning," make sure the jumpers don any equipment they may have removed. This equipment must be rerigged and inspected. Any additional equipment will be rigged on the jumper and inspected.

At the "10-minute warning" or as soon as the cabin has been depressurized to at least 2,500 feet above the set opening altitude, you will give the signal to "ARM MAIN PARACHUTE." Upon receipt of your signal, the jumpers will remove the arming pins from their automatic ripcord releases and hold the pins up in front of them to allow you or your assistant to check them. Count the pins and assist any jumper who has difficulties. After you have checked the arming pins, the jumpers will secure them in pockets until after the jump or until you give the signal to "REINSERT ARMING PINS."

If at any time the aircraft descends below the safe-to-arm altitude for any reason, give the signal to "REINSERT ARMING PINS." Simply reverse the "ARM MAIN PARACHUTES" signal. Insure that each jumper has reinserted his arming pin and assist if necessary.

"Ground Winds" signals are generally relayed accompanying the "6-minute warning."

When it becomes necessary to stop smoking, give the signal to "EXTINGUISH SMOKES." Insure that all cigarettes and flame-producing items are completely extinguished. This signal will also be given prior to activating any on-board oxygen supply.

There will be additional signals for jumps from oxygen altitudes. Prior to bringing the cabin pressure above 1,000 feet, or at the time pre-breathing is to start, make sure that the oxygen safety man has activated the oxygen supply and give the signal to "MASK." Insure that each jumper's mask is fitted and functioning properly and assist if anyone has difficulties.

Make an "Oxygen Check" immediately upon masking, at the 20-, 10-, and 6-minute warnings, prior to cabin pressure being raised above 10,000 feet, and whenever else you believe it to be necessary. Do not hesitate to order additional oxygen checks. If the individual jumper is not having oxygen problems, he will return your signal and hold it until you have completed your oxygen check. If problems occur, the individual in difficulty will place his hand over the console with his palm facing down. Have him assisted immediately. At the end of the oxygen check, make the oxygen check signal *again* to indicate to the jumpers that *you* are having no difficulties with oxygen.

If you must use a nonstandard signal to meet a specific requirement, keep it simple and make sure the desired reaction is clearly indicated.

The 20-minute, 10-minute, and 6-minute time warnings are standard. You may request additional time warnings from the pilot if you believe them to be necessary or helpful to you. Normally, a 2-minute, 1-minute, and 10-second warning will be relayed from the pilot, but it is not necessary for you to relay these warnings to the jumpers. Each of these warnings has specific requirements of you, whether the release is to be AWADS or visual spotting. You must coordinate with the pilot to establish when he will turn the green light on and under what circumstances he should turn the red light back on.

Normally, on a visual spotting release, the green light should be turned on at the 2-minute warning if all conditions for the jump are satisfactory at that time. If conditions become unsatisfactory for any reason, the pilot will turn the red light back on to indicate a no-drop condition.

On an AWADS jump, the red light will remain on until actual exit time. The activation of the green light will be the signal to exit, but you must still give the necessary commands from the 2-minute warning on.

At about the 2-minute warning, move to the door selected for spotting. Choose a door which will enable you to observe both the drop zone and release point while aligning the aircraft. Of the two, however, it is more important for you to be able to see the release point than the drop zone. Take up a stable position which will give you good perspective so that you will be able to determine the position of the aircraft by looking straight down. By learning to maintain the same position in the door, you will develop a technique for selecting good reference points to assist you in guiding the aircraft to the release point. In addition to good perspective, your door position must be stable enough for you to remain fairly comfortable in it as long as necessary to align the aircraft.

Check the aircraft's position by looking straight down. Do not try to look down the side of the aircraft to align it with the release point. If the pilot is crabbing to maintain the track, your perspective will be thrown off. The aircraft should be as level as possible.

Give the first jump command, "STAND UP." The parachutists will stand up, check the attachment and adjustment of their equipment, check the bottom locking pin of the individual directly in front of them, and place their goggles in position.

Determine your location and store that reference point in your mind. Locate and identify the drop zone and the release point. By dividing in half the distance from where you were at the 2-minute warning to the release point, you can determine your position at the 1-minute warning. Construct an imaginary line through your present position and your position at the 2-minute warning, and extend it toward the release point. This will be the actual track. Imagine another line from your present position directly to the release point.

LEFT CORRECTION

This is the desired track. If there is a difference of more than 50° in the two tracks, correct the aircraft's track by giving the pilot a correction. Corrections are made in increments of 5° and should be approximated to the closest increment in the desired direction. The correction, LEFT, TEN, for example, would tell the pilot to correct his course ten degrees to the left. You want the pilot to correct the heading and return to level flight aligned with the release point as quickly as possible. Check the alignment further and make any subsequent corrections.

