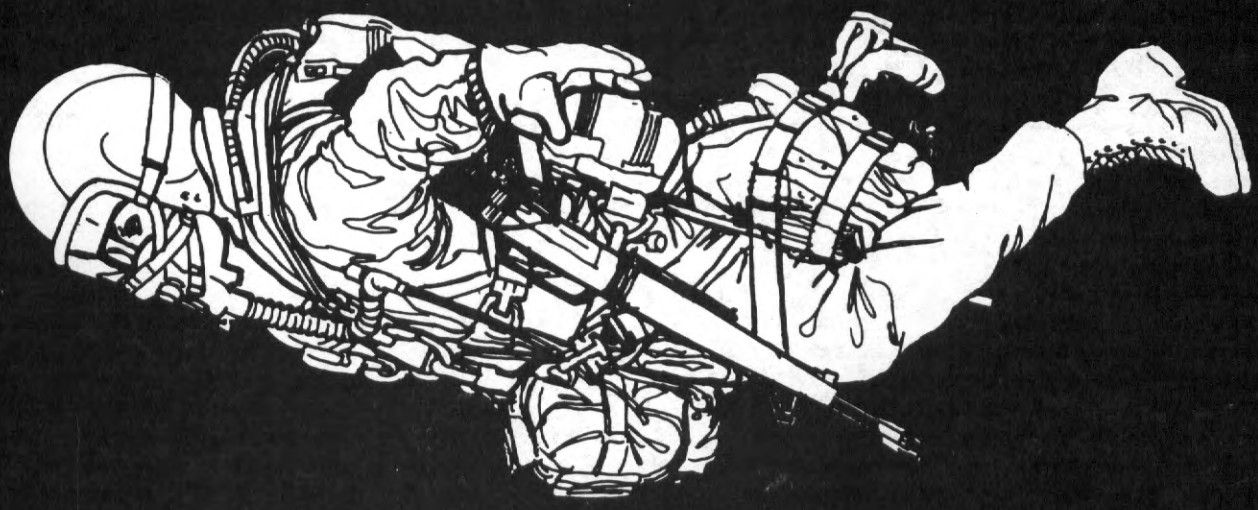
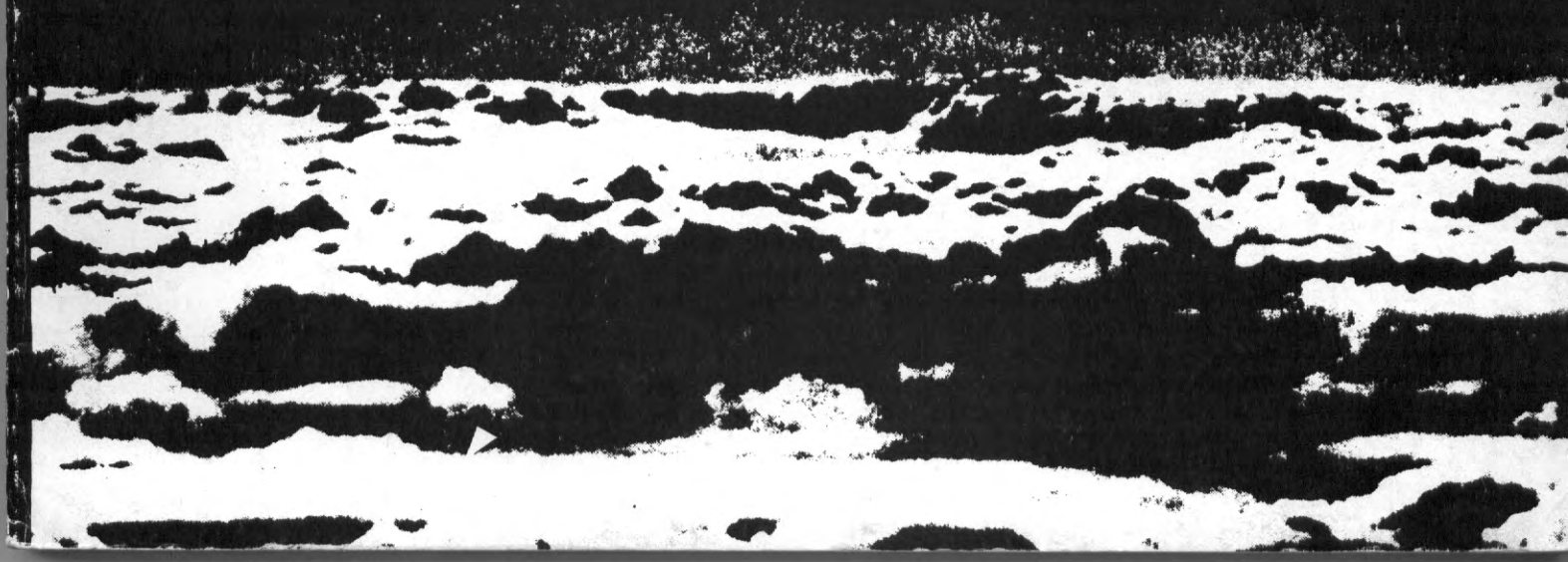
FM 31-19

AUGUST 1977



SPECIAL FORCES MILITARY FREE-FALL PARACHUTING



*FM 31-19

HEADQUARTERS
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.

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MILITARY FREE-FALL PARACHUTING
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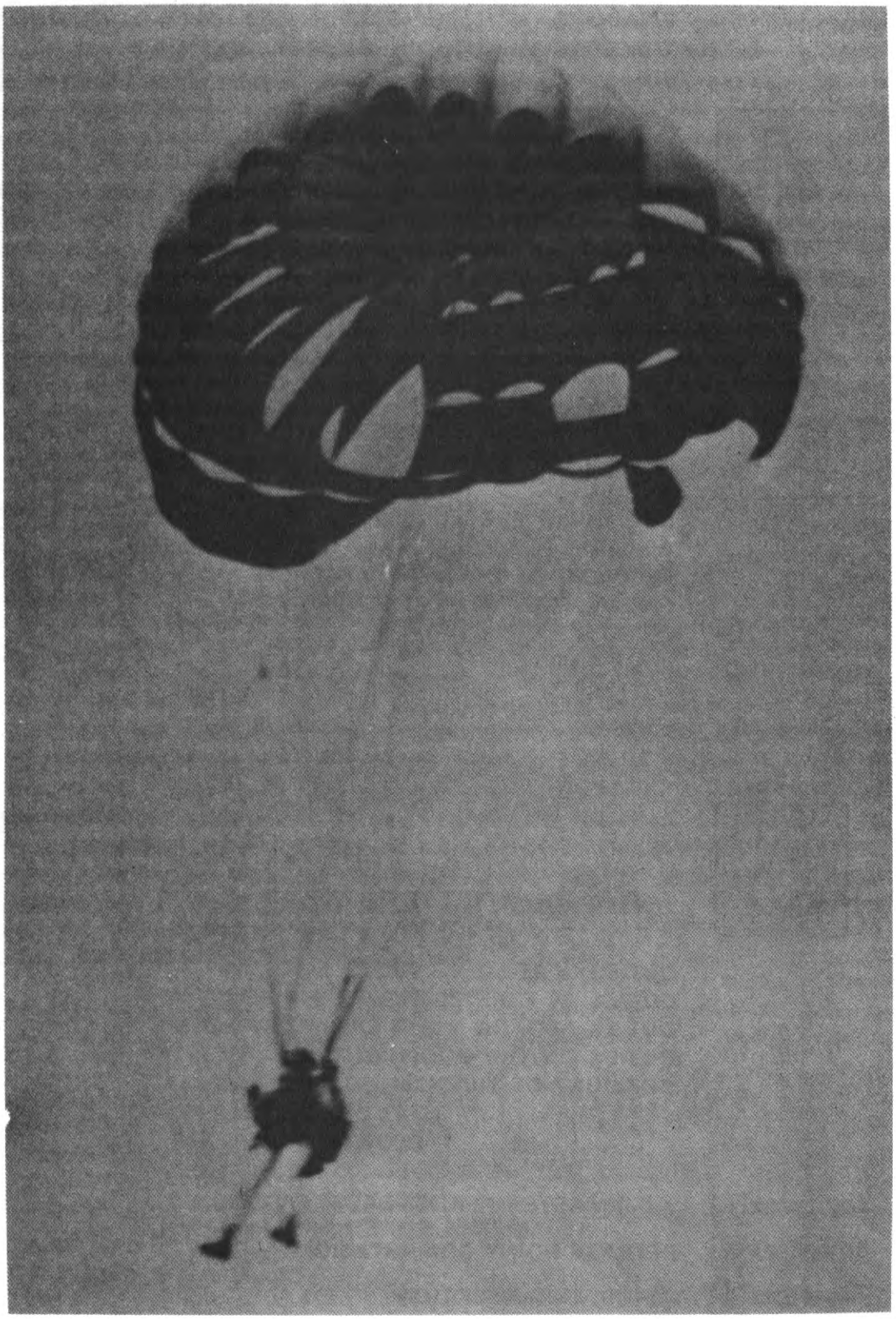
Gift: Richard Burns



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 perachuting 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

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.

