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Fleet Marine Field Manual 7-43

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MILITARY FREE-FALL PARACHUTING TACTICS, TECHNIQUES, AND PROCEDURES

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PREFACE

This field manual (FM) presents a series of concise, proven techniques and guidelines that are essential to safe, successful military free-fall (MFF) operations. The techniques and guidelines prescribed herein are generic in nature, and MFF-capable organizations of all sizes from all branches of the joint community should observe them.

The procedures contained in this FM apply for all MFF operations, These techniques represent the safest and most effective methodologies available for executing MFF operations and should be used in joint as well as combined endeavors. In events where multinational forces are involved, United States (U.S.) forces personnel should govern their actions by common sense, guided by the contents of this FM.

This FM incorporates the lessons learned from years of testing and from several actual instances of combat application. It closely follows pertinent portions of United States Special Operations Command (USSOCOM) Directive 350-2 (Draft) Air Operations. It applies during training as well as during real-world operations.

Although the MC-3 Military Free-Fall System is still available in the procurement system, user units should make the transition to the Ram-Air Parachute System (RAPS) to ensure joint interoperability and a lower injury rate in airborne operations. Some Reserve and National Guard elements still use the MC-3 System (see Appendix A).

When conducting service-pure MFF operations, services will also use their applicable regulations and standing operating procedures (SOPs).

The proponent of this FM is the United States Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS). Send comments and recommendations on DA Form 2028 to Commander, USAJFKSWCS, ATTN: AOJK-DT-DM, Fort Bragg, NC 28307-5000.

This FM implements Standardization Agreement (STANAG) 3570.

Unless otherwise stated, whenever the masculine gender is used, both men and women are included.

CHAPTER 1

MILITARY FREE-FALL PARACHUTE OPERATIONS

Special operations missions require rapid and clandestine infiltrations into operational areas or objectives across the operational continuum. Military free-fall (MFF) parachuting enables the commander to infiltrate detachments or individuals into areas under conditions that restrict static-line parachute operations.

Characteristics

MFF parachute operations are flights over or next to the objective area from altitudes not normally associated with conventional parachute operations. MFF infiltrations normally take place during darkness or twilight to reduce the chance of enemy observation. Ram-air parachutes permit detachment members to deploy their parachutes at a designated altitude, assemble in the air, and land together in the objective area prepared to execute the mission. MFF operations take place under varying weather conditions.

Advantages

MFF parachuting allows all detachment personnel to open at a predesignated altitude and land safely together as a tactical unit prepared to execute its mission. Although 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,

The advantages of MFF parachuting are as follows:

- As a means to infiltrate hostile areas when low-altitude penetration is not practical because of enemy ground fire.
- When there is a need or desire for precision landings on small drop zones (DZs).
- When immediate assembly of the operational detachment is necessary.
- When the desired or available aircraft cannot be used for static-line parachute operations.
- Where parachute operations using aircraft at low altitudes are prohibited, unsafe, or otherwise impractical, such as in mountainous terrain.
- When infiltration is to occur with other operations involving aircraft, or formations of aircraft, flying at high altitude.
- When navigational aids (NAVAIDS) are not available to ensure the required accuracy of drops at low altitude (for example, deserts and jungles).
- When there is a need for near simultaneous landings at multiple points on an objective

(for example, attack or seizure of key installations).

- When standoff operations increase supporting aircraft survivability.
- When low-signature infiltrations are necessary to mission success.

Applications

MFF parachute operations are ideally suited for, but not limited to, the infiltration of operational elements, pilot teams, assets, and personnel replacements conducting various missions across the operational continuum. Pathfinder or combat control teams (CCTS) can also infiltrate to provide terminal guidance for future airborne operations.

MFF parachute operations do not take place only at high altitude. The MFF parachutist can exit an aircraft as low as 5,000 feet above ground level (AGL), immediately deploying his parachute. The free-fall tactical element can exit an aircraft in a fraction of the time required for a comparable static-line operation. Such quick exits also reduce dispersion even without considering the ram-air parachute's increased maneuverability.

Considerations

When planning MFF operations, commanders consider the coordination with necessary agencies and services to obtain jamming for the supporting air service. This coordination also includes planning for the disruption of detection systems when operations are to take place in hostile areas protected by radar and other detection systems. Other considerations include—

- Availability of aircrews working under arduous conditions in depressurized aircraft at high altitudes.
- Specialized training of personnel and special equipment required.
- Currency and proficiency levels of training of the parachutist.
- Delivery altitudes requiring the use of oxygen and special environmental protective clothing.
- Limitations on jumping with extremely bulky or heavy equipment, The total combined weight of the parachutist, parachute, and equipment cannot exceed 360 pounds.
- Accurate weather data. This information is essential. The lack of accurate meteorological data, such as winds aloft, jet stream direction and velocity, seasonal variances, or topographical effects on turbulence, can severely affect the infiltration's success or the mission's combat effectiveness.
- High altitude high opening (HAHO) standoff operations. Wind, cold, and high altitude openings increase the probability of physiological stress and injury, parachute damage, and opening shock injuries.
- Minimum and maximum exit and opening altitudes (Figure 1-1).

WARNING

DO NOT fly for a period of 24 hours after diving (AFR 50-27).

EXIT ALTITUDE (IN FEET)		OPENING ALTITUDE (IN FEET)	
Minimum	Maximum	Minimum	Maximum
5,000 AGL	43,000 MSL	3,500 AGL	25,000 MSL
NOTE: Openings above 25,000 feet MSL exceed the parachute's design parameters.			

Figure 1-1. Minimum and maximum exit and opening altitudes.

Physical Examination and Training Requirements

Before participating in MFF operations and regardless of altitude or aircraft used, each MFF parachutist must have met certain minimum requirements. Parachutists must have a high altitude low opening (HALO) physical examination and have a current Physiological Training Card (AF Form 1274), which are prerequisites for all MFF operations.

The MFF student must take a physical exam within 1 year before MFF training. To sustain currency, the MFF parachutist must undergo a physical exam every 3 years with an interim exam performed annually up to age 45. At age 45 and above, he must undergo a full physical exam annually. In addition, the military free-fall parachutist must take physiological training every 3 years, to include oxygen procedural training and a high altitude chamber flight.

Equipment

The MFF parachutist jumps with the proper table of organization and equipment (TOE) and table of allowance (TA) clothing and equipment for the climatic conditions facing him, as well as food and survival items. Additional equipment required includes the free-fall parachutist helmet goggles, and altimeter. The detachment members jump with and carry all operational equipment and supplies as individual loads except when using accompanying free-fall bundles.

NOTE: All MT1 series RAPSs are compatible in that the main canopies have exactly the same load-bearing and gliding capability. The RAPSs may be jumped on the same pass and combined in the same airborne operation. The only jumpmaster planning consideration is to ensure he plots the high altitude release point (HARP) for the smallest (least gliding capable) canopy, usually the reserve for some sister service RAPS. (See Appendix B for additional information.)

If dropping selected items as accompanying supplies, the parachutist packs them in proper aerial delivery containers. Once the drop is in progress, the detachment members locate the bundles and follow them to the ground under canopy to lessen the chance of losing the equipment. Techniques used to free-fall equipment include-

- An automatic rip cord release (ARR) and a rip cord-activated parachute.
- Power-actuated reefing line cutters and items of issue available to airborne units when shorter delays are necessary.
- A ram-air free-fall bundle system,
- A high altitude airdrop resupply system for delivery of loads up to 2,000 pounds rigged in A-22 containers.
- A drogue-stabilized, tandem parachute system.

Oxygen

For altitudes above 10,000 feet mean sea level (MSL), the use of oxygen is mandatory for aircrew members (see Chapter 7). Special equipment needed in addition to the goggles and helmets are oxygen masks and several main oxygen sources. These oxygen sources include-

- An oxygen console to support an entire operational element for long flights,
- The delivery aircrafts oxygen supply to support the aircrew.
- Walk-around oxygen bottles for jumpmasters, aircrew, oxygen safeties, or physiological technicians.
- Portable/bailout oxygen system with oxygen mask for the parachutist after he has disconnected from the onboard console and left the aircraft

Procedures

When employed correctly SFODs or larger units can make MFF infiltrations. However, since the number of personnel normally dropped in this manner is small, emphasis is placed on taking only absolutely essential equipment and supplies. The MFF parachutist normally attaches the combat pack (all-purpose, lightweight, individual, carrying equipment [ALICE]) below his main parachute (Figure 1-2), However, he may also attach the equipment to his front like the static-line parachutist does (Figure 1-3). Chapter 4 addresses other rucksack systems authorized by sister services,

Briefing

The briefing includes a review of en route plans and actions at specified points along the route in case of an abort or enemy action. It explains all the techniques of the jump, to include oxygen procedures, when to arm the ARR, and actions at time warnings. It indicates that a minimum of two extra parachute systems and altimeters will be available in case of a premature firing of the ARR, a failure of an altimeter, or the accidental opening of a container.

Station

Under tactical conditions, the operational element is completely rigged at the point of no return. This procedure ensures the personnel will exit the aircraft with all their equipment in case of a bailout over enemy territory. A final equipment check is made. All detachment members calibrate their altimeters so that the instruments read distance above the ground at the DZ.

In-Flight

En route, the aircraft commander keeps the jumpmaster informed of the aircraft's position. In turn, the jumpmaster keeps the parachutist informed. This information is essential. The parachutist must know his relative position along the route so that he can apply the required actions in case of an abort or enemy action. While in flight, the aircraft commander keeps the MFF jumpmaster informed of changes to the altimeter reading should it be necessary to abort and make an emergency exit. All actions at time warnings will be in accordance with (IAW) pm-mission briefings and this manual. The pilot will signal the jumpmaster upon arriving at the HARP, The parachutist exits the aircraft on the jumpmaster's command.

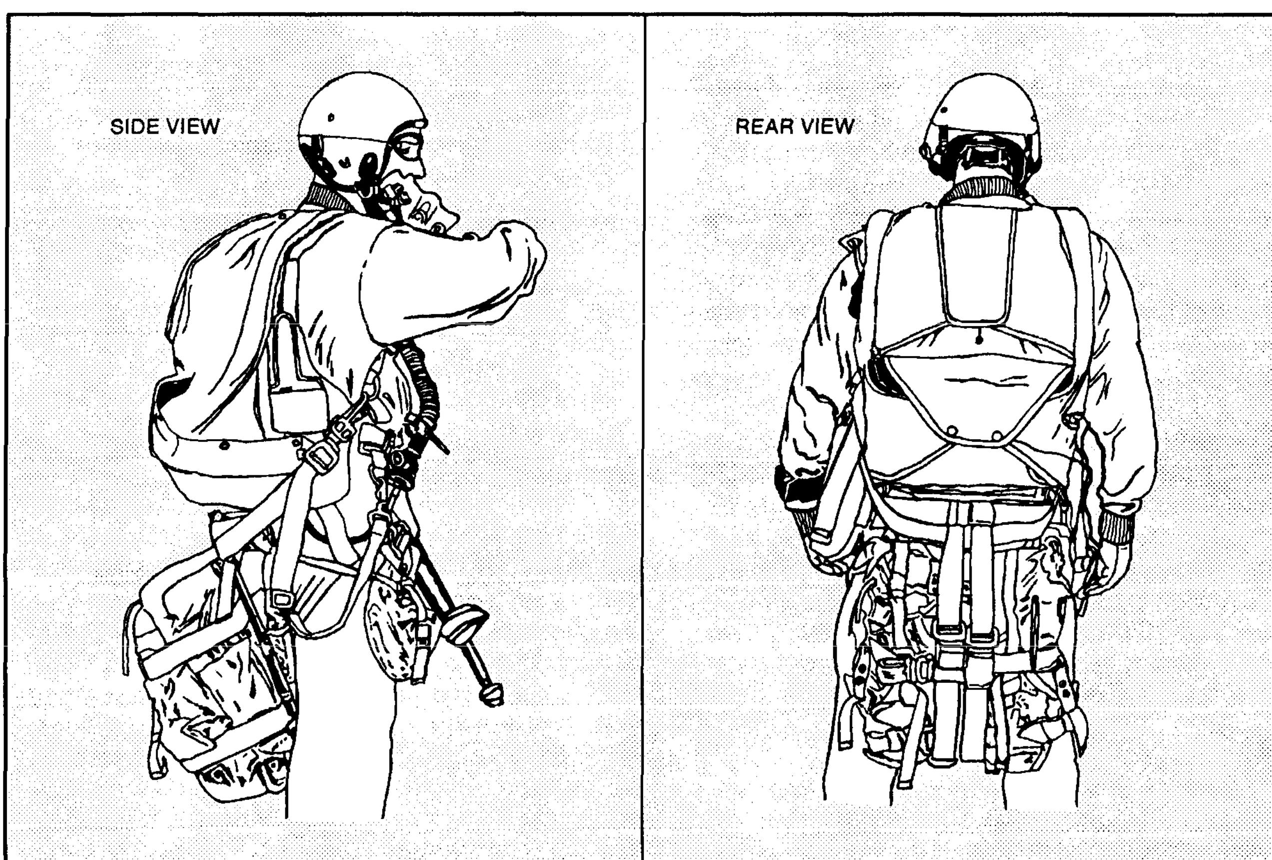


Figure 1-2. Parachutist with rear-mounted combat pack.