RIGHT CORRECTION

At the 1-minute warning, give the second jump command, "MOVE TO THE REAR." All jumpers who are to exit on that pass will move to the vicinity of the selected exit. If oxygen is being used, the jumpers will activate their bailout bottles and disconnect from the on-board oxygen source before moving to the exit. They will continue to watch you for the next jump command. Occasionally, because of aircraft configuration, seating arrangements, or number of jumpers, "move to the rear" may be omitted, but if so, jumpers should be thoroughly briefed in advance.

Continue spotting, giving corrections as may be necessary. When you are given the 10-second warning, give the command to "STAND BY." Get to your feet if you kneel to spot, so that you will be in a position to command "GO." The lead jumpers will position themselves within 3 feet of the edge of the exit being used and watch the jumpmaster and jump light as instructed in the MACO or plane-side briefing. If the electronic release is being used, the jumpers should watch the light and glance at the jumpmaster approximately every 5 seconds for either the "GO" or abort signal. During visual release, it is the jumpmaster who determines whether the situation is "GO" or abort.

If a pass is aborted, face the front of the aircraft and walk slowly forward, shaking your head from side to side. DO NOT MOVE YOUR HANDS OR ATTEMPT TO ATTRACT THE JUMPERS' ATTENTION WITH YOUR HANDS. If your hand should happen to be raised in preparation for the command "GO," do not bring it down. LEAVE IT IN THE AIR AS YOU WALK FORWARD, or the jumpers may mistake your motion for the "GO" signal and exit. **Any hand or arm motion** you make may be misinterpreted as the "GO" signal at this point.

The last jump command is "GO," given in conjunction with the green light when using electronic release, or when the jumpmaster determines that he is over the release point when visual release is used. It is extremely difficult to direct the aircraft directly over the release point at high altitudes, but make every possible effort to do it.

In the event you have someone who refuses to jump, move him forward in the aircraft and seat him. Have him fasten his seat belt and wait for airlanding or the return to the departure airfield. At no time should you attempt to force an individual out of an aircraft. When time permits, you may try to calm him down by talking to him. If a jumper becomes ill on an

administrative jump, have someone land with him. If a jumper should suffer from oxygen sickness, the circumstances will dictate the proper procedures to be followed.

Strike Reports

Assuming that there will be multiple passes, the drop zone safety NCO or officer must give the jumpmaster a **strike report** by radio. The strike report includes the distance and direction from the desired impact point to the point where the center of the mass of jumpers landed. Measure the distance in meters. To give the direction, the DZSO must know the direction of the aircraft's track, and must convert the direction to the closest hour by the clock method. Twelve o'clock is located on the aircraft's track in the direction of flight with 6 o'clock 180° to the track.

The DZSO forms his strike report by combining the direction of the closest hour (within 15°) and the distance in meters. It will be given in a form such as "200 meters at 2 o'clock."

When you receive the strike report from the ground, write it down. If the hour part of the strike report is smaller than 6 o'clock, add 6 hours to it. If it is larger than 6 o'clock, subtract 6 hours from it. This procedure is basically the same as finding the back azimuth in map reading, but "hours" are used instead of "degrees."

After plotting the actual release point on your map, draw a line through it parallel to the track of the aircraft. Plot the corrected release point from the actual release point by moving the release point in the converted direction for the given distance. It is not necessary to allow for forward throw again. After you have plotted the new release point, use it on the next pass.

After the last jumper has exited and the last equipment bundle has been dropped, you will exit the aircraft. Your duties in the aircraft are completed.

DUTIES ON THE DROP ZONE

Your first drop zone duty will be after assembly. You must account for all personnel and equipment, to include all air items, personal gear, weapons, and combat equipment. Conduct a manifest call to determine that all personnel are present. In the event that a jumper is missing, notify the DZSO and the organization; the DZSO will conduct a search for the missing jumper in accordance with unit SOP and/or regulations.

If there are any malfunctions, the jumper (except when injured) will remain with the gear. He will in no way tamper with or move it until a qualified rigger has inspected it. The rigger will state the disposition of the equipment after he has inspected it. It is also your responsibility to see that all injured personnel receive proper medical attention as soon as possible.

Once you have turned over all personnel and equipment to their unit commander, your duties and responsibilities as jumpmaster are ended. During tactical operations, however, your duties end when the last man exits the aircraft. The tactical commander assumes command after the personnel land.

CONDUCT OF TRAINING

A student jumpmaster will be a previously qualified military free-fall parachutist. He will attend classroom instruction on jumpmaster duties and procedures; familiarization with military free-fall equipment; preparation of parachutists and equipment for free-fall operations; inspection of military free-fall personnel, equipment, and aircraft; supervision of movement in the aircraft, preparation for exit, and exit from the aircraft; and aligning the aircraft over the proper release point.