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.

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.

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.

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.

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:

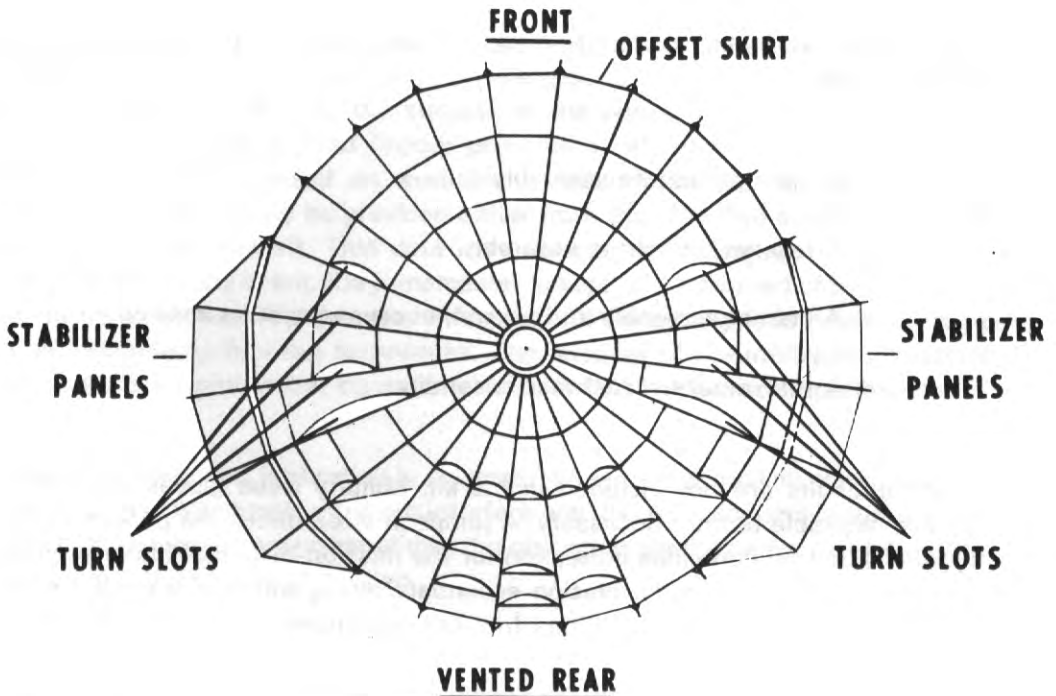
- A main parachute assembly.
- A reserve parachute assembly.
- A helmet assembly and personnel oxygen system assembly.
- A rear-mounted rucksack assembly.

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 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 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

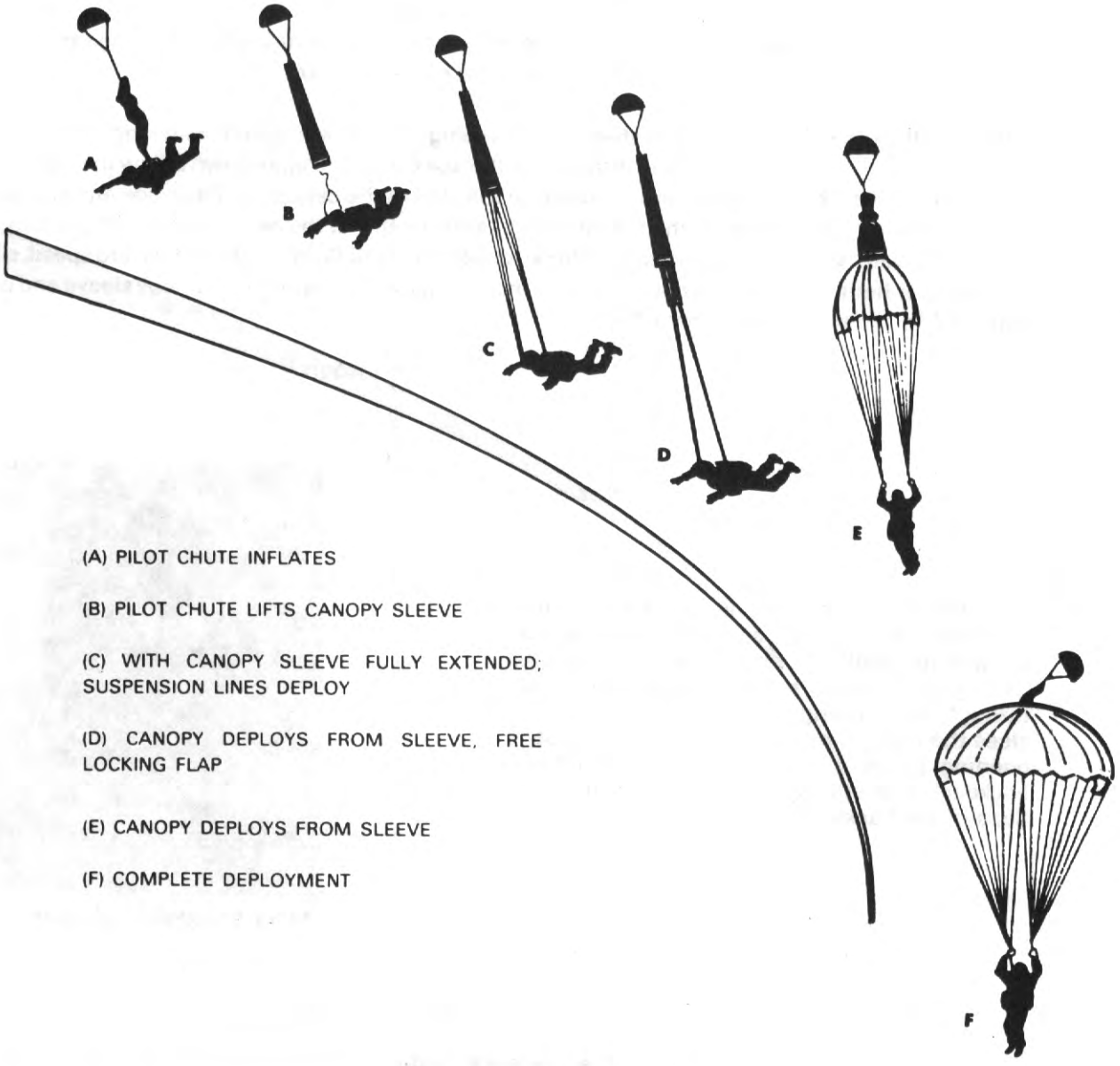
toggles will control the volume and direction of air flow through the turn slots, allowing variation in the direction, forward speed, and rate of descent of the canopy.

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 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.