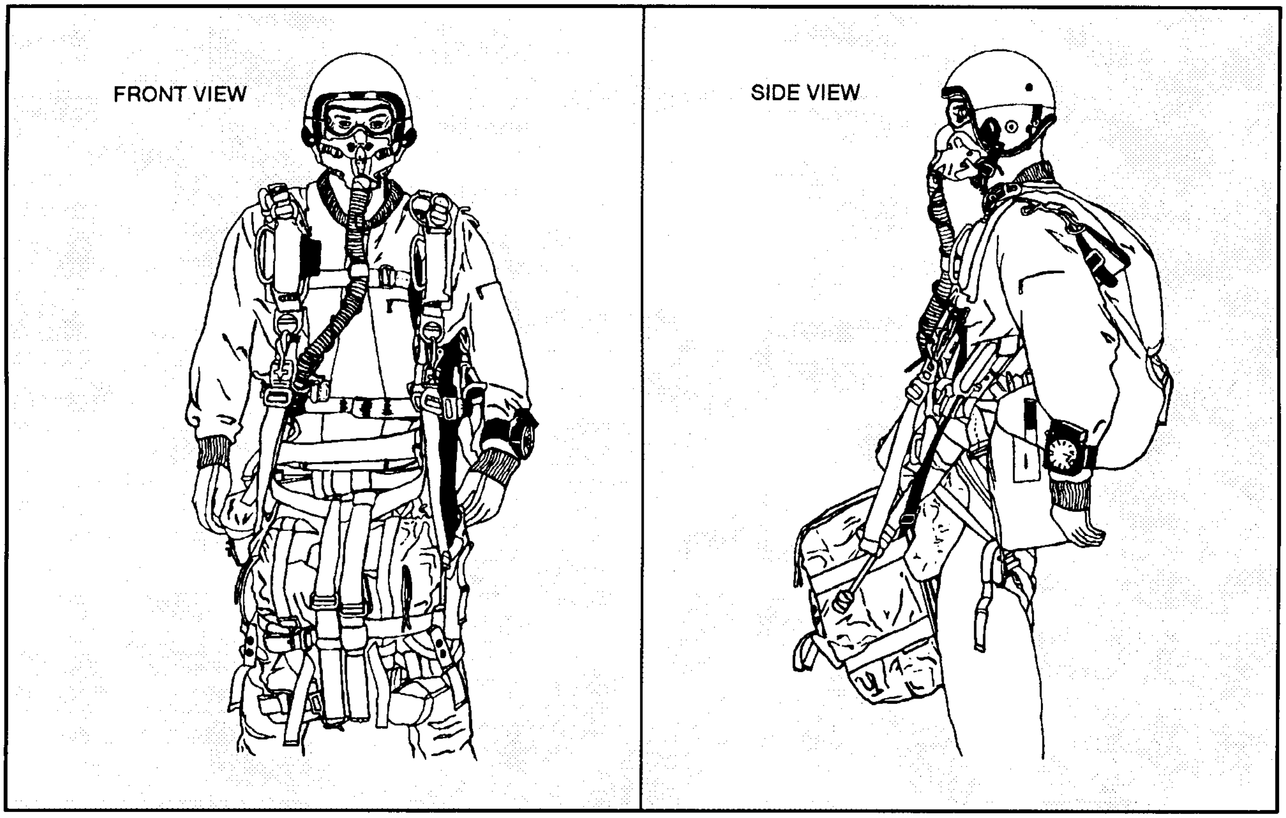


Figure 1-3. Parachutist with front-mounted combat pack.

Free-Fall

Once the parachutist has exited the aircraft, he orients himself on a preselected heading or groups on a prebriefed or designated parachutist. The detachment members then fall along the aircraft's flight path until manually activating their parachutes at the predesignated altitude. This technique keeps the parachutists' dispersion relatively constant during free-fall. Visual sighting of terrain features will not always be a reliable means of determining heading, for example, in night operations, flat jungle areas, or desert terrain. One way the parachutist maintains heading is to orient himself the aircraft's direction of flight upon exiting. An alternate method is the use of a wrist-mounted compass. If terrain permits, the HALO team orients on a specific terrain feature and begins navigating toward it during free-fall.

NOTE: Commanders must ensure that MFF training operations conducted outside military-controlled airspace comply with Federal Aviation Administration or host nation agreements or regulations.

CHAPTER 2

THE MILITARY FREE-FALL RAM-AIR PARACHUTE SYSTEM

The evolution of the parachute used in MFF has been considerable over the years. New technology and advances continue to bring about changes, This chapter identifies the RAPS' components (Figures 2-1 to 2-13). Technical Manual (TM) l0-1670-288-23&P and NAVAIR 131-21 (MTI-XS/SL) contain information on repairing and maintaining this parachute.

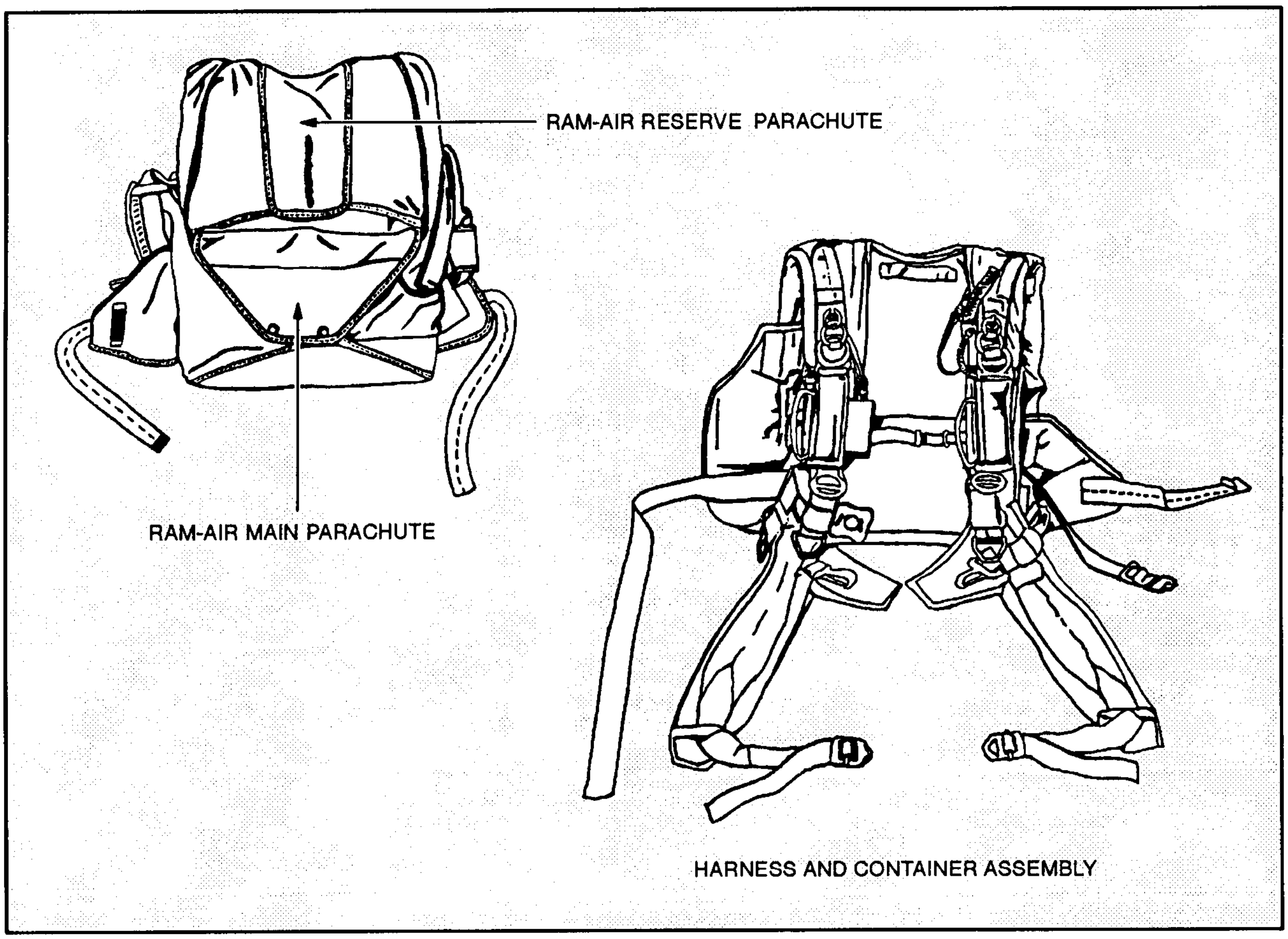


Figure 2-1. The RAPS' components.

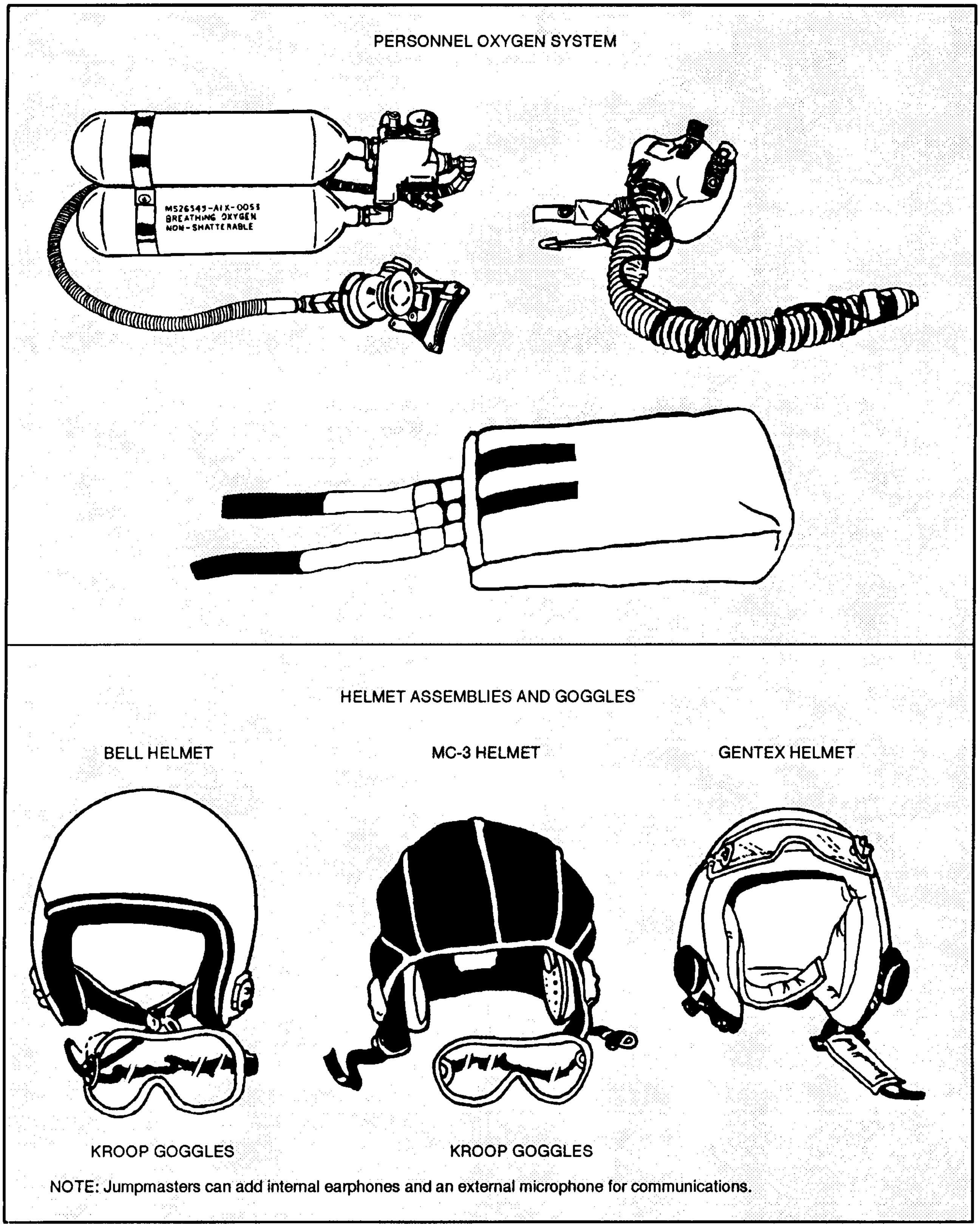


Figure 2-1. The RAPS' components (continued).