Practical exercises will be conducted in which the student jumpmaster applies his classroom knowledge and prior jump experience. Half the students in a class will act as jumpmasters, giving commands to their "jump buddies." Both the jumpmaster and his buddy will exit on the jumpmaster's spot; they will alternate roles on each jump. In the usual size class (18 students) this constitutes nine passes per sortie.

If the AWADS system is used, the jumpmaster students will issue jump commands and exit on the green light. After exit, students are required to stay close to each other while falling and land within 25 meters of each other. The jumps are scheduled normally as two per day or one day and one night jump. Altitudes will begin at 10,000 feet AGL and progress to 20,000 feet AGL (jumps may be conducted at altitudes up to 40,000 feet). Oxygen will be used when jumping from altitudes higher than 10,000 feet.

APPENDIX

A JUMPMASTER PERSONNEL INSPECTION

Prior to each military free-fall jump, the jumpmaster must conduct a systematic inspection of each parachutist to insure that all equipment is properly worn and attached.

With the jumper facing the jumpmaster, the jumpmaster begins the inspection with the helmet and works down to the last item. The jumper then faces about and is inspected from the rear in the same manner. The jumpmaster coordinates the progression of his hands and eyes, so that he visually inspects each item as he touches it. The particular hand not involved remains on the last item inspected to aid in keeping the inspection in sequence. Comparison inspection of like items improves the accuracy of the inspection significantly.

The jumpmaster personnel inspection can usually be conducted at the rate of one jumper per minute for planning purposes, but **SAFETY AND ACCURACY ARE NEVER SACRIFICED FOR SPEED.** If a deficiency is detected in a piece of equipment, consult a rigger or replace the piece of equipment.

WARNING: AN IMPROPER OR INCOMPLETE INSPECTION CAN RESULT IN SERIOUS INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT.

NOTE: ALL EQUIPMENT TO BE JUMPED OR AIRDROPPED MUST RECEIVE A JUMPMASTER PERSONNEL INSPECTION.

The following is a proven method of jumpmaster personnel inspection:

With the jumper facing you, place both hands on each side of the helmet and inspect the retainer strap on the goggles to insure that it is in serviceable condition and is attached to the sides or rear of the helmet. Inspect the lens to insure that it is of the clear type and has no cracks or severe scratches to obscure vision.

Check the adjustable chin strap on the helmet to insure that the snaps are functional and that the strap is serviceable. Insure that the oxygen mask is properly secured to the helmet and that it releases properly, allowing rapid removal in the event of an oxygen malfunction.

Check the oxygen mask for proper fitting and cleanliness. Insure that both inhalation valves are pointed down and that the exhalation valve is properly secured. Insure that the oxygen hose is secured to the oxygen mask with a clamp. Trace the hose to insure that it is not misrouted, that it is free of cracks, and that the mask connector is properly inserted and seated in the connection block assembly mounting plate. Check to insure that the mounting plate is attached to the left main lift web of the parachute harness assembly. Insure that the male connecting portion for the bailout bottle assembly hose is located to the parachutist's left side. Insure that there is an O-ring attached to the male connecting portion of the oxygen mask-to-regulator connector. Check the bayonet connector of the MC-1 oxygen cylinder assembly for proper seating and insure that it is in the "locked" position.

Move to the risers. Place both hands, palms up, as close to the packtray as possible. Grasp the risers with your thumbs on top of the risers. Applying pressure upward and moving one hand at a time toward the canopy release assembly, check for twisted or misrouted risers, and insure that the fitting of the male to the female portion of the canopy release assembly is secured.

With your right hand on the last item inspected, place your left hand on the parachutist's right canopy release assembly. Grasp the canopy release cover and check for spring tension. With your left hand on the canopy release cover, inspect the left canopy release cover using the same procedures. Grasp the entire right canopy release assembly with your left hand and rotate the assembly one-quarter turn outwards and visually inspect the seating of the male and female portions of the assembly. Repeat the same procedures with the parachutist's left canopy release assembly.

Grasp the ripcord handle with your left hand. Place your right hand firmly around the ripcord grip pocket, and apply pressure to insure that it is properly seated. Check the tacking and routing of the ripcord cable housing with your left hand.

Inspect the chest strap routing and attachment. Place your left hand on the short chest strap V-ring attached to the right main lift web. With your right hand, trace the chest strap from the attaching point on the left main lift web to the quick-ejector snap fastener. Insure that the strap is attached to the V-ring of the short chest strap. Apply pressure on the release lever of the quick-ejector snap fastener to insure that it is locked.

Move to the reserve parachute assembly and place your hands on each end of the reserve, palms facing toward the center of the reserve. Starting on the parachutist's right side, check to insure that the right carrying handle is secured and a safety wire is attached. Looking to the right, use your right hand to check the left carrying handle to see that it is not secured.