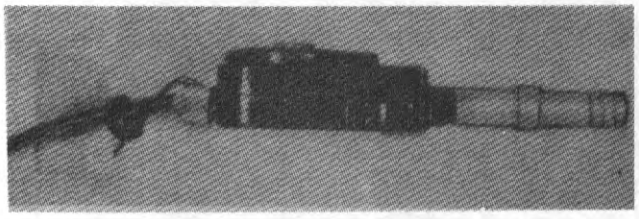
DEPLOYMENT SEQUENCE

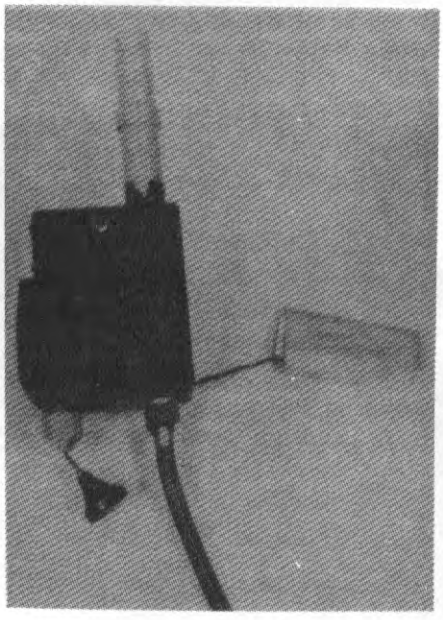
The troop back and chest personnel parachute harness assembly is mounted on a short-girth vest for easy donning and incorporates a sponge rubber backpad for comfort. The harness components consist of the two main lift webs with canopy quick release fittings and canopy release pads, elastic webbing retainers,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





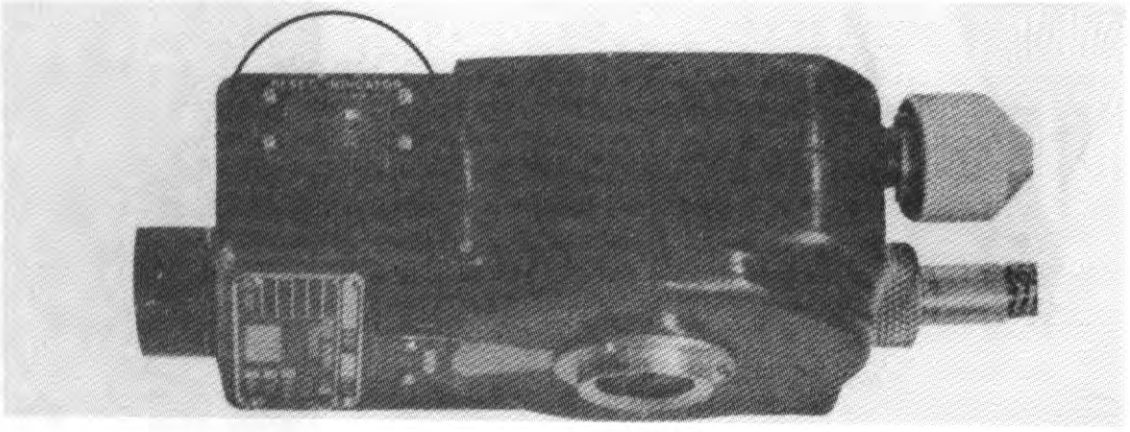
FF-2 AUTOMATIC RIPCORD RELEASE

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.

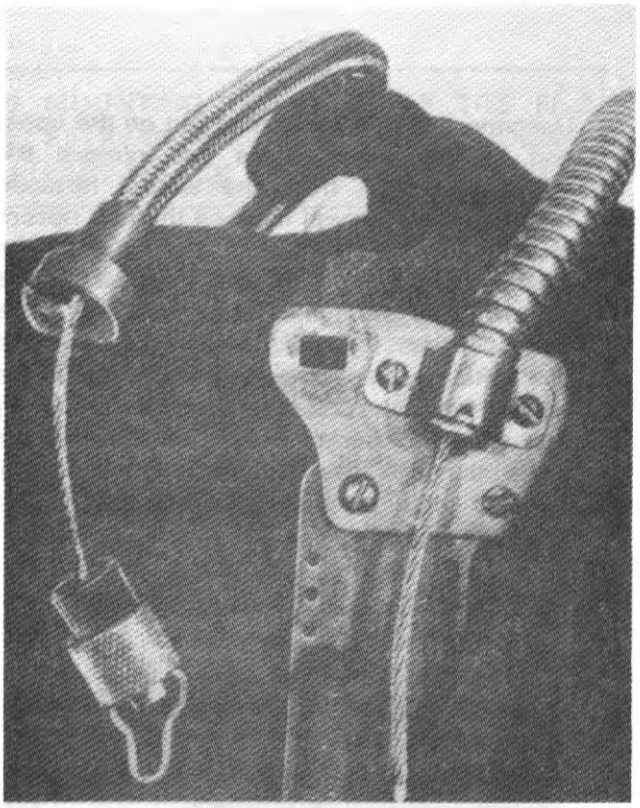


RESET INDICATOR WINDOW

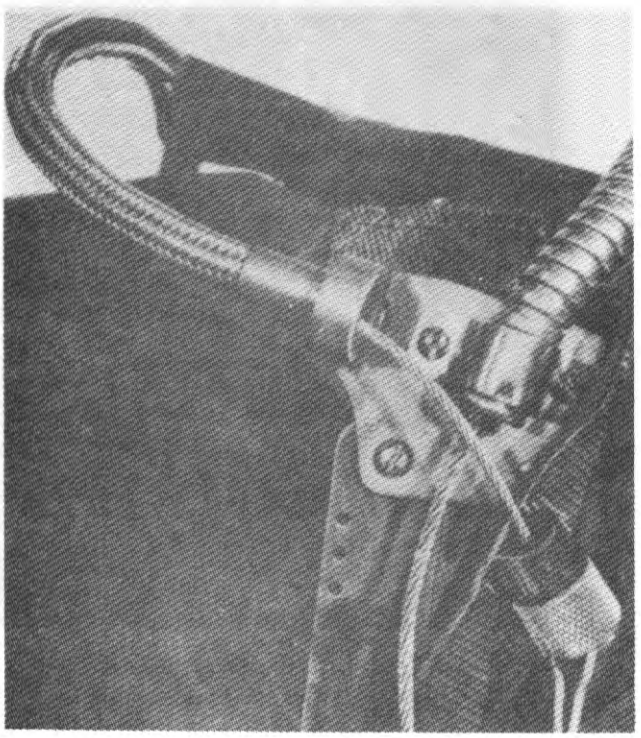
Visually check the window, above which is marked "RESET INDICATOR" on the release casing, and observe the location of the two white marks. If the release time-delay mechanism has been reset, the two marks will be aligned. If the lower, movable, mark is offset more than the width of the indicator, the 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.