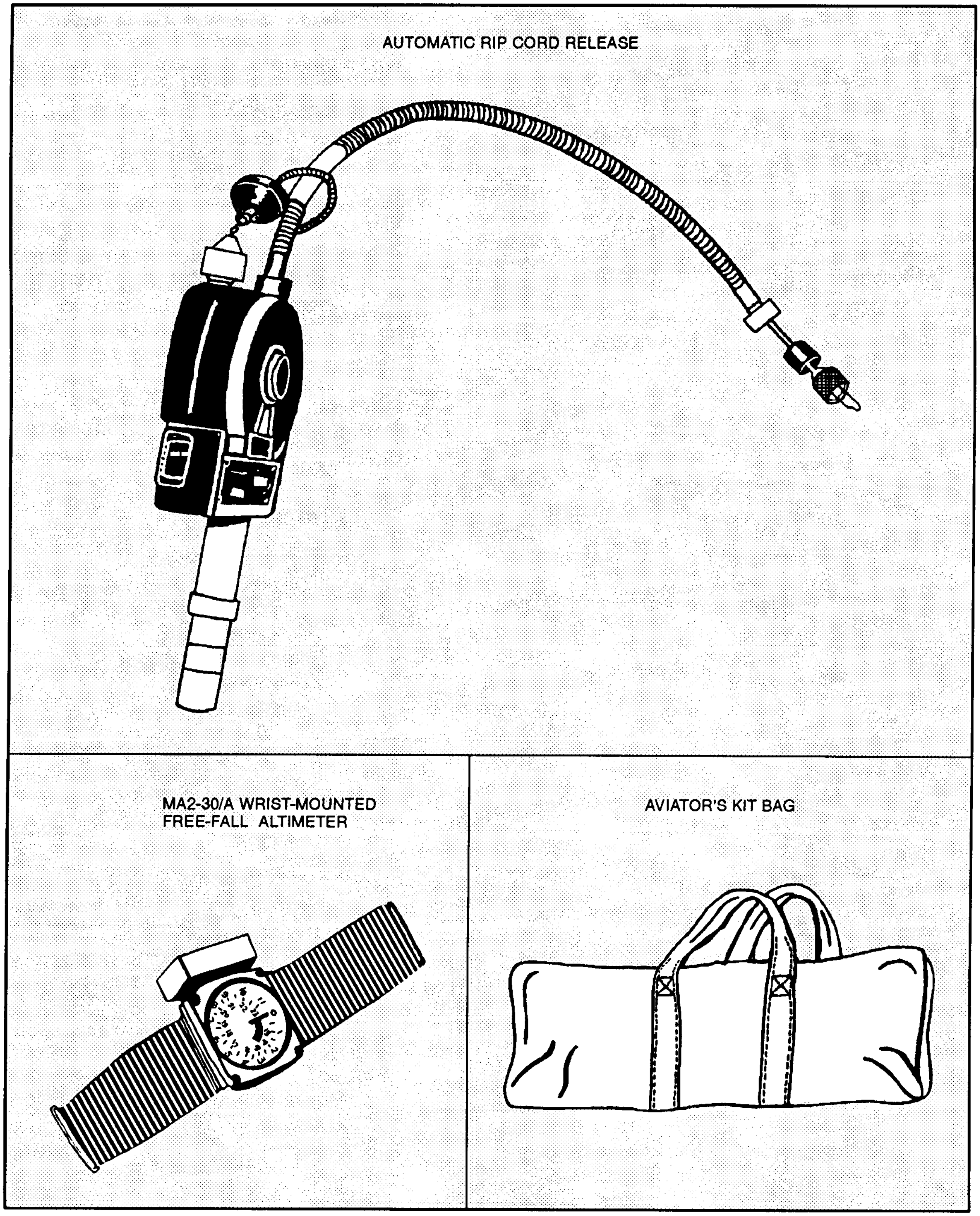
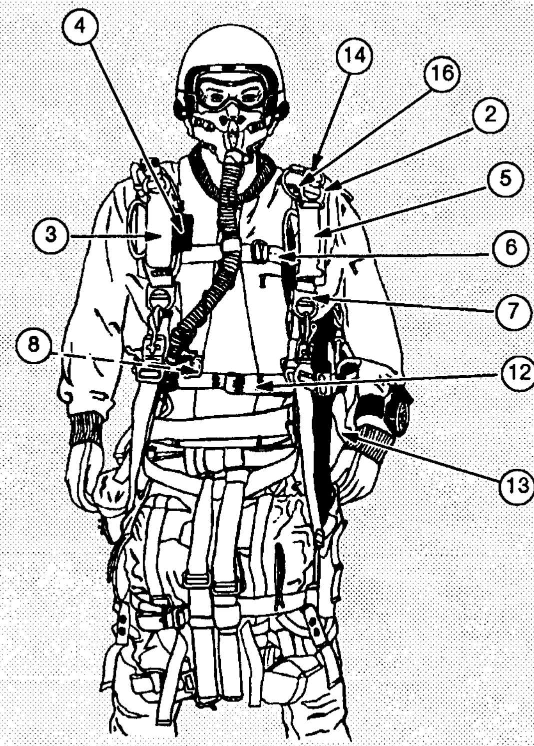
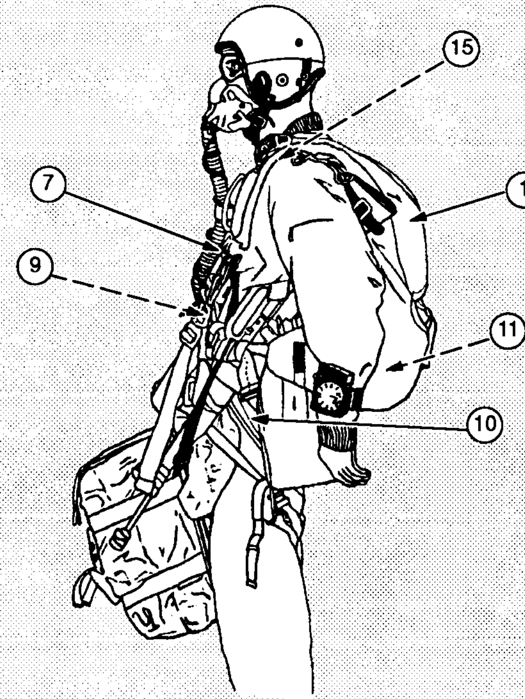


Figure 2-1. The RAPS' components (continued).

HARNESS AND CONTAINER ASSEMBLY BREAKDOWN

1. Integral harness and parachute containers
2. Base ring of the three-ring canopy releases (Figure 2-4)
3. Main rip cord assembly and elastic pocket (Figure 2-5)
4. Cutaway handle for the three-ring canopy releases (Figure 2-5)
5. Reserve rip cord assembly and elastic pocket (Figure 2-6)
6. Chest strap (Figure 2-6)
7. Large equipment attachment rings (Figures 2-6 and 2-7)
8. Oxygen fitting block (Figure 2-7)
9. Equipment lowering line attachment V-rings (Figure 2-7)
10. Leg straps with split saddle (Figure 2-9)
11. Wing flap and pouch for attachment of the ARR (Figure 2-9)
12. Waistband (Figure 2-9)
13. Wing flap for securing bailout oxygen system (Figure 2-9)
14. Weapon tie-down loop (Figure 2-10)
15. Reserve parachute risers (Figure 2-10)
16. Reserve static line attached





NOTE: Dashed lines indicate items hidden from view.

Figure 2-2. The RAPS' harness and container assembly components.

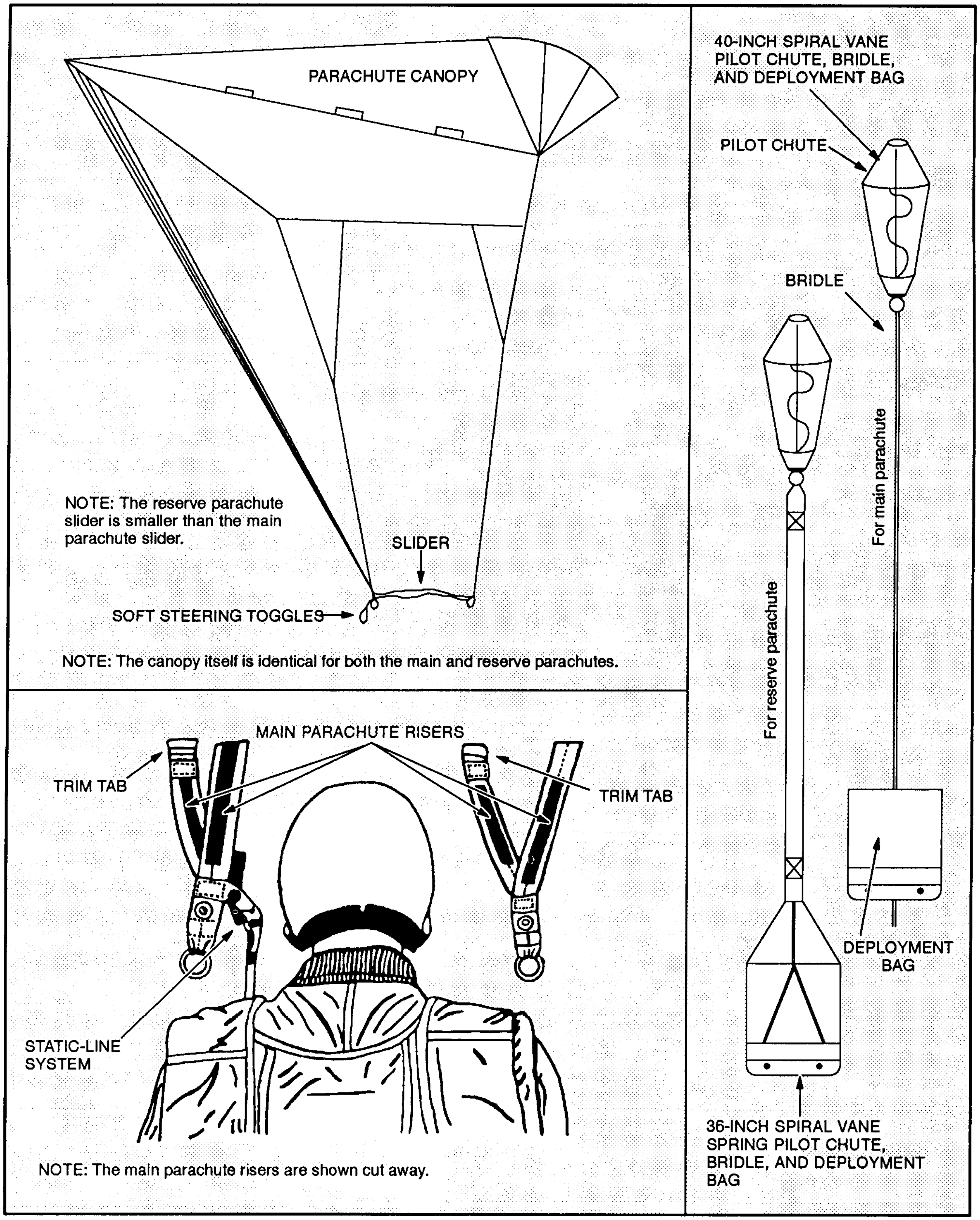


Figure 2-3. The RAPS' assembly components.