Then grasp the reserve assembly with both hands and raise it upward and away from the parachutist to relieve tension from the snap fastener guard. Place the index fingers of each hand on the outer edge of the snap fastener guard. Visually inspect to make sure that the snap fasteners are attached to the harness assembly D-rings. Check the snap fastener guards for spring tension. With your left hand, trace the reserve tie-down strap on the parachutist's right side to insure that it is properly secured to the backpack retainer strap. With your right hand, check the left side reserve retainer strap for proper routing and secure attachment. Moving your left hand, fingers closed and palm facing toward the reserve, to the front of the reserve parachute, insert your fingers with a downward motion between the packtray and ripcord grip to insure that the pack opening band is not over the ripcord grip. Insert the index finger of your left hand into the ripcord grip pocket to insure that no foreign material is present and that the ripcord swage ball is intact. Insert both index fingers under the ripcord protector flap, and apply pressure away from the container to release the snap fasteners. Starting on the parachutist's right side of the ripcord cable, visually and with your left hand insure that the grommet of the right end flap is on top of the pack-releasing cone. Check the first and second pins in sequence to insure that they are not bent, are fully seated, and that the holes of the pack-releasing cone are free of foreign matter. Check the grommet of the left end flap to insure that it is on top of the pack-releasing cone. Secure the flap back in the closed position. Check the proper routing and attaching of the pack opening bands. Grasp the pull tab of the right end pack opening band with your left hand and apply pressure to the pull tab to insure that it is attached. Grasp the left pull tab with your right hand and check it in the same manner. Move both hands to the bottom pull tabs and check them one at a time.

The oxygen cylinder bag is secured by the pack opening bands on the bottom of the reserve packtray. Check proper routing of the pack opening bands. Open the bag flap with your right hand and check the oxygen cylinder for an 1800 to 2200 psi reading indicated on the gauge. Trace and inspect the hose from its connection on the bailout bottle assembly to its attachment on the connector. Move both hands to the top of the reserve and insure that the routing of both the top pack opening bands secure the altimeter mount. Pull on the tabs to insure they are secured.

Next, check the altimeter for proper setting, adjustment operation, and securing to the altimeter mount.

Raise the reserve and instruct the jumper to "hold the reserve and squat."

Place both hands on the leg straps as far back toward the saddle as possible. With your fingers facing down, trace the leg straps back toward the V-ring, insuring that there are no twists or misrouting, and that the quick-ejector snap fastener is properly locked. Always insure that one leg strap, either left or right, is routed through at least one of the carrying handles of the kit bag, which is placed under both the leg straps.

Moving to the parachutist's left side, start at the top. Insure that the weapon, if carried, is slung over the parachutist's left shoulder, muzzle down and pistol grip to the rear. Insure that the weapon is riding as low as possible with the butt as close to shoulder level as possible. Insure that the sling is routed over the left shoulder and under the left main lift web, and that the chest strap is routed through the sling. The reserve restraint strap should be routed over the sling and upper handguard and secured to the backstrap V-ring.

Move to the Automatic Opening Device (AOD). Check to insure that the arming pin is properly inserted into the body of the AOD. Visually inspect the reset indicator to check the proper alignment of the white reset indicators. Check the millibar setting through the access hole on the side of the pocket, and insure that it is correct. Trace the power cable housing to the mounting plate and insure that it is properly attached. Inspect the power cable and withdrawal hook for proper routing and attachment to the top locking pin.

Moving to the rear of the parachutist, check the goggles' retainer strap on the helmet for proper attachment.

Place both hands, fingers up, under the risers as close to the canopy release assembly as possible. Trace the routing, one riser at a time, back toward the packtray assembly, checking to insure proper mounting and that the risers are not twisted. Inspect the ripcord housing cable to insure that it is properly secured to the ripcord housing clamp. Raise the ripcord protector flap and inspect the ripcord cable for frays and insure that no pins are bent. Starting from the top pin, physically check the routing and pins, and close and snap the ripcord protector flap. Inspect the pack opening bands on each side, one at a time, to insure that they are secured to the packtray.

Next, check the left side packtray slide fastener to insure that it is secured. Inspect the right packtray slide fastener in the same manner. Instruct the parachutist to lean forward so that you can check the saddle for twists.

After the jumpmaster personnel check is completed, have the parachutists don any equipment with which they will be jumping. Inspect the equipment container starting from the front of the jumper.

Between the parachutist's legs you will see the equipment lowering line. Check its attachment to the equipment container harness. Check the container harness leg straps for routing through the keepers and insure that they are not twisted. Continue checking the routing up to the quick-release adjustable buckle attached to the harness D-ring. Insure that a safety wire is inserted in the snap hook on the right side.