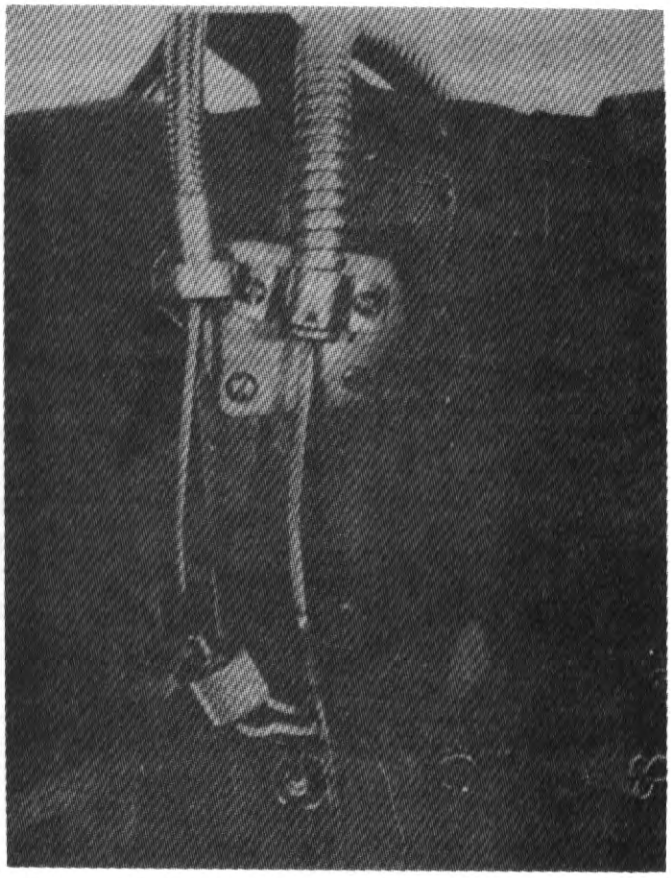


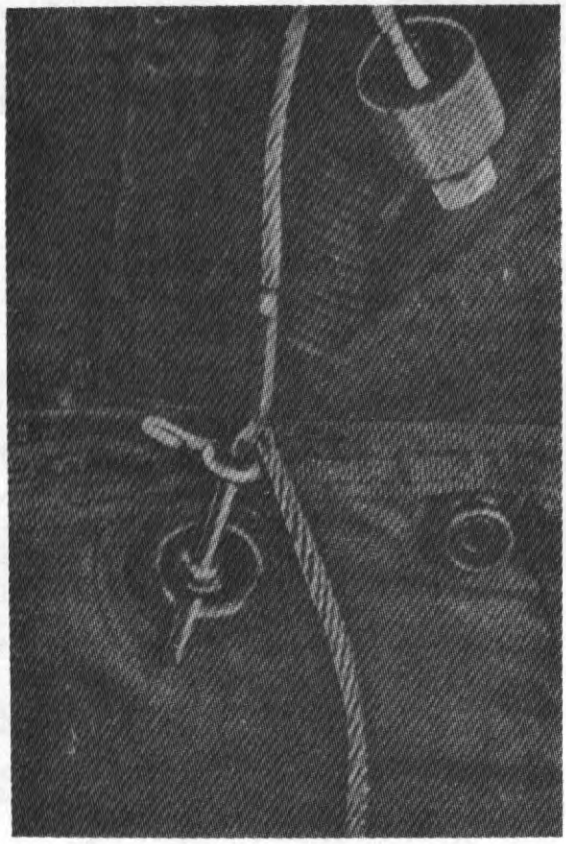
Pass the upper end of the arming cable and housing assembly through the power cable sleeve on the inside of the left upper end of the pack. Attach the release pocket to the pocket attaching strap at the center of the left side of the pack by using the elasticized attaching webs.

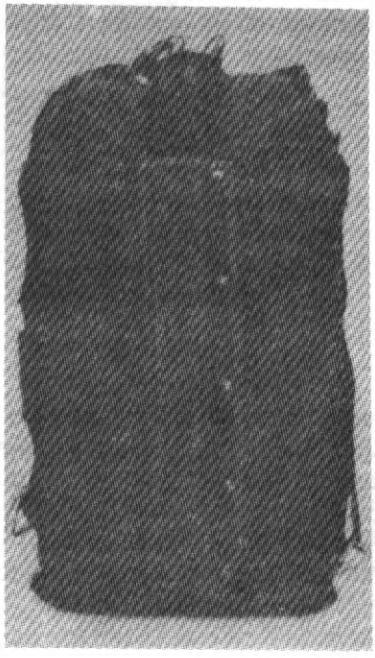


Pass the upper end of the arming cable and housing through the power cable retaining loop at the upper end of the pack, and route it toward the ripcord housing plate. Rotate the power cable housing end 90° clockwise to lock the key in the slot and secure the housing to the plate.

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.

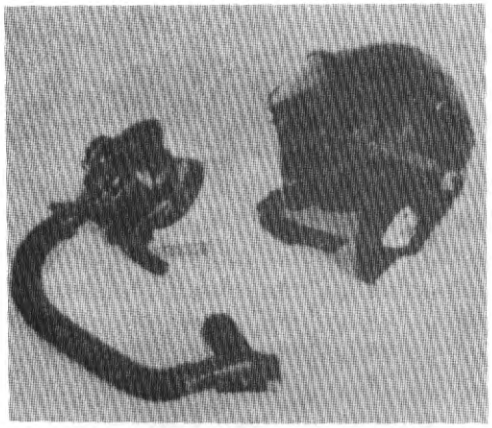




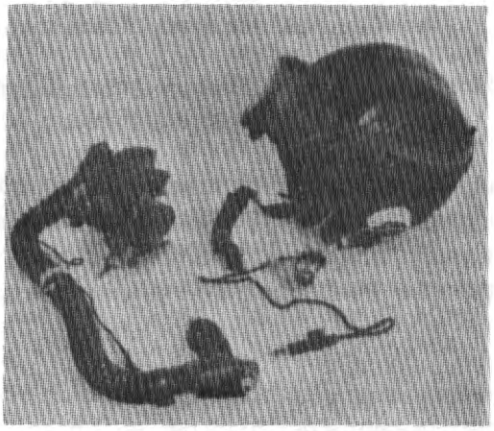


WARNING: DUE TO THE EXPOSED MOUNTING LOCATION OF THE FF-2 AUTOMATIC RIPCORD RELEASE, TAKE EXTREME CARE IN THE HANDLING, STORAGE, AND TRANSPORTATION OF AN MC-3 BACK STEERABLE PARACHUTE

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.



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.

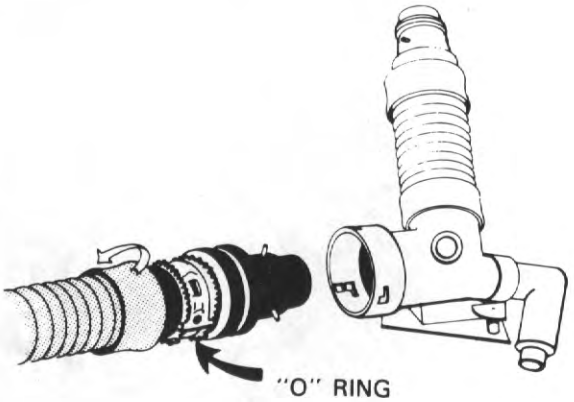
The personnel oxygen system consists of an oxygen mask, a CRU 60/P oxygen connector, and an oxygen bottle assembly. One of the most essential pieces of equipment you will use is the MBU3P oxygen mask. This pressure-type mask comes in small, medium, and large sizes. It should fit snugly and must be airtight. 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.

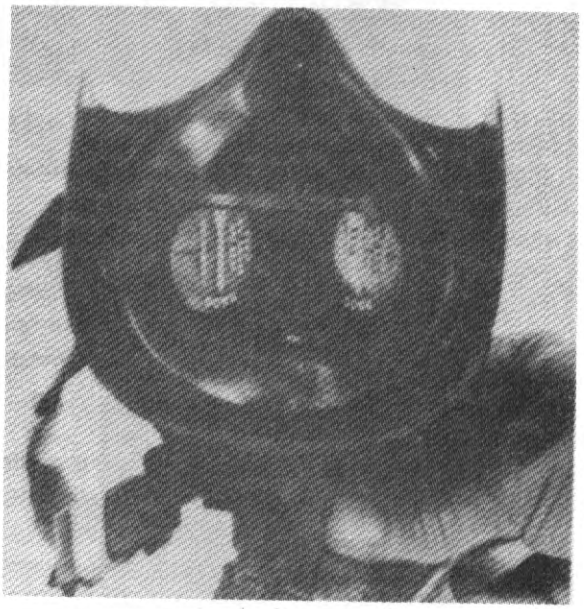
Check the mask carefully to insure that the straps are complete. Each strap should have a bayonet-type fastener attached to the adjustment harness for quick disconnecting.

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.

PRESSURE
REGULATOR
INDICATOR
CONNECTOR
EQUIPMENT

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.