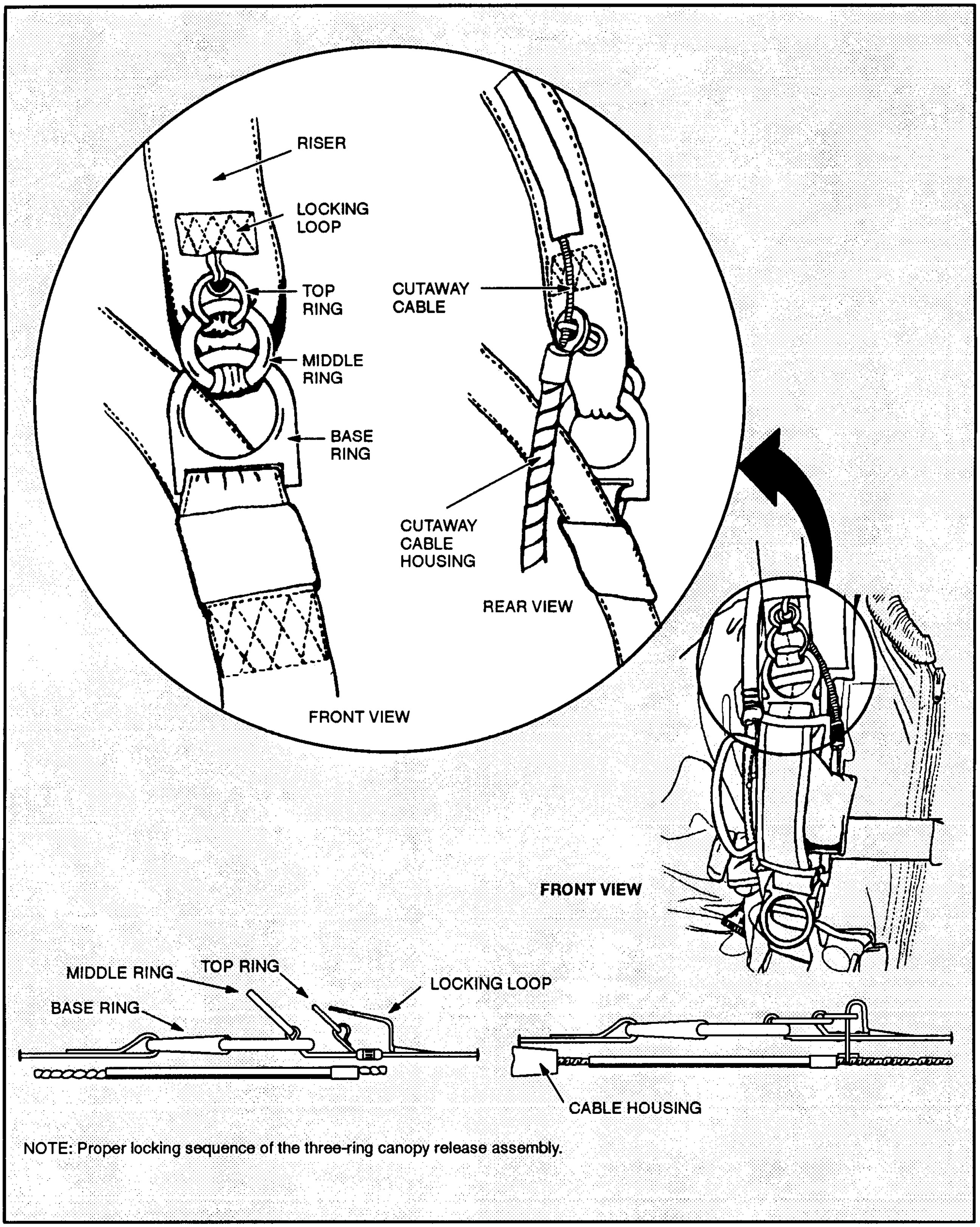


Figure 2-4. Location and locking sequence of the three-ring canopy release assembly.

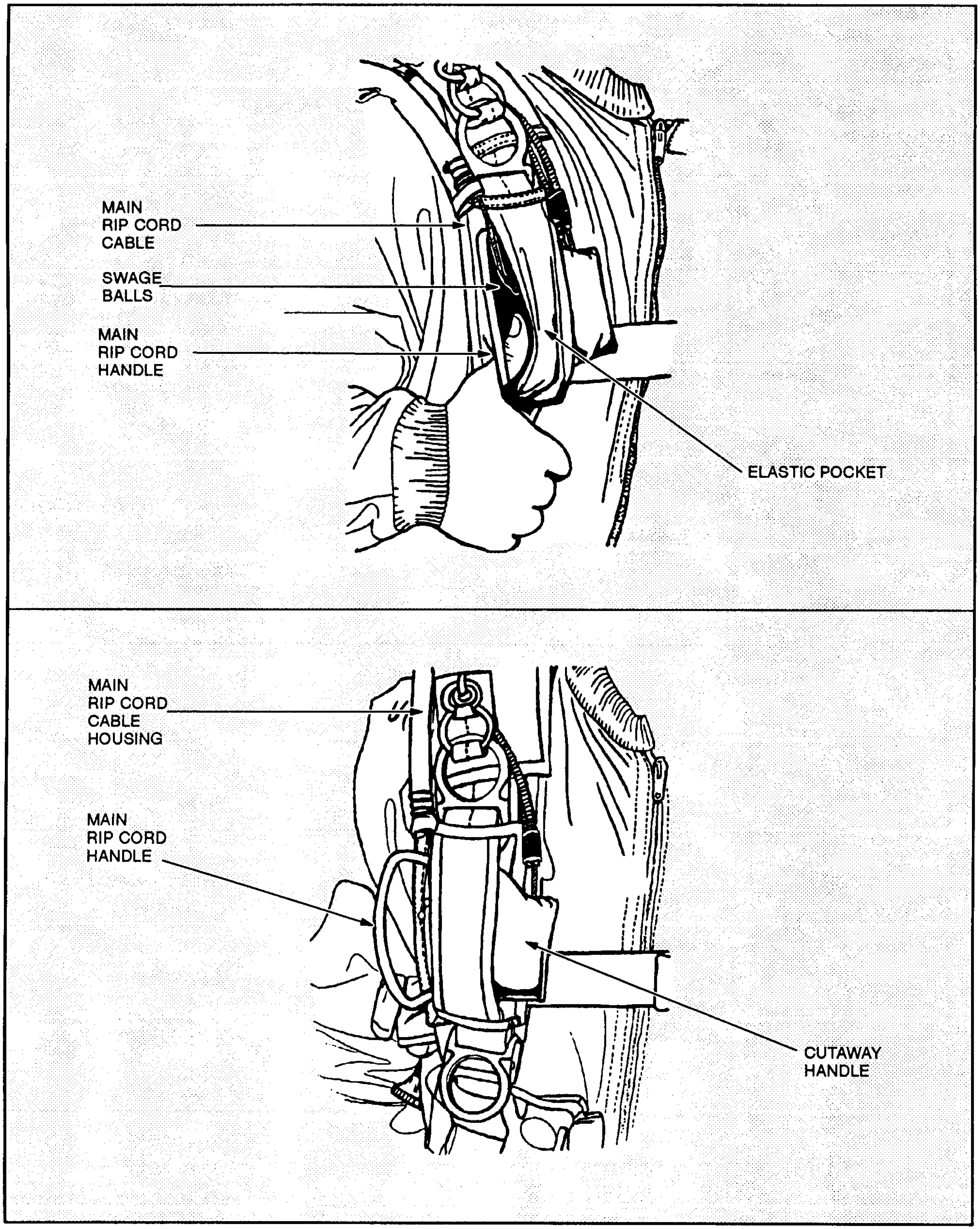


Figure 2-5. Location of the main rip cord handle and cutaway handle (front view).

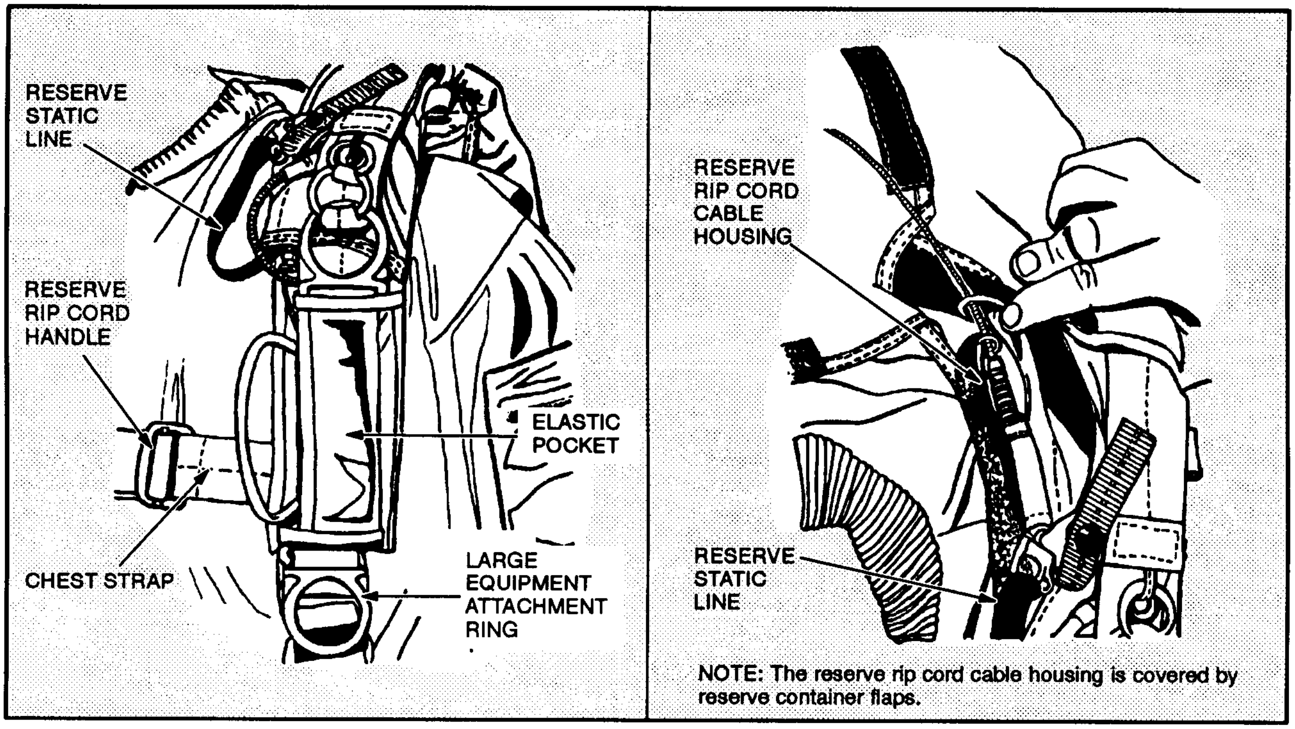


Figure 2-6. Location of the chest strap, reserve rip cord handle, large equipment attachment ring, and reserve rip cord cable housing (front view).