Move to the right side of the parachutist and check to insure that the quick-release snap fastener on the lowering line is attached to the equipment ring on the right side of the main lift web. Move to the rear of the parachutist and check the proper stowing and routing of the lowering line on the equipment container. Insure that all loose straps are properly stowed.

APPENDIX

B RELEASE POINT COMPUTATION

Wind is the uncontrollable factor with which all parachutists must contend. The effects of wind will confront the free-fall parachutist both in free fall and after canopy opening, and must be taken into consideration when computing a release point.

The primary source of wind information is the military weather services. Any Air Force base or meteorological section in an artillery unit has the equipment and capability to provide information on wind direction and velocity at various altitudes. Wind information is also available from civilian weather services usually found at municipal airports or from any branch of the US Weather Bureau. It is also possible to obtain wind data while aboard the aircraft by arranging for the air crew to give you wind readings at different altitudes.

Properly recorded wind data will eliminate confusion in making release point computations. The wind reading, velocity, and direction are taken every 2,000 feet in free-fall altitudes and every 1,000 feet in under-canopy altitudes.

It is important that you understand the steps and sequences used in the computation of release points. Always work from the desired impact point (DIP) back up to the aircraft, the first leg being from the "DIP" to the opening point, the second leg from the opening point to the preliminary release point, and the third from the preliminary to the computed release point, to compensate for the forward throw from the aircraft.

The formula for determining drift is D= KAV, both for deployed wind effect and free-fall drift effect. In each case, "D", the drift in meters, is the unknown. "K" is a constant, the drift in meters per 1,000-foot loss in altitude in a 1-knot wind; "A" represents altitude in thousands of feet; and "V" indicates average wind velocity in knots.

Deployed Wind Effect

To determine deployed wind effect, "K" will be 25, based on the fact that a parachute will drift 25 meters for every 1,000-foot loss in altitude in a 1-knot wind. If deployment altitude is 3,000 feet, for example, "A", the altitude in thousands of feet, will be "3"; if opening altitude is 2,000 feet, "A" will be "2". To determine "V", the average wind velocity, add the wind velocities at 1,000-foot intervals and divide by the number of velocities. If opening altitude is 3,000 feet, obtain the value of "V" by adding the wind velocities at 3,000, 2,000, and 1,000 feet, and divide the total by 3. Disregard surface winds in your computations.

$$D = KAV$$

"K", the constant ..... = 25

"A", altitude in thousands of feet ..... = 3

"V", average wind velocity, (14 knots + 12 knots + 10 knots divided by 3) ..... = 12

Therefore, D=KAV is 25 x 3 x 12 = 900 meters.

The next step is to determine wind direction. Both the wind velocities and directions are received at each altitude. Wind directions are given from true north. Normally, to figure the average direction, total the azimuths and divide by the number of azimuths. Because you will be working with the full 360° range, you will receive wind readings where the directional change is less than 90° but the numerical difference is greater than 180°, such as 355° and 005°. A numerical average in this case will be erroneous for your purpose. If you add 360° to the smaller numerical reading, you will arrive at a true average wind direction. This phenomenon, not to be confused with a "dog leg," will occur only when one or more of your wind readings fall between 001° and 090°. In all other cases when the numerical difference is greater than 180°, the directional change will be greater than 90°, and you will have to compute a "dog leg," or two average wind directions.

A dog leg calculation requires two or more complete and separate computations to obtain the drift. Using the formula D=KAV, compute the drift from

the DIP to the point where the wind direction shifts, averaging azimuths to obtain the direction. Then make another set of computations with the same formula to determine drift and direction from the windshift to the opening point. If there is more than one windshift, make extra computations to compute drift and direction from one windshift to another, and finally from the last windshift to the opening point. Next, convert true azimuths to grid azimuths.

Free-Fall Wind Effect

The next step in the computation process is the computation of the free-fall wind effect. The same formula (D=KAV) used for the deployed wind effect is used again, but the values differ.

"D" is again the drift in meters; "K", the constant, is 3 for free-fall wind effect, determined by the premise that a body in free fall will drift 3 meters per 1,000 feet of drop in altitude in a 1-knot wind. "A" is the difference in thousands of feet between drop and opening altitudes. If, for example, drop altitude is 12,000 feet and the opening altitude is 3,000 feet, the "A" would be "9", representing 9,000 feet of free fall. "V" is again the average wind velocity in knots, but the velocities are taken at 2,000-foot intervals instead of the 1,000-foot intervals for deployed vector. (Do not use the wind velocity at opening altitude when figuring free-fall wind effect.) Average the wind velocities and directions in the same manner as for figuring deployed wind effect. Be careful to recognize "dog legs" and to calculate in the same manner as for deployed wind effect. Convert the true azimuths to grid azimuths.