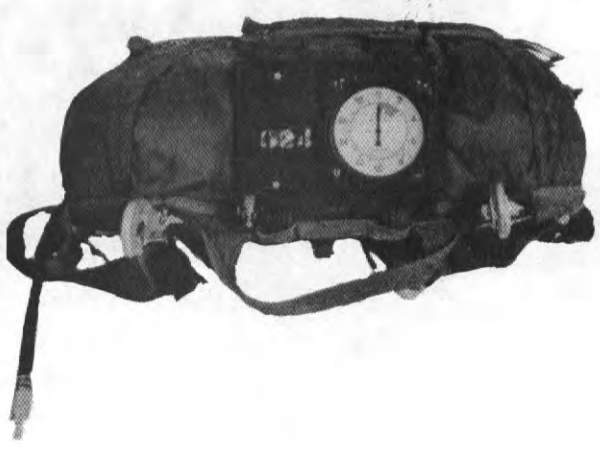
Pass each triangle link end of the strap through the fourth pack opening band slot located at each side of the backpack assembly.

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.

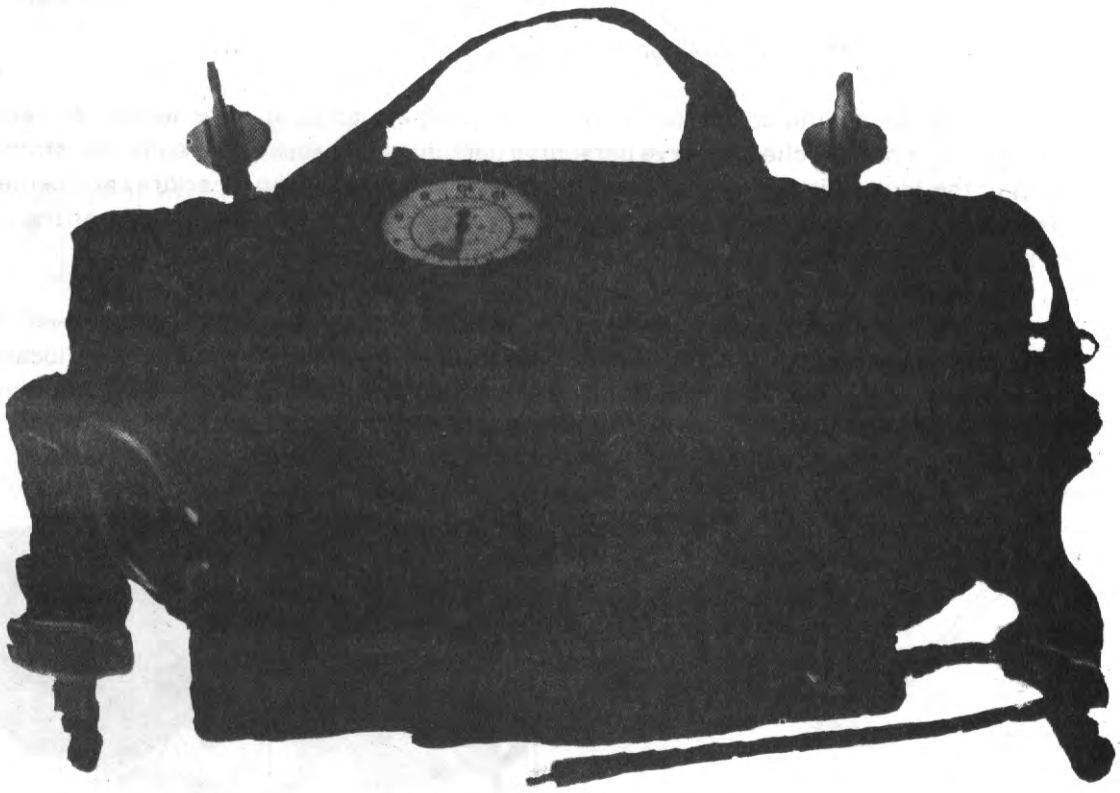
Position the reserve parachute at the center of your body so air will flow evenly over the upper and lower portions of your body. Secure it firmly with the reserve restraint strap (located at the bottom of the main backpack) to prevent shifting during free fall. Position the instrument mount on the reserve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



The altimeter, 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.



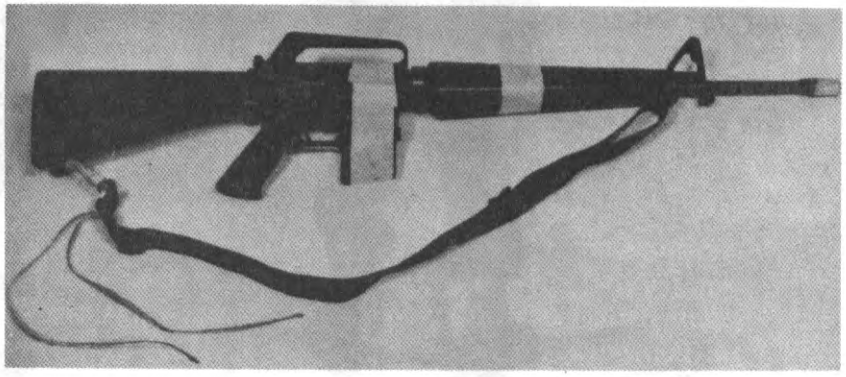
ALTIMETER ATTACHMENT

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.

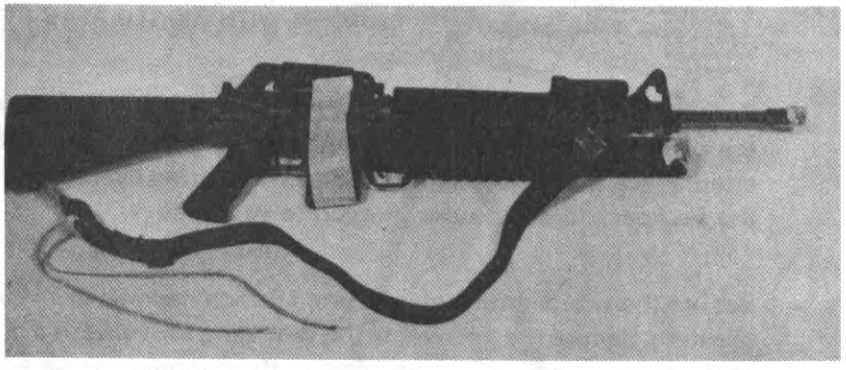
Individual weapons are normally carried secured to the parachutist's left side. Take care to insure that sharp edges are covered and that the muzzle is taped to prevent clogging upon landing.

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.

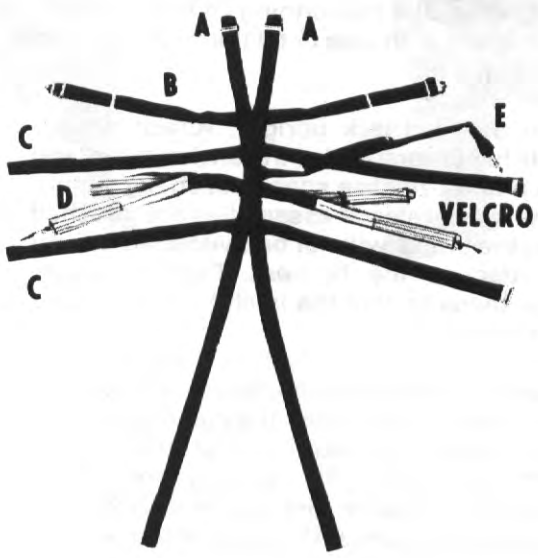
The rucksack is a general purpose item which may be used to carry designated combat equipment. It is equipped with adjustable carrying straps which permit it to be carried in the same manner as a field pack.

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

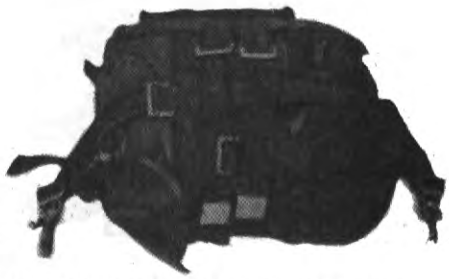


Rigging the rucksack requires the use of a special harness assembly, which is attached to the rucksack using the following procedures:

- 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

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.