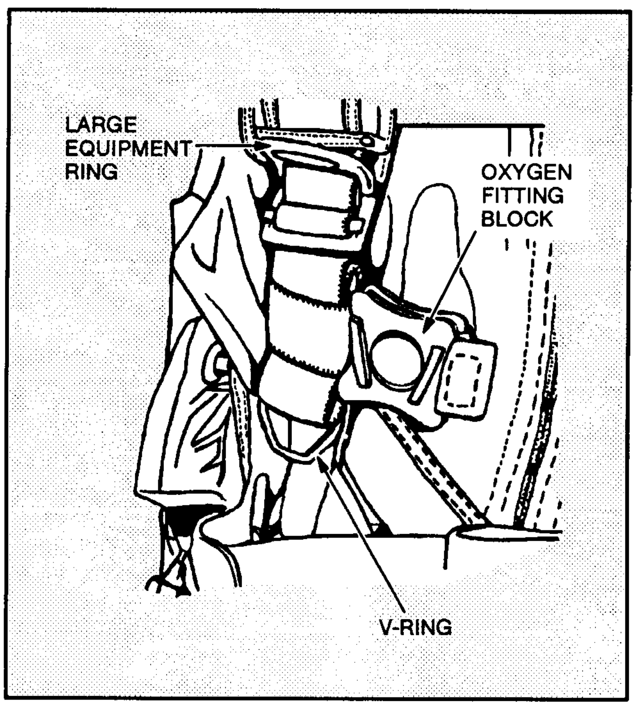


Figure 2-7. Location of oxygen fitting block and equipment lowering line attachment V-rings (front view).

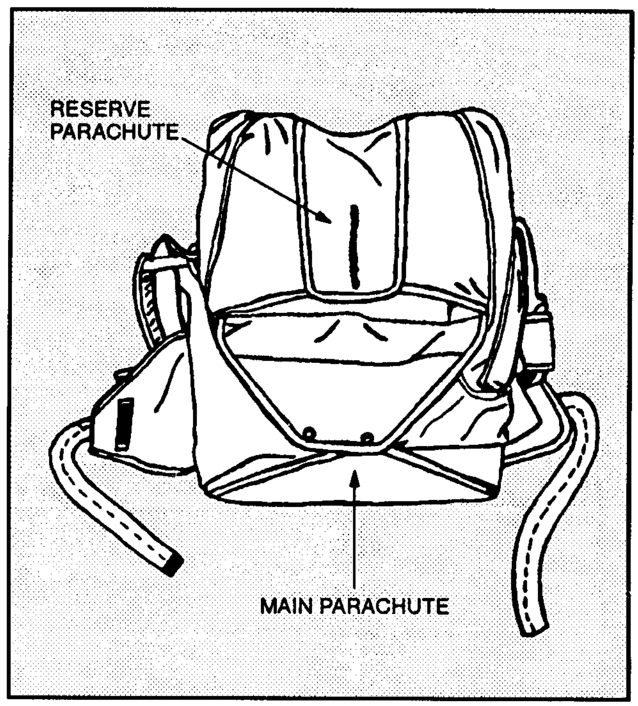


Figure 2-8. Location of the main and reserve parachutes in the container.

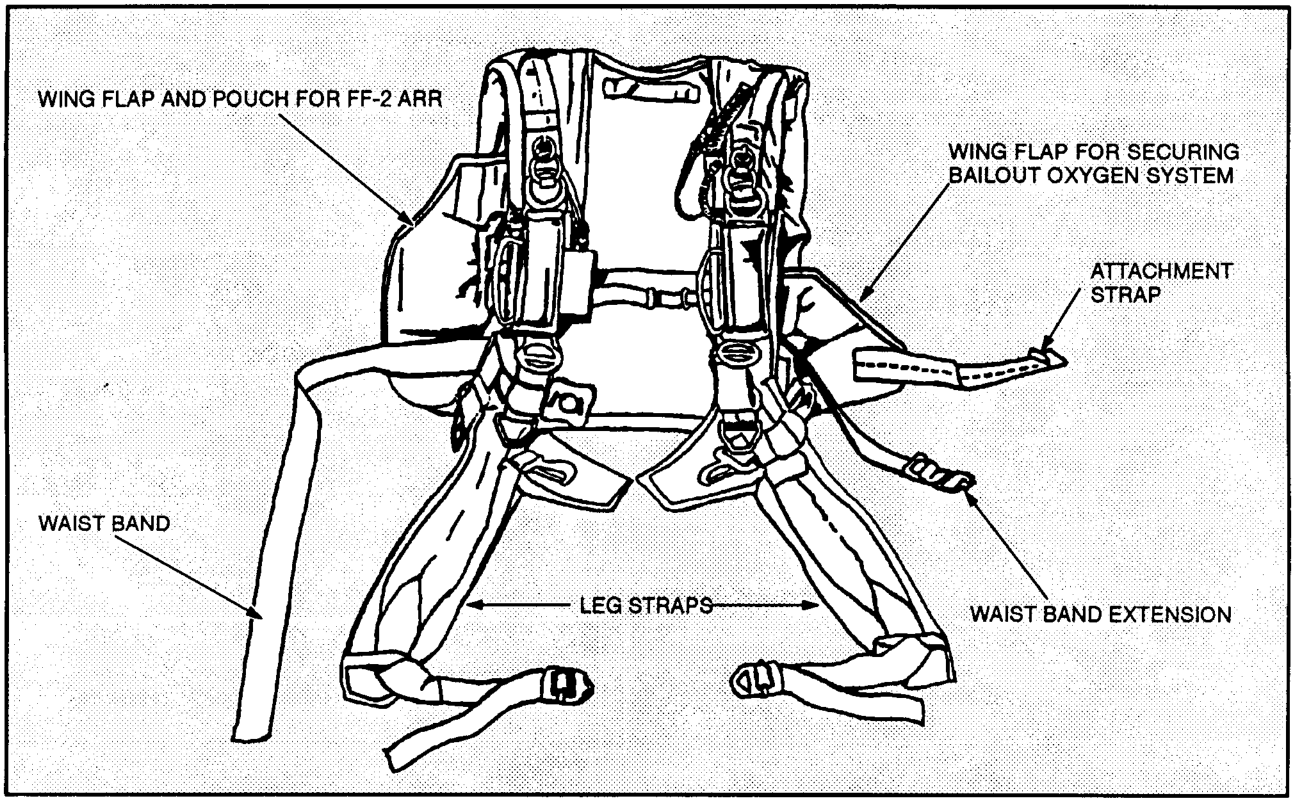


Figure 2-9. Location of straps (front view).

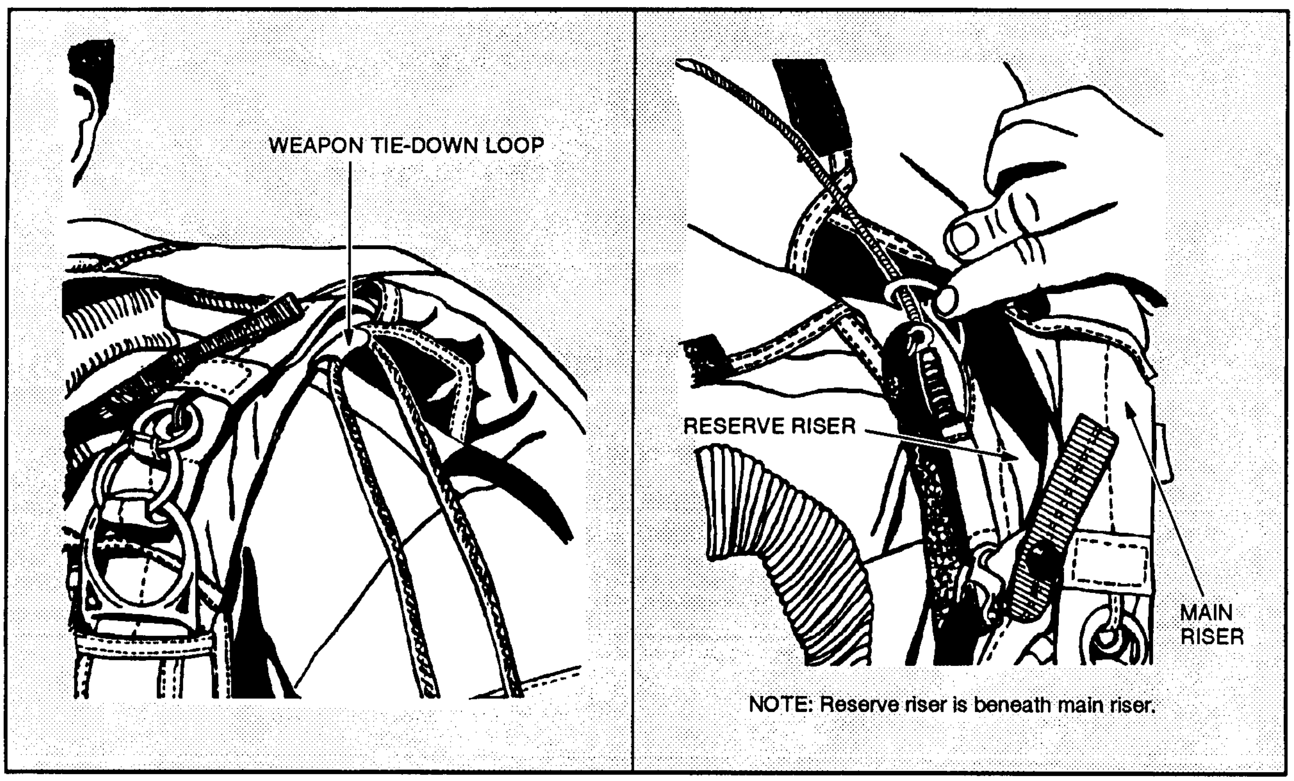


Figure 2-10. Location of the weapon tie-down loop and reserve risers (front-side view).

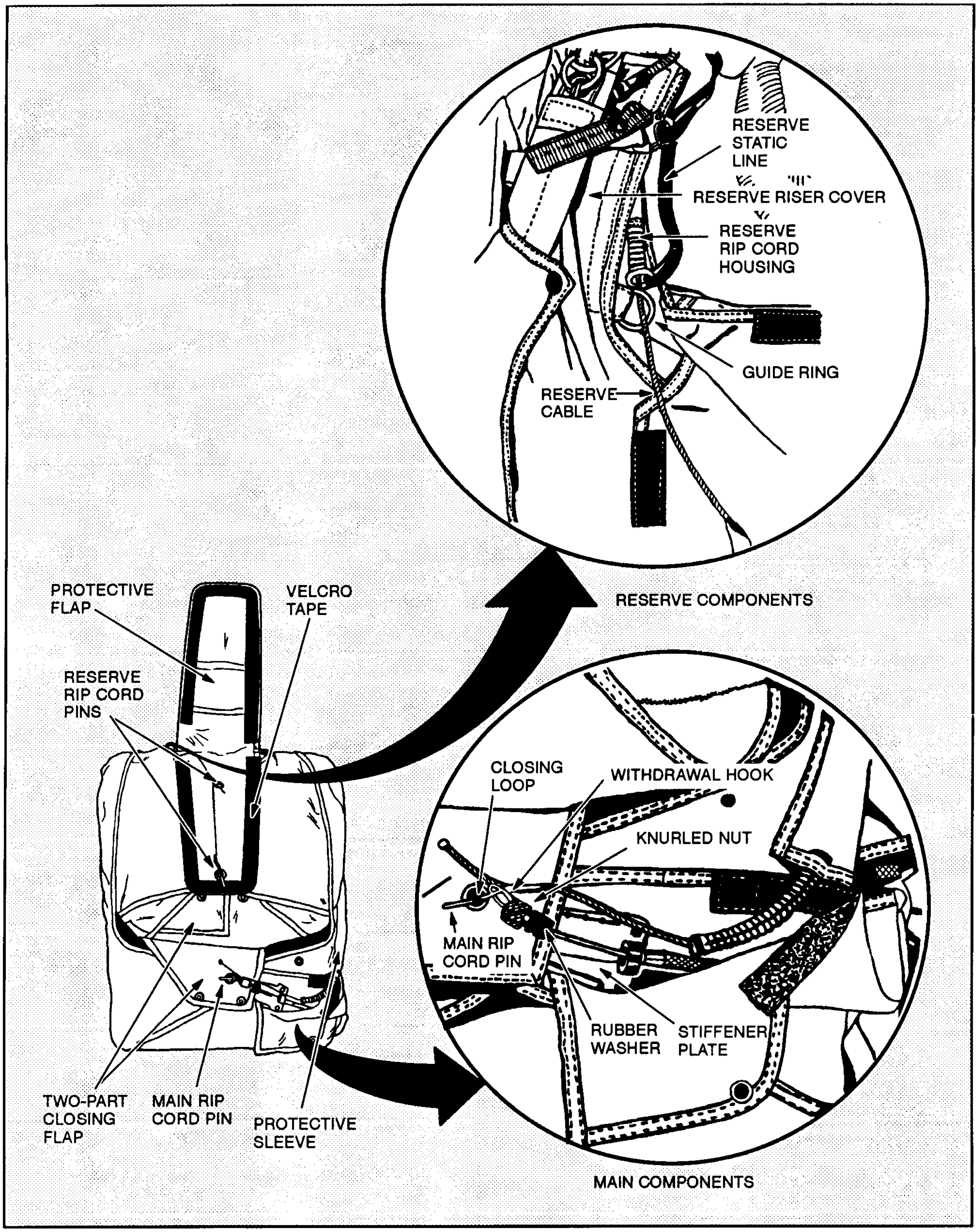


Figure 2-11. Location of main and reserve components.