After you have computed the deployed and free-fall wind effects, recheck to insure that you have converted all true azimuths to grid azimuths. Then check to insure that you have plotted the desired impact point correctly on your map. Take a protractor and place the index over the DIP, insuring that the zero on the scale is pointing to grid north and that the numbers increase to the right. Move to the average direction of canopy drift as you have determined it, and place a tick mark on the map. Draw a straight line from the DIP to the tick mark. Then measure off the drift distance on the line, starting from the DIP, and mark the line at the calculated distance. The mark will indicate the opening point if there is no "dog leg," or the windshift point if there is. If there are "dog legs," continue to mark direction and distance from the last mark made by placing the index of the protractor on the last mark and realigning the zero on the scale with grid north and repeating the procedure until you have reached the opening point.

Move the protractor along the line and place the index over the opening point mark. Realign the zero on the scale with grid north, and plot the set of drift and direction figures for free-fall wind effect in the same manner. Mark off distance and direction for all "dog legs" which may occur. The last mark you have made will indicate the preliminary release point.

Computed Release Point

The final step is to determine your computed release point. The initial vector is the ground distance which the parachutist will travel before reaching terminal vertical velocity. Although there may be variations in the initial vector, 300 meters is used for calculation purposes. Depending upon winds and direction of flight, this figure may not be correct, but compensation can easily be made.

Beginning at the preliminary release point marked on your plotted map, measure 300 meters back into the line of the aircraft's flight, and mark that point. This marked point will be your computed release point. Select a recognizable terrain feature close to this point for actual release. You may want to select another recognizable terrain feature approximately 1,000 to 1,500 meters back from the release point along the aircraft's track. This will give you a reference point for your "STAND BY" command.

APPENDIX

C AIRCRAFT INSPECTION

US Air Force troop carrier and assault type aircraft are the primary aircraft used in military free-fall operations and in proficiency and qualification training. Any aircraft, however, may be used for free-fall parachuting providing the parachutists can exit without hazard, can clear the aircraft completely, the drop speed is not excessive, and the total number of parachutists does not exceed the weight and space limitations of the specific aircraft.

The aircrew is responsible for preparing the aircraft for air drops and will furnish any special equipment which may be required. The jumpmaster, however, must be familiar with the safety considerations and jump procedures applicable to each aircraft. The items to be checked on an aircraft inspection are:

PROJECTIONS/EDGES	All sharp or protruding edges around or aft of the jump doors should be taped and padded, including door handles. (Doors on pressurized aircraft should NOT be taped.)
JUMP DOORS STOWED/LASHED	C-124 and C-119
JUMP PLATFORMS	optional.
WIND DEFLECTORS	when exiting by troop doors from C-130 and C-141
FLOOR	Clean and not slippery. No projections extending into aisle. Prepared to receive M 2900 console, if used.
INTERCOM	operable.
JUMP LIGHTS, ALARM BELL	operable.

TROOP COMFORT FACILITIES	operable, location known.
SEATS, SEAT BELTS	sufficient and properly installed. Use of outboard seats allows room for mounting oxygen consoles.
LIGHTING	adequate for night flights.
EMERGENCY EXITS	location known.
SICK CUPS	available.
EQUIPMENT	stowed and lashed.
LIFE VESTS/RAFTS	present for overwater flights.
EMERGENCY EQUIPMENT FIRST AID KITS FIRE EXTINGUISHERS FIRE AXES	present; location known.
SPECIAL EQUIPMENT	oxygen console properly stowed and lashed.

There should be sufficient room allowed for troop exit movement in the aircraft. Two files, for example, may be utilized for door exits, but for ramp exits as many as four parachutists may be placed on a line on the ramp with the remainder of the parachutists in successive ranks.

APPENDIX

D GLOSSARY

Abort - Failure to accomplish the mission for any reason. It may occur at any point from initiation of operation to destination.

Above Ground Level (AGL) - Actual distance of the aircraft above the ground, normally expressed in feet.

Adverse Weather Aerial Delivery System (AWADS) - An electronic release system used when visual siting of the drop zone cannot be accomplished.

Airborne SOP - A locally prepared document regulating the conduct of airborne operations.

Alignment - The heading in relation to the release point.

Altimeter - A device to determine altitude.

Ambient Altitude - The atmosphere at any given altitude.

Anemometer - An instrument used to give wind readings and sometimes wind direction.

Arming Knob - The knob on the FF-2 automatic ripcord release which activates or deactivates the automatic ripcord release by its removal or reinsertion.

Armed Pins - An unsafe condition in which the ripcord pins are retracted from the locking cones to the point that little or no effort results in deployment.

Automatic Ripcord Release - A mechanical device designed to automatically open a parachute at a predesignated altitude.