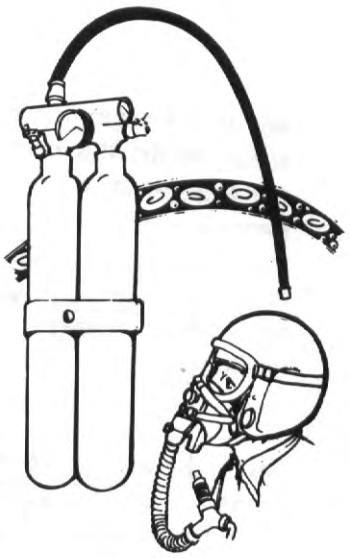
Attach the quick-release end of the lowering line to your right main lift web equipment ring on the parachute harness. Insure that the lowering line follows the shortest route from the rucksack to the equipment ring without encircling either leg or other webbing.

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.

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.

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

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

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.

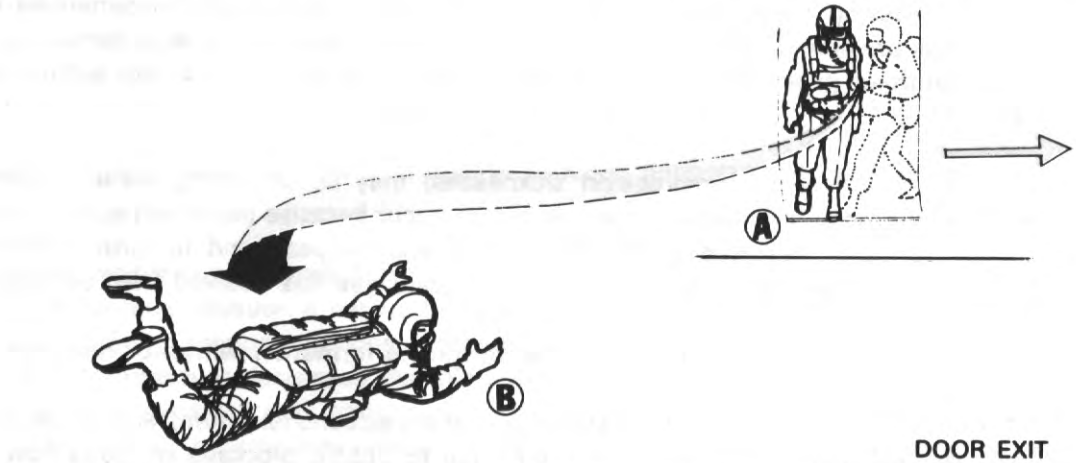
3. Skin Symptoms: Itching, tingling, numbness and sometimes a mottled appearance to the skin (purplish splotches usually occurring on the chest).

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.

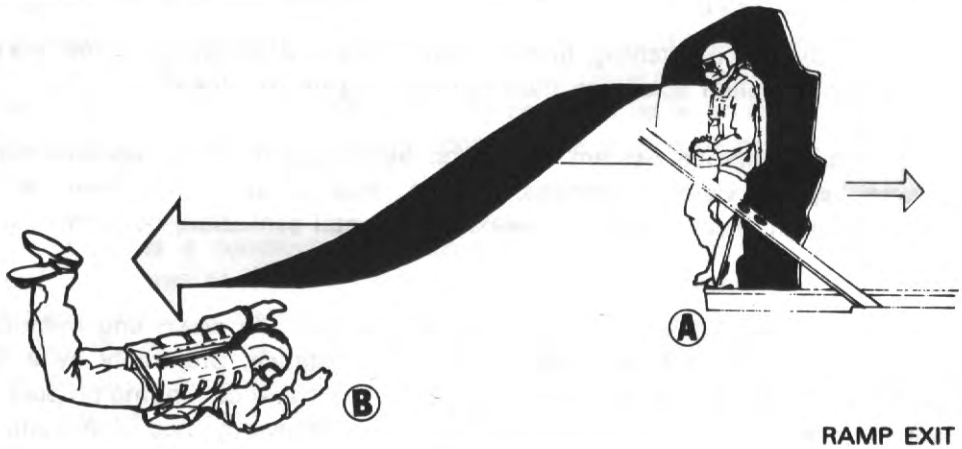
Treatment includes 100% oxygen, immediate descent, lie down and minimize movement. Upon reaching ground level, obtain medical assistance, preferably by a flight surgeon. Prebreathing 100% oxygen immediately prior to flight and continuing on pure oxygen during ascent removes nitrogen from the body and 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.

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.

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

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.

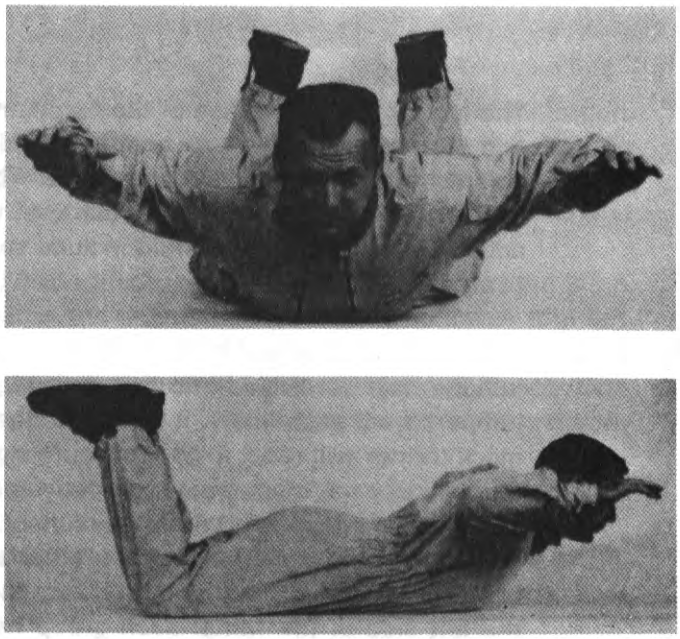
The table-top body stabilization training and suspended harness (free-fall) apparatus are used extensively for teaching free-fall stability.

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.

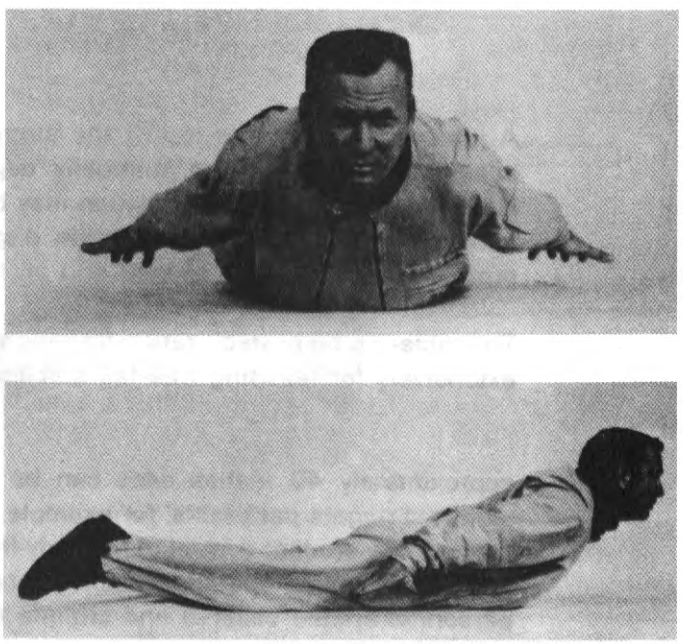
To assume the modified frog position, arch your back and throw your head back. Extend your arms horizontally, elbows bent and hands eye level. Turn your palms down, spread your fingers, and cup your hands slightly. Separate your legs about shoulder width, and bend your knees in a relaxed position as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



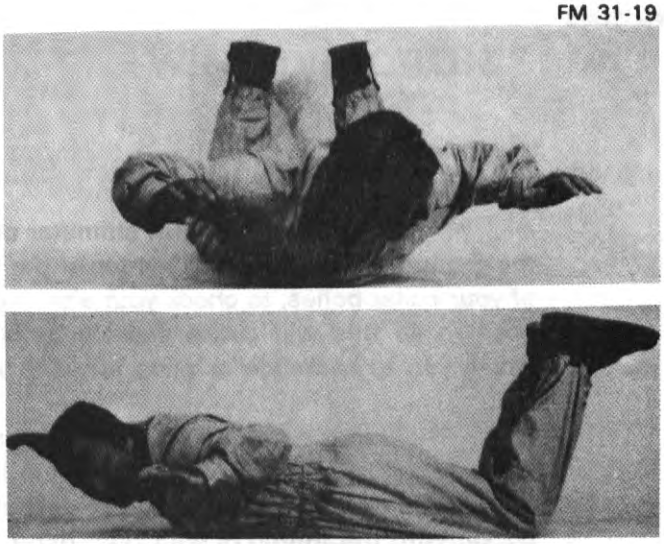
MODIFIED FROG POSITION

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.