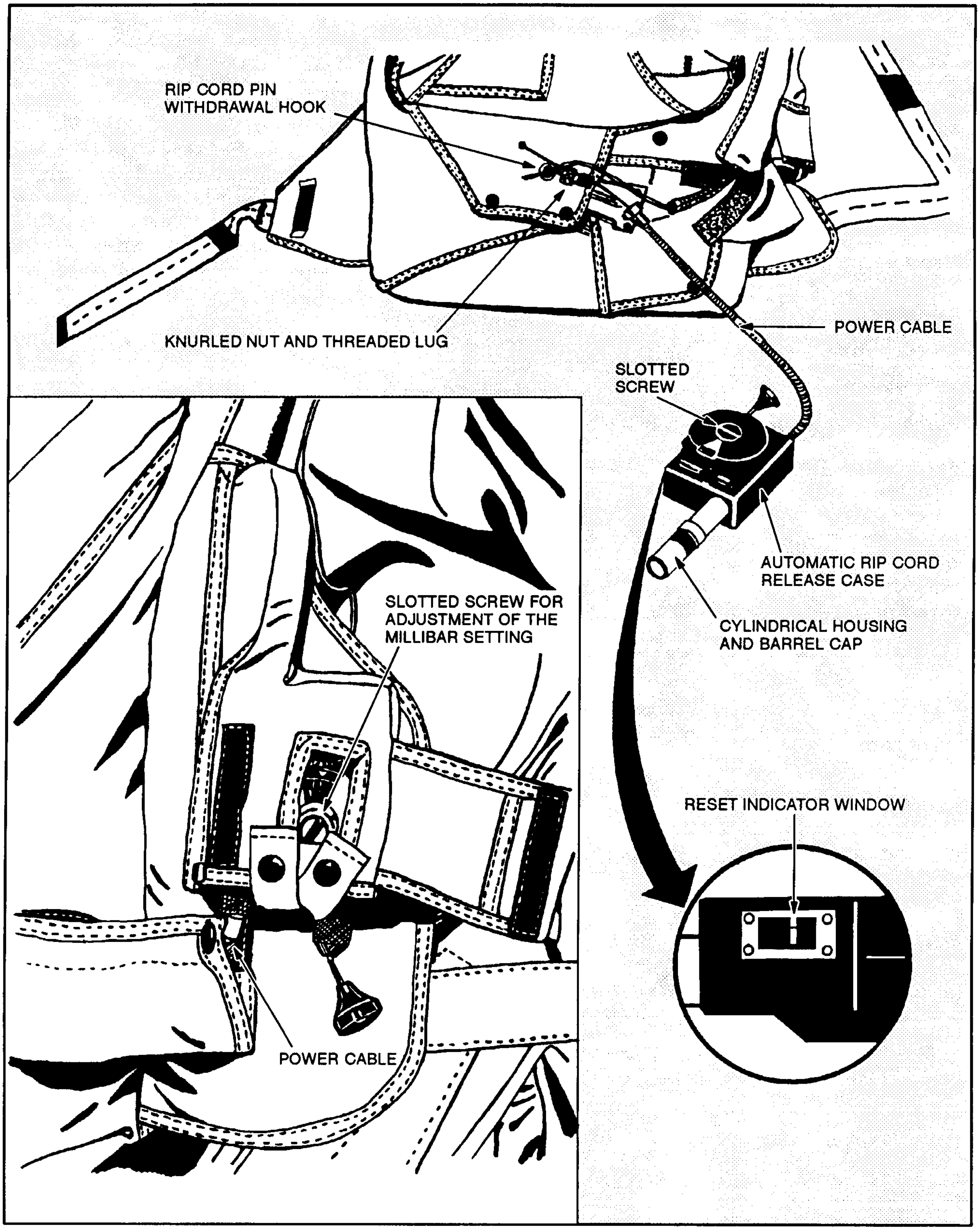


Figure 2-12. ARR assembly components.

Helmet Assembly

The MFF parachutist uses the MC-3 helmet ("bunny"), which is a semirigid, padded leather helmet and the Gentex and Bell helmets (see Figure 2-l). These helmets have bayonet receptacles used to attach the oxygen mask. When the jumpmasters use these helmets, they modify them to include internal earphones and an external microphone for communications.

WARNING

The parachutist should ensure the MFF parachutist helmet has been modified for compatibility with and the proper fit of the oxygen mask.

Standard driving goggles were issued with the semirigid leather (MC-3) parachutist helmet, However, they are not recommended for use because they can limit the parachutist's field of vision. This potential problem increases when the oxygen mask is worn. Only the clear lens should be used. The lens should be relatively free of scratches that might obstruct the vision, Commercial goggles (Kroop), also issued, provide a wider field of vision and come in two sizes, regular and a larger, boxier design that will fit over standard military eyeglasses.

Other helmets approved for use and issued include the Gentex (HGU-55/P) lightweight parachutist helmet and the Bell motorcycle helmet (not full face). The Bell motorcycle helmet must have bayonet receptacles installed for the attachment of the oxygen mask. The technical bulletin referenced in the WARNING, above, describes the procedure to emplace the bayonet receptacles.

MA2-30/A Free-Fall Altimeter

The parachutist wears the MA2-30/A altimeter on his left wrist (Figure 2-13). The altimeter shows his altitude above the ground during free-faill. It permits him to determine when he has reached the proper altitude for deploying the main parachute. The altimeter must be transported and stored with care. It must be chamber tested for accuracy IAW TM 10-1670-264-13&P. It must be rechecked after an unusually hard landing and after accidentally dropping it. An altimeter that was submerged in water must be replaced.

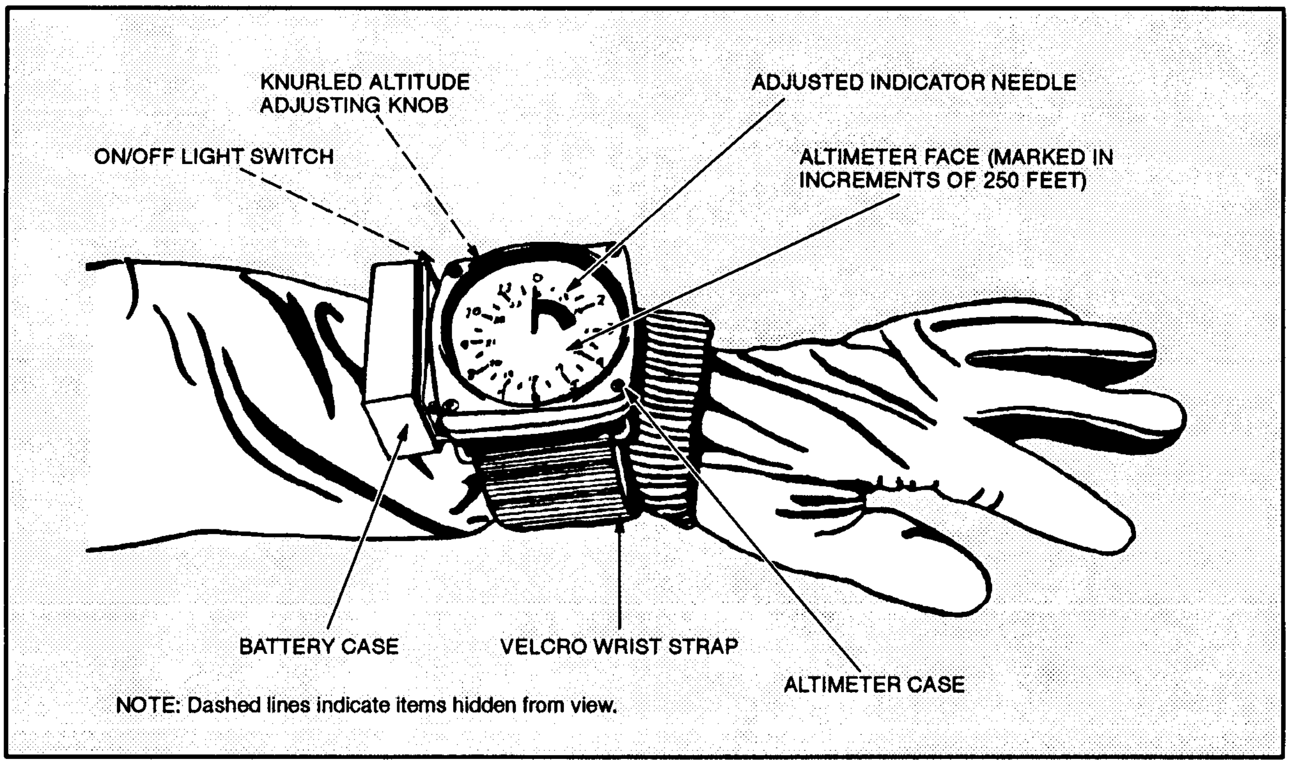


Figure 2-13. MA2-30/A free-fall altimeter.

Other Recommended Items

Gloves, boots (without speed lacing hooks), and jumpsuits are not RAPS' components; however, they are considered mandatory safety equipment. Different types of gloves, boots, and jumpsuits may be necessary depending upon the degree of environmental protection required.

CHAPTER 3

THE RAM-AIR PARACHUTE SYSTEM DONNING AND RECOVERY

The method of donning and adjusting the RAPS provides an additional safety check and prevents unnecessary delays during the jumpmaster personnel inspection (JMPI). It also ensures minimum discomfort to the parachutists aboard the aircraft (or from the opening shock during parachute deployment). The buddy system, or the pairing of parachutists, within each operational element provides the most efficient and accurate way for parachutists to adjust and check each others' parachutes.

Preparing and Donning the Aviator's Kit Bag

The jumpmaster determines if the kit bag will be front or rear mounted. The parachutist prepares the kit bag by closing its slide fastener and securing all its snap fasteners. The jumpmaster's decision on whereto attach the kit bag determines how the parachutist further prepares the kit bag for mounting,

Front Mounting

The parachutist folds the kit bag in two folds from the bottom leaving the handles centered (Figure 3-l). He places the folded kit bag across his lap. He laces one leg strap through one kit bag handle and fastens the leg strap. He repeats the process with the other kit bag handle and leg strap,

Rear Mounting

The parachutist folds each end of the kit bag with one fold toward the center leaving the handles exposed at one end (Figure 3-l). He positions the kit bag between the small of his back and the parachute container with the kit bag handles to his right side. He laces the waistband through both kit bag handles and fastens the waistband.

Donning the Ram-Air Parachute System

See Figure 3-2 for procedures when donning the RAPS. Each parachutist first checks the parachute assembly for visible defects. He then lets out all harness adjustments for ease of donning. Finally, he lays the assembly out with the pack tray face down (Figure 3-2, Step A).