Automatic Ripcord Release Calculator - A circular slide rule type of instrument used by the jumpmaster to calculate the setting on the FF-2 automatic ripcord release.

Back Slide - A term used to describe a rearward movement of a parachutist during free fall.

Bailout Bottle Assembly - A dual bottle oxygen cylinder system designed to provide oxygen to parachutists during free fall.

Body Stabilization - Attaining and maintaining a stable body position during free fall.

Body Turn - A movement made in free fall to effect a turn by moving the upper torso either to the right or left.

Brakes - A term used in describing the position of the toggles to control the forward speed of the canopy.

Cabin Pressure - The actual altitude pressure inside the aircraft as opposed to the altitude pressure outside the aircraft.

Canopy Control - Maintaining canopy maneuverability in the desired direction.

Canopy Thrust - The inherent forward speed of the canopy.

Center Line - The joined portion of two lines extending from the rear risers to the apex. This line inverts the apex of the canopy and increases glide.

Chamber Flight - A simulated flight in a training pressure chamber, which closely resembles actual flight.

Control Lines - The lines which connect the toggles and turn slots and by which the parachutist may control the action of his canopy.

Correction - Information the jumpmaster gives the pilot in order to assist the pilot in aligning the aircraft over the release point.

Corrected Release Point - The release point determined as a result of corrections after a strike report.

Crabbing - Maneuvering the canopy at an angle to the direction of the wind.

Cross Control - The manipulation of toggles to counteract each other in order to maintain a stable canopy overhead position.

Crown Lines - Twelve continuous lines attached zig-zag fashion to the 24 radial seams at the canopy apex.

Cutaway - A term used for the jettisoning of the main canopy in the event of a malfunction.

D-Ring - A D-shaped metal fitting used to fasten different items to the harness.

Departure Airfield - The actual location where jumpers are loaded on the aircraft and from which the aircraft departs for the drop zone.

Deployed Wind Effect - The wind drift from deployed altitude to the surface in meters.

Desired Impact Point (DIP) - Desired spot for parachute landings on the drop zone.

Disarm Automatic Ripcord Release - Term used to instruct parachutists to reinsert the arming pin into the automatic ripcord release.

Dog Leg - A term used to describe calculations when the directional difference in winds is 90° or more at two consecutive altitudes.

Don Helmets - Put helmet on and fasten chin strap.

Drop Time - The actual time jumpers exit the aircraft.

Drop Zone (DZ) - A terrain feature used as a landing area for parachutists.

Drop Zone Safety Officer (DZSO) - Officer responsible for the conduct of operations on the drop zone.

Early Green Light - Signal which indicates that the aircraft is in jump posture and that the jumpmaster may give the release.

Effective Canopy Range - The maximum distance from which the canopy can be maneuvered to the target area from a given altitude.

Free-Fall Bundle - A bundle used to drop certain items of equipment not carried by jumpers.

Free-Fall Drift Effect - The wind effect in meters from terminal vertical velocity to deployment altitude.

Glide - This position is used to permit forward movement, to prevent collision with other jumpers. Glance down at the top of reserve. Do not break the arch in the back, extend legs slightly.

Grouping - A technique used to enable parachutists to fall together in the air, remain together under canopy, and land as a compact tactical unit.

Heading - Direction of flight.

Holding - Term used when the canopy is pointed directly into the wind (as opposed to crabbing or running).

Hyperventilation - Increased pulmonary ventilation beyond that needed to maintain the blood gases within normal range.

Hyponemic - Indicating a condition of lack of oxygen in the bloodstream.

Hyporic - Showing signs of hypoxia.

Hypoxia - Lack of oxygen.

Impact Point - Point on the ground where the jumper should land.

Initial Vector - The ground distance from exit to terminal vertical velocity. It is plotted in meters in the direction of motion, which is the true heading at moment of release.

Intercommunications System (Intercom) - The communications system on the aircraft whereby the aircrew and the jumpmaster may talk with the pilot and each other.

Jettison - Term used to describe the act of cutting away the main canopy in case of a malfunction.

Jump Commands - Signals given by the jumpmaster to the parachutists on his sortie to control the parachutists' actions between the 2-minute warning and exit.

Jumpmaster - The assigned airborne qualified individual who controls parachutists from the time they enter the aircraft until they exit.

Jumpmaster Personnel Inspection - An inspection by the free-fall jumpmaster similar to that of static line jumpmaster to insure all safety requirements have been met.

Load Time - The actual time the parachutists board the aircraft.

Loadmaster - The Air Force representative who is responsible for securing all loads on the aircraft.

Lowering Line - A cord designed to allow a parachutist to lower a rucksack or a piece of equipment to the ground prior to his own impact.

MACO - Marshalling Area Control Officer.