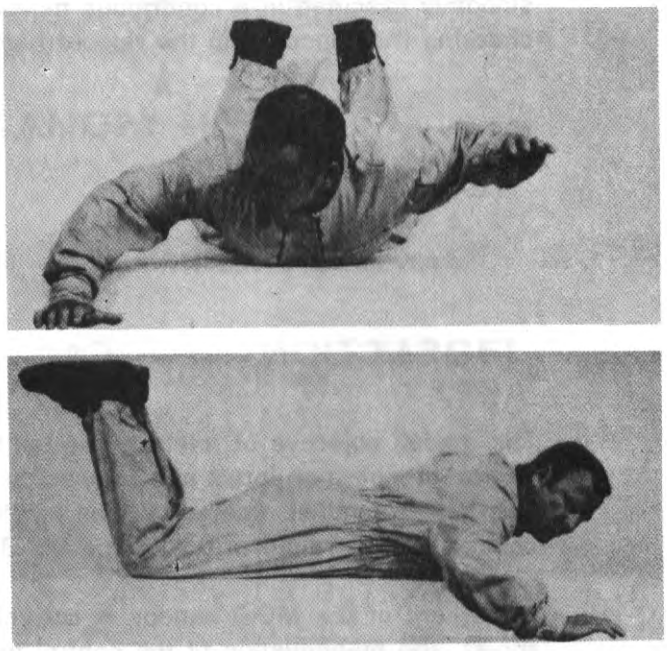
SEMI-DELTA POSITION

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

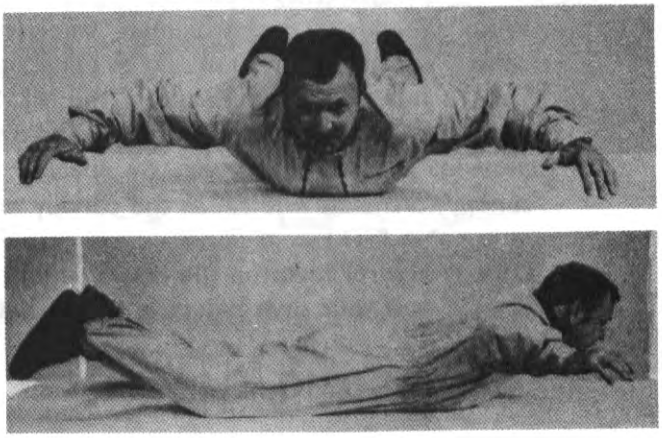
Push turns are faster than body turns. From a modified frog position, look in the direction in which you wish to turn and extend the corresponding hand toward the earth. If you wish to turn right, for example, look to your right, and, still looking in that direction, extend your right hand toward earth. 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

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.



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

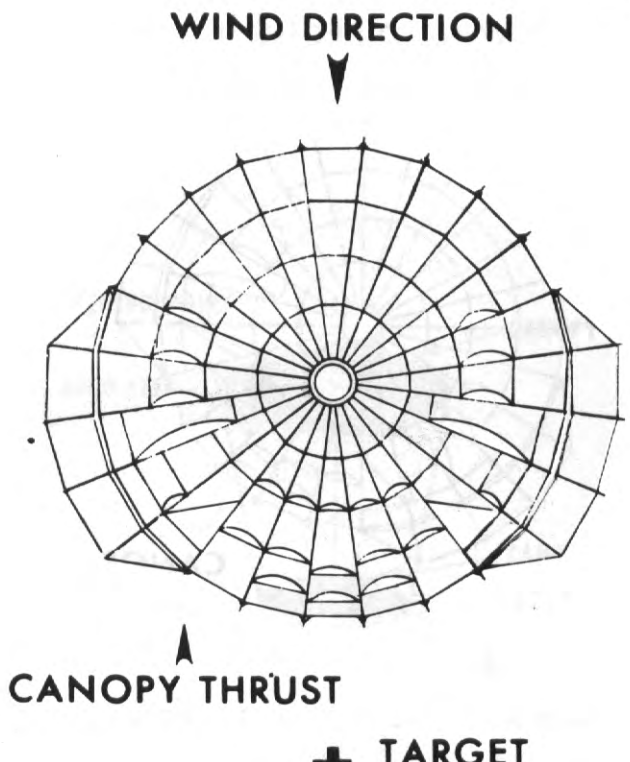
The overall objective of military free-fall training is to land personnel and equipment of a tactical organization intact and compact to accomplish the assigned mission. To this end, the free-fall parachutist must know and employ the principles and governing factors of canopy control as they relate to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

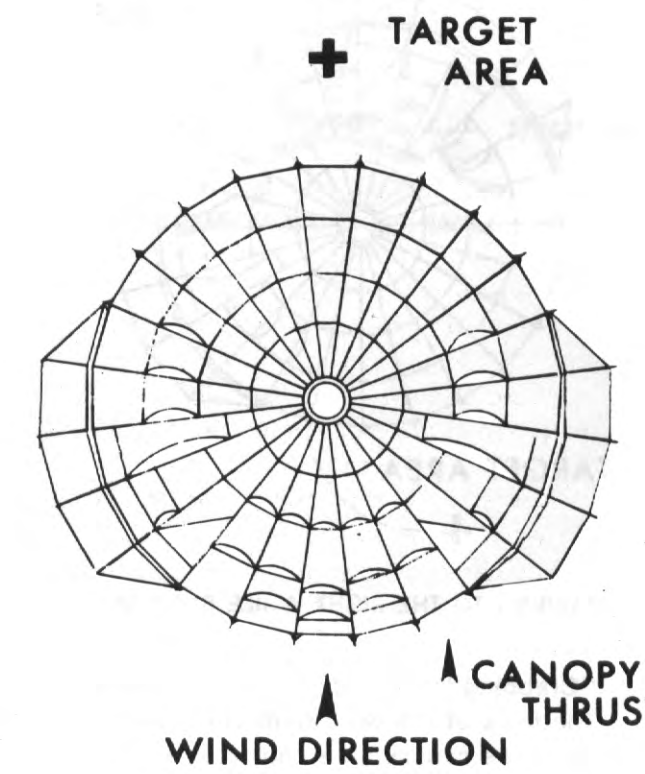
Canopy control involves the coordination of wind direction and velocity, canopy thrust and design, and your own selective manipulation and distortion of the canopy.

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.