To don the parachute, the parachutist (No. 1) assumes a modified high jumper position. A second parachutist (No, 2) holds the parachute assembly by the main lift webs at the canopy release assemblies and places it on No. 1's back (Figure 3-2, Step B).

No. 1 remains bent forward at the waist and No. 2 pushes the container high on No. 1's back. As No. 1 threads and fastens the chest strap (Figure 3-2, Step C), No. *2* prepares the leg straps.

No. 2 calls out "Left. (right) leg strap" and passes it to No. 1.

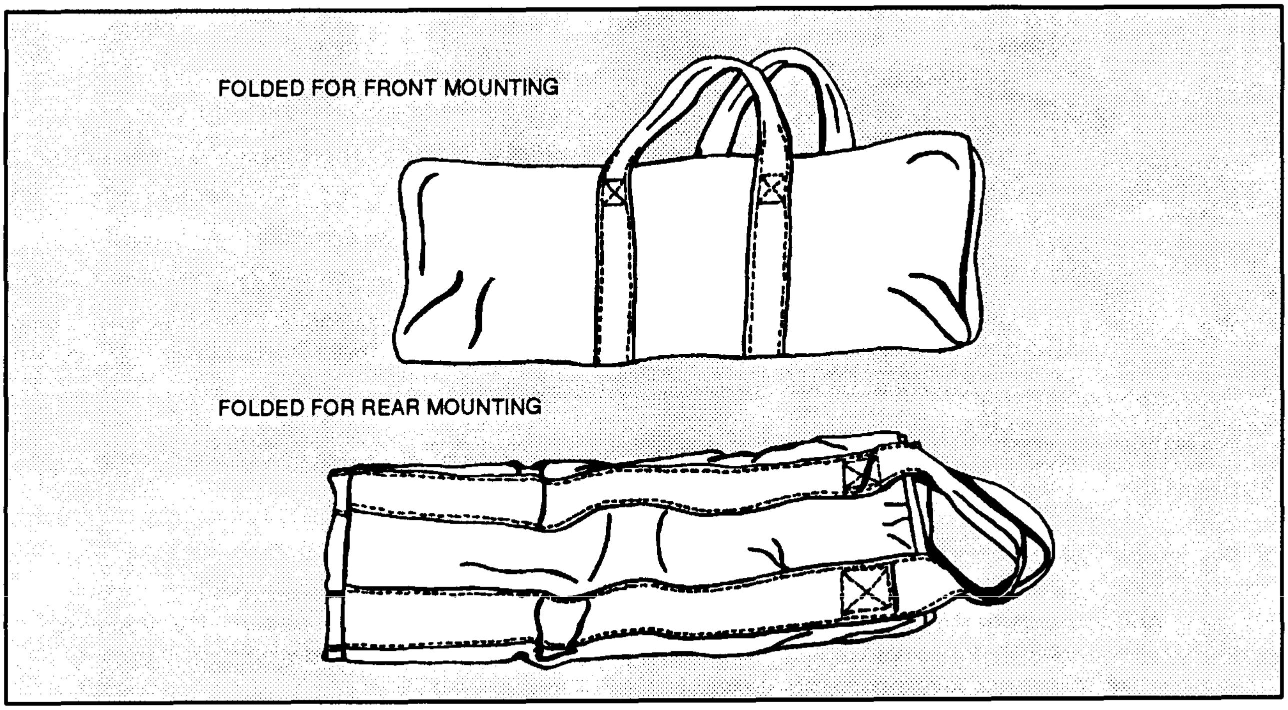


Figure 3-1. Folded kit bag for front or rear mounting.

No. 1 repeats "Left (right) leg strap" and grasps the leg strap with one hand. With his other hand, he starts from the saddle and feels the length of the leg strap, removing any twists and turns. He inserts the leg strap through one kit bag handle (if the kit bag is front mounted) and fastens the leg strap (Figure 3-2, Step D). He repeats the procedure for the remaining leg strap.

No. 1 stands erect and checks to ensure the canopy release assemblies are in the hollows of his shoulders by adjusting the main lift webs (Figure 3-3 Step E).

No. 2 locates the free running ends of the horizontal adjustment straps and tightens the harness until No. 1 indicates it fits snugly and comfortably (Figure 3-2, Step F).

No. 1 then threads the long running end of the waistband through both kit bag handles (if the kit bag is rear mounted) and fastens the waistband to the waistband extension (Figure 3-2, Step G).

After final adjustment, No. 1 rolls all excess webbing outward and secures it using the elastic keepers. No. 1 should be able to stand erect without straining (Figure 3-2, Step H).

No. 1 and No. 2 then change positions and repeat the procedure.

When both parachutists have donned their parachute assemblies and adjusted their harnesses, they face each other, make a visual inspection of each other, and correct any deficiencies prior to the JMPI.

Recovering the Ram-Air Parachute System

If jumping oxygen, the parachutist locks the ON/OFF switch in the OFF position. He removes the bailout bottles and pouch from the waistband.

NOTE: The parachutist does not place the oxygen mask on the ground unprotected during parachute recovery. Moisture from breathing and condensation due to temperature changes will cause dirt and debris to adhere to the mask, making cleaning difficult.

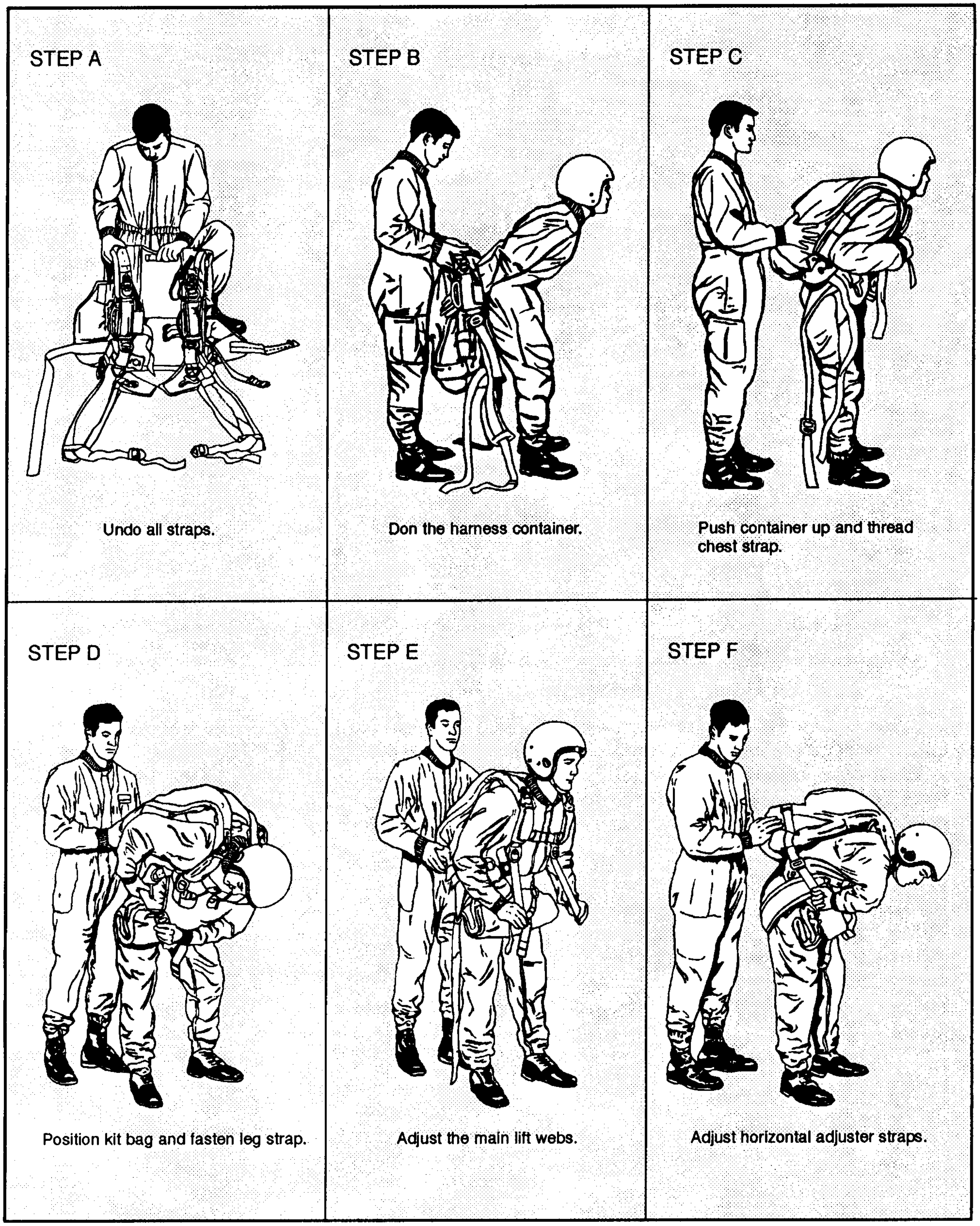


Figure 3-2. Donning the Ram-Air Parachute System.

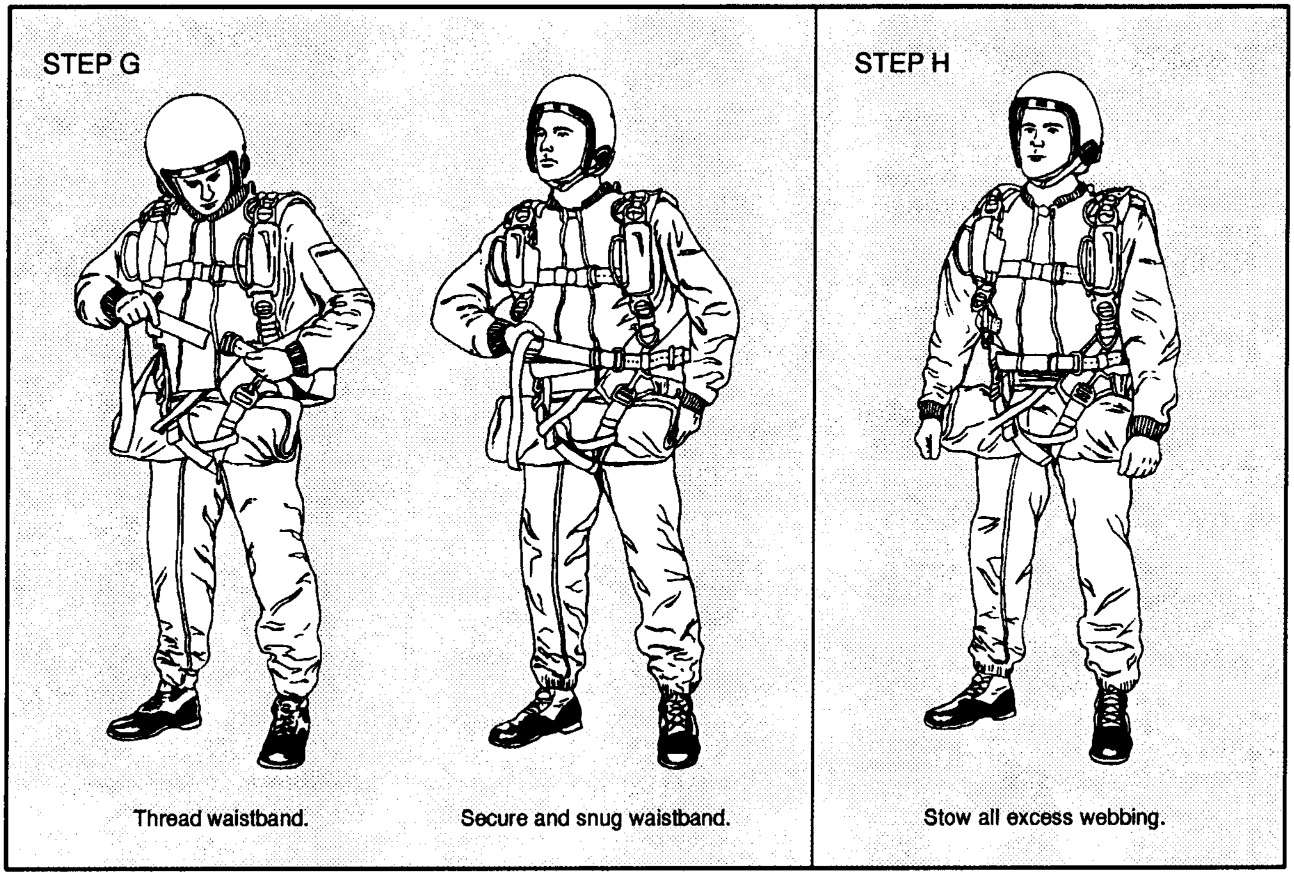


Figure 3-2. Donning the Ram-Air Parachute System (continued).