Malfunction - Any discrepancy in the deployment or inflation of the parachute which can create any faulty, irregular, or abnormal condition increasing the jumper's rate of descent.

Millibars - Unit of measurement of barometric pressure used when setting the FF-2 automatic ripcord release.

Modified Frog Position - A preferred body position for exit and free fall. Back is arched, head back, arm extended horizontally, elbows bent, hands at eye level, knees bent in a relaxed position.

Non-Oxygen Jump - A parachute jump, normally below 10,000 feet, which does not require the use of oxygen equipment.

Non-Oxygen Procedures - Signals given by the jumpmaster to control the action of the jumpers between take-off and the 2-minute time warning when oxygen is not used.

Opening Point - The point on the ground over which the parachutist deploys his canopy.

Out-of-Control - A term used to describe a free-fall parachutist in a condition in which he is not in control of his fall, such as spinning or tumbling.

Oxygen Check - Visual check made by the jumpmaster to see that each jumper is receiving oxygen.

Oxygen Jump - A free-fall parachute jump requiring the use of oxygen, normally at any altitude above 10,000 feet.

Oxygen Mask - A face mask which may be connected to an oxygen supply, allowing parachutists to operate above non-oxygen altitudes.

Oxygen Procedures - Procedures used by jumpers and the jumpmaster when they jump using oxygen equipment.

Oxygen Station - A hose to which one jumper can connect his mask and receive oxygen.

Parachute Landing Fall (PLF) - A controlled method of landing with a parachute to prevent injury.

Partial Malfunction - A situation in which the canopy does not fully deploy.

Physiological Training - Training conducted by the Air Force to enable parachutists to identify oxygen equipment and systems and explain the effects of high altitude physiology, cabin pressurization, and hazardous noise and stress.

Pilot Briefing - A briefing the jumpmaster gives the pilot to clarify any points related to the airborne operation, such as drop signal, time, or alternate DZ.

Power Cable - A cable through which power is transmitted from the FF-2 to the pins, securing parachute opening.

Pre-Breathing Time - That time spent prior to a high altitude drop when the parachutists and jumpmaster breathe 100 percent oxygen.

Preliminary Release Point - The point above the ground at which the initial vector stops and the free-fall drift factor begins.

Premature Deployment - Deployment of a parachute prior to the planned time or altitude.

Pressurization - The introduction of a mechanically produced artificial atmosphere aboard the aircraft.

Reference Point - Any recognizable point on the ground which may aid a jumper in determining his location and orientation.

Release Point - The point over which parachutists exit the aircraft.

Reset Indicator - A window on the FF-2 automatic ripcord release through which the release time-delay mechanism is checked.

Reset Key - A small key used to reset the time-delay mechanism.

Running - Pointing the canopy in the direction of the wind.

Safe-to-Arm-Altitude - An altitude 2,500 feet above that altitude at which the FF-2 is set to activate.

Semi-Delta - A free-fall position in which the jumper can move laterally.

Spotting - A technique used by the jumpmaster to visually align the aircraft and release the jumpers at the proper release point.

Stabilizer Panels - Five panels on each side of the canopy skirt, extending below the skirt and reducing oscillation.

STABO - A method of extracting personnel from areas not suitable for aircraft landings, or the special equipment used for it.

Stall - Stop forward movement of the canopy and increase rate of descent.

Strobe light - A small high-intensity marking light.

Table-Top Stabilization Training - A method where any table top or flat surfaced material can be used to teach a student control of his body during free fall.

Terminal Velocity - The velocity at which a falling object attains its maximum, constant speed, normally about 125 miles per hour for a free-fall parachutist.

Terminal Vertical Velocity - That moment when the parachutist has in essence come to the end of his forward throw (initial vector), usually within 300 meters, and the body is falling vertically.

Time Warnings - Warnings, given in minutes, to alert the jumper to the time remaining before exiting the aircraft.

Toggles - Wooden knobs attached to lines which control the forward speed of the canopy, mounted on the back side of the front risers.

Total Malfunction - A type of malfunction in which the parachute remains in the packtray.

Turn Slots - Slots in each side of the canopy which turn the canopy when the parachutist manipulates the toggles.

Visual Release - A method by which the jumpmaster releases the parachutists according to his own visual observations, as opposed to electronic, or AWADS, release.

Walk-Around Bottle - A large, low-pressure oxygen cylinder which may be used by either the jumpmaster or safety personnel not connected to the oxygen console or the aircraft oxygen system.

Wind Cone - An imaginary area representing the maneuver area of a parachute during descent.

Wind Drift Formula - A formula used to locate the proper release point.

Windline - An imaginary line extending upwind from the target area to the opening point.

Wind Reading - A report of wind speed and direction, given in knots per hour and degrees, respectively.

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By Order of the Secretary of the Army:

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General, United States Army
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