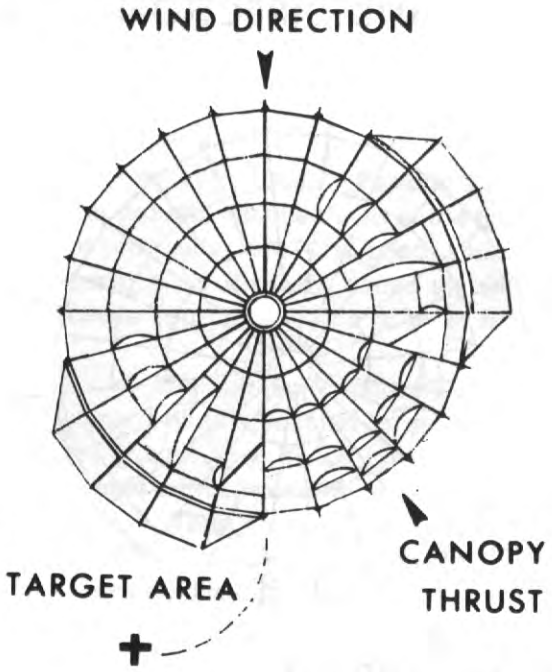


HOLDING MANEUVER

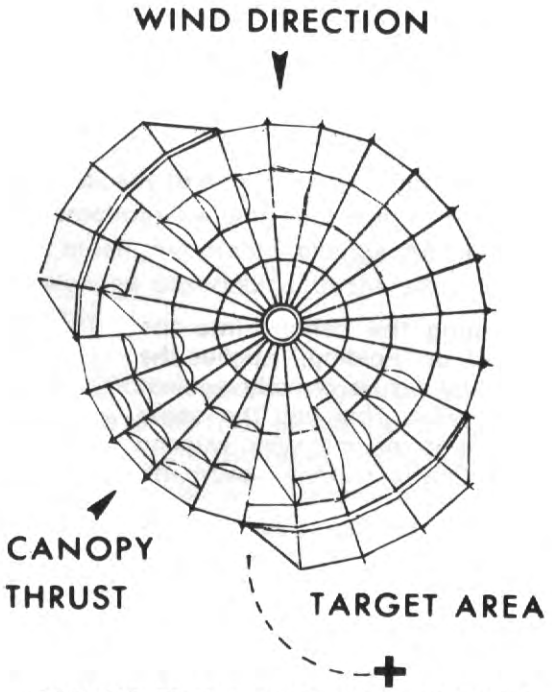
If the canopy is pointed with the wind, the combined thrust and wind velocity produce increased speed of canopy movement, called "running."



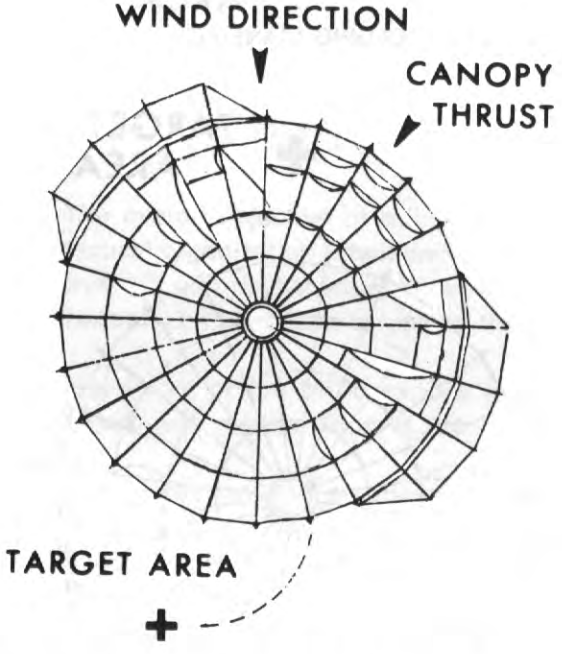
RUNNING MANEUVER



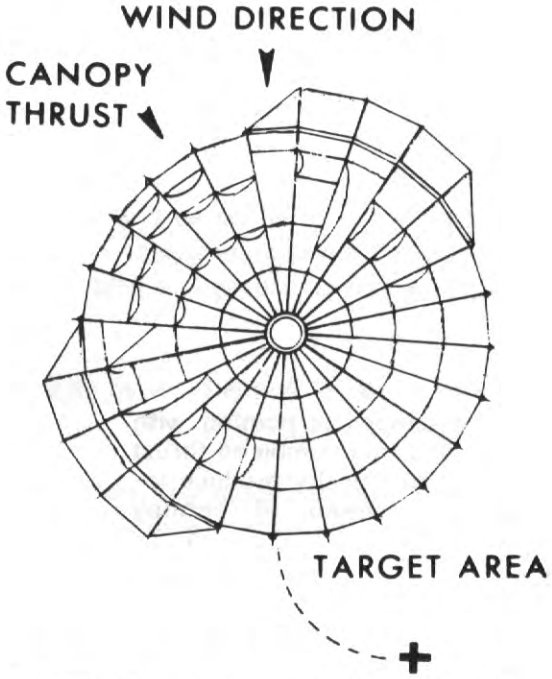
CRABBING TO THE LEFT WHILE HOLDING



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.

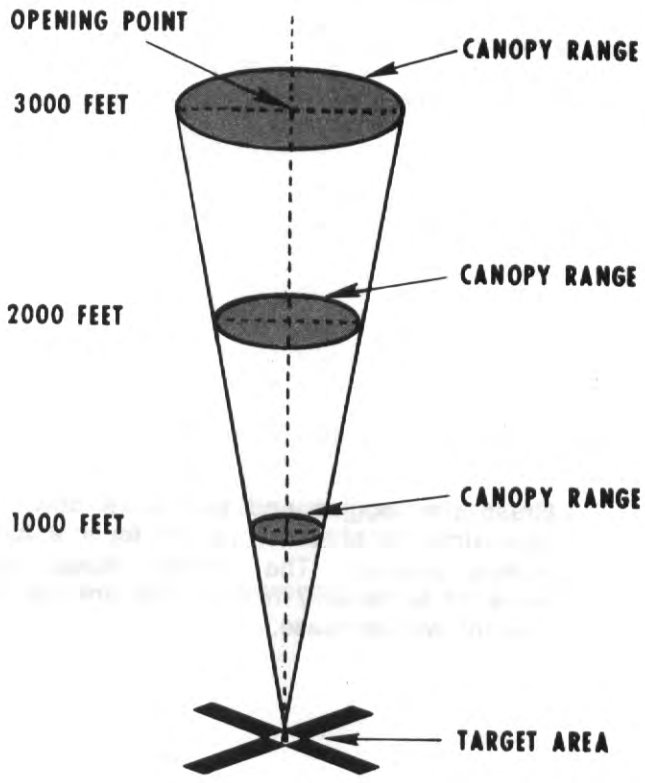
The effective canopy range if the maximum distance from which the canopy can be maneuvered into the target area from a given altitude. It is greater at high altitudes and decreases proportionately at lower altitudes, forming a cone-shaped area. Changes in wind direction and conditions may cause this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

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.



EFFECTIVE CANOPY RANGE

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

NO 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

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

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

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.

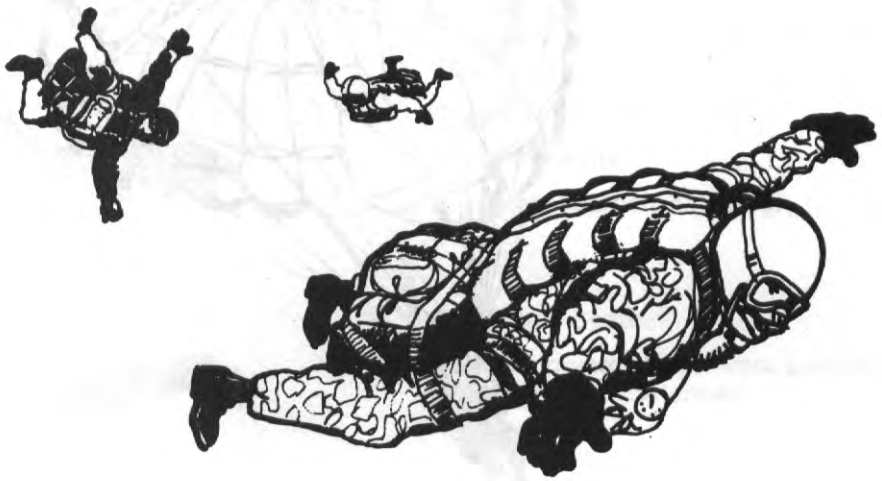
A Guide to Good Canopy Control

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).

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.