The parachutist removes the harness and container. He removes the aviator's kit bag and opens it. He then replaces the arming pin in the ARR. Next, he replaces the rip cord into the rip cord cable housing and replaces the rip cord handle into the stow pocket.

The parachutist places the pilot chute next to the kit bag. He places the canopy deployment bag, suspension lines, and risers in the kit bag. He then removes the quick-release snap hooks and lowering line quick-ejector snap from the equipment rings on the parachute harness. Next, he places the harness and container in the kit bag with the backpad facing up to protect the ARR. Finally the parachutist places the pilot chute in the kit bag and snaps the fasteners.

CAUTION

The parachutist does not use the slide fastener (zipper) to close the kit bag, as the teeth can damage any protruding **canopy fabric.**

CHAPTER 4

EQUIPMENT AND WEAPONS

Free-fall parachutists will normally operate with individual equipment which includes clothing and equipment in keeping with the climatic conditions, food, and survival items. In addition, each parachutist will have a weapon, free-fallparachutist's jump helmet, goggles, and altimeter. All detachment equipment and supplies will be jumped and carried as individual loads. If selected items must be dropped as accompanying supplies, they are packed in appropriate aerial delivery containers.

Equipment and Weapons Packing

The parachutist can attach or wear his individual equipment and weapon in several configurations (for example, exposed, placed in containers, or a mix of the two). Unit SOPs specify ways to pack equipment that are consistent with safety requirements. As a rule, units pack hard, bulky, or irregularly shaped (nonaerodynamic) items in containers. Commanders can use approved rucksack rigging systems that the Special Operations Test Board certifies.

The parachutist packs his individual equipment in containers, kit bags, or the medium or large combat pack and attaches it to the equipment rings on the main lift web of the parachute. He may front or rear mount the combat pack using the improved equipment attaching sling or the H-harness (modified). He should lower combat packs or any equipment that weighs more than 35 pounds.

The parachutist pads fragile items (like weapon sights). He does not place crushable items (like the protective mask) directly under the attaching harnesses. Exposed weapons or equipment, snap hooks, and projections are potential safety hazards that the parachutist tapes.

Parachutist and Parachute Load Limitations

Commanders: Do not overload the parachutist with equipment! The variety (and weight) of equipment and weapons that can be attached to a parachutist (Figures 4-1 to 4-4) may exceed the safe design limits of the RAPS resulting in parachute damage, unsafe descent rates, and injury to the parachutist. Also, the parachutist's actions (and the time available) to release the tie-down straps and to lower the equipment may interfere with his control of the parachute close to the ground.

Life Preservers

Life preservers must be worn whenever the planned flight path (from exit to impact point) is over open bodies of water (over 3 feet deep and large enough to be unavoidable with a maneuverable chute) for one third or more of the distance under canopy. They must also be worn when an open body of water is within 1,000 meters of the planned impact point.

DESCRIPTION	MAXIMUM CONTAINER LOAD (POUNDS)	MAXIMUM RIGGED WEIGHT (POUNDS)*
MEDIUM COMBAT PACK	50	55.56
LARGE COMBAT PACK	70	75.96
*Weight of H-harness or attaching sling.		

Figure 4-1. Container weight limits.

DESCRIPTION	WEIGHT (POUNDS)	REFERENCE	REMARKS
MAXIMUM LOAD BEARING CAPACITY RAPS ON DEPLOYMENT	360	Natick Research and Development Command	Increased weights will reduce canopy service life or destroy canopy (for example, blown cells)
AIR MOVEMENT PLANNING WEIGHT OF COMBAT-EQUIPPED FREE-FALL PARACHUTIST	305		Parachutist with one equipment container and weapon

Figure 4-2. Parachute load limits.

B-7 Life Preserver

The parachutist wears the B-7 under his parachute harness and over his uniform or jumpsuit (Figure 4-5). To fit the life preserver, he places one flotation packet under each arm so that the packet flaps are to the outside and the toggle cords are down and to the front. He routes the shoulder strap from front to rear over his left shoulder, under the back strap, then from rear to front over his right shoulder and attaches it to the ring on the right flotation packet.

He adjusts the shoulder strap so that the flotation packets fit snugly against his armpits, He attaches the chest strap to the attachment ring on the left flotation packet forming a quick release.

If there is a water emergency, he inflates the life preserver by pulling the toggle cords located on each flotation packet. He can also manually inflate the life preserver by blowing into the rubber hose located on each flotation packet. He uses manual inflation only if the $C0_2$ inflation system fails to operate.

WARNING

The parachutist ensures he does not wear the B-7 life preserver with the inflation packets between the parachute harness and his body. Serious injury may result if inflated when worn incorrectly.

CONTAINER TYPE	CONTAINER MAXIMUM INTERNAL WEIGHT	WEIGHT OF CONTAINER	SUSPENDED WEIGHT OF RAPS WITH OXYGEN	FATIGUE UNIFORM HELMET, MASK, AND BOOTS	SOLDIER WEIGHT	M16A1 RIFLE	TOTAL SUSPENDED WEIGHT*
KIT BAG	50	3	43.15	15	205	7.6	323.75
MEDIUM COMBAT PACK	50	5.56	43.15	15	205	7.6	326.31
LARGE COMBAT PACK	70	5.96	43.15	15	205	7.6	346.71

*Weight of parachutist in pounds

Figure 4-3. Weight of parachutist with two equipment loads.

WEAPON LOAD TYPE	WEAPONS LOAD WITH AMMUNITION[1]	WEIGHT OF LARGE COMBAT PACK	SOLDIER WEIGHT	FATIGUE UNIFORM HELMET, MASK, AND BOOTS[2]	LOAD-BEARING EQUIPMENT WITH TWO CANTEENS (WATER)	SUSPENDED WEIGHT OF RAPS WITH OXYGEN	REMAINING WEIGHT OF RAPS WITH OXYGEN	TOTAL SUSPENDED WEIGHT*
M16 RIFLEMAN	31	5.96	205	15	11.5	43.15	48.39	360
M203 GUNNER	40	5.96	205	15	11.5	43.15	39.39	360
RADIO OPERATOR	71.6	5.96	205	15	11.5	43.15	7.79	360
M60 MACHINE GUNNER	54.4	5.96	205	15	11.5	43.15	24.99	360

*Weight of parachutist in pounds

[1] Includes basic load of ammunition, grenades, Claymore, bayonet, and cleaning kit.

[2] Weight of uniform does not include winter gear (for example, parka, liners, underwear).

Figure 4-4. Weight of parachutist with two equipment loads and basic load.

Figure 4-5. B-7 life preserver.

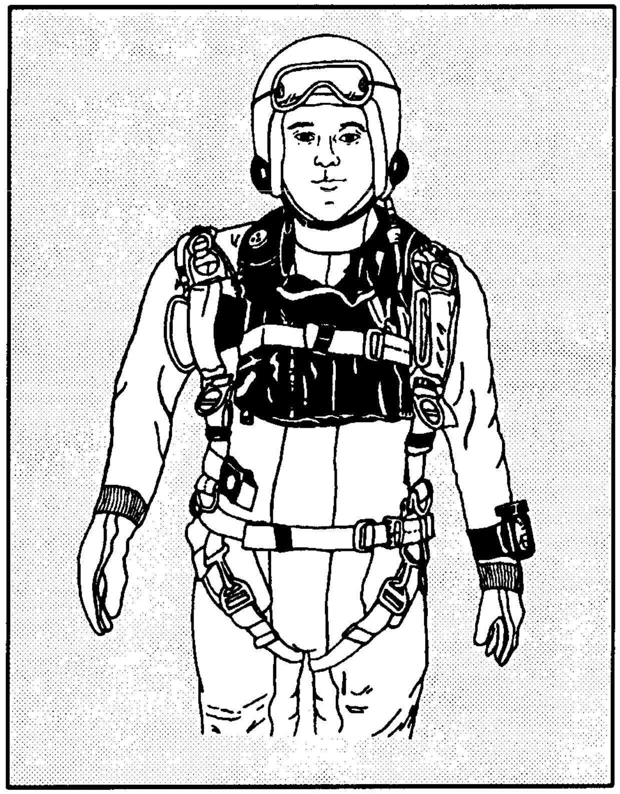


Figure 4-6. UDT life vest.

Underwater Demolition Team (UDT) Life Vest

In Figure *4-6*, the parachutist is wearing the UDT life vest instead of the B-7 Life preserver. He dons the vest before donning the parachute harness. He may inflate the vest manually or with CO_2. The UDT life vest should be rubber banded to prevent interfering with the cutaway handle and reserve rip cord handle.

Hook-Pile Tape (HPT) (Velcro) Lowering Line Assembly

Figure 4-7 shows the steps for stowing an HPT lowering line assembly. The current HPT lowering line assembly (NSN 1670-01-067-6838) consists of—

- An 8-foot lowering line made of l-inch-wide tubular nylon.
- A 9-by 7-inch nylon duck retainer (stow pocket) sewn to the upper end. The flaps have HPT sewn to the edges.
- A metal (parachute harness) ejector snap.

NOTE: To help in preventing the inadvertent, premature deployment of the lowering line, the parachutist places a double looped retainer band around the middle of the stowed lowering line retainer pocket before attaching it to the combat pack (Figure 4-8).

Weapons Preparation

A parachutist can jump with his individual weapon either exposed or inside a weapon or other equipment container. If the commander decides to jump with weapons exposed, he must consider the increased risk of injury to the parachutist(s) that may further hinder the mission's success.

Exposed Weapons

A buddy helps the parachutist attach an exposed weapon to his left shoulder. The muzzle always faces down and the pistol grip to the rear to reduce the chance of entanglement during parachute deployment. Hazards the parachutist faces when jumping with exposed weapons include-

- The weapon becoming entangled with the parachute upon deployment.

- The weapon becoming entangled with another parachutists parachute should a midair entanglement occur.

- Damage to the weapon upon landing or when dragged on the ground.

Ml6A1/A2 Rifle

The parachutist prepares the rifle by extending the sling all the way and tapes the keeper in place. He secures padding over the side-mounted bolt assist and the operating handle, He pads and tapes the muzzle and sights to avoid possible entanglement with the parachute's suspension lines or dirt clogging the weapon upon landing. He inserts the magazine and tapes it to the receiver, including the ejector port cover, to prevent loss of the magazine as well as debris from entering the bolt area. He tapes the handguards to prevent their loss at landing impact, To aid the removal of the padding and tape, he folds and presses together a portion of adhesive side of the running end of the tape to form a quick-release pull tab, Figure 4-9 shows the M16A1/A2 rifle rigged for jumping.

Tie-Downs. The parachutist uses a 12- to 18-inch tie-down of 1/4-inch cotton webbing (or a like item) to secure the weapon. He attaches the tie-down to the weapon sling, about 6 inches below the buttstock sling swivel, with a girth hitch.

Positioning. With the help of a buddy the parachutist slings his weapon over his left shoulder with the muzzle down and rotates the pistol grip to his rear (Figure 4-10). He places the sling from the lower keeper (buttstock) on the outside of the stock and over his left shoulder. He then runs the sling under the main lift web and routes the chest strap through the sling. He secures the tie-down to the weapon tie-down loop on the parachute system. He positions the weapon under the waistband. He tightens the waistband securely so that the weapon lies snugly against his side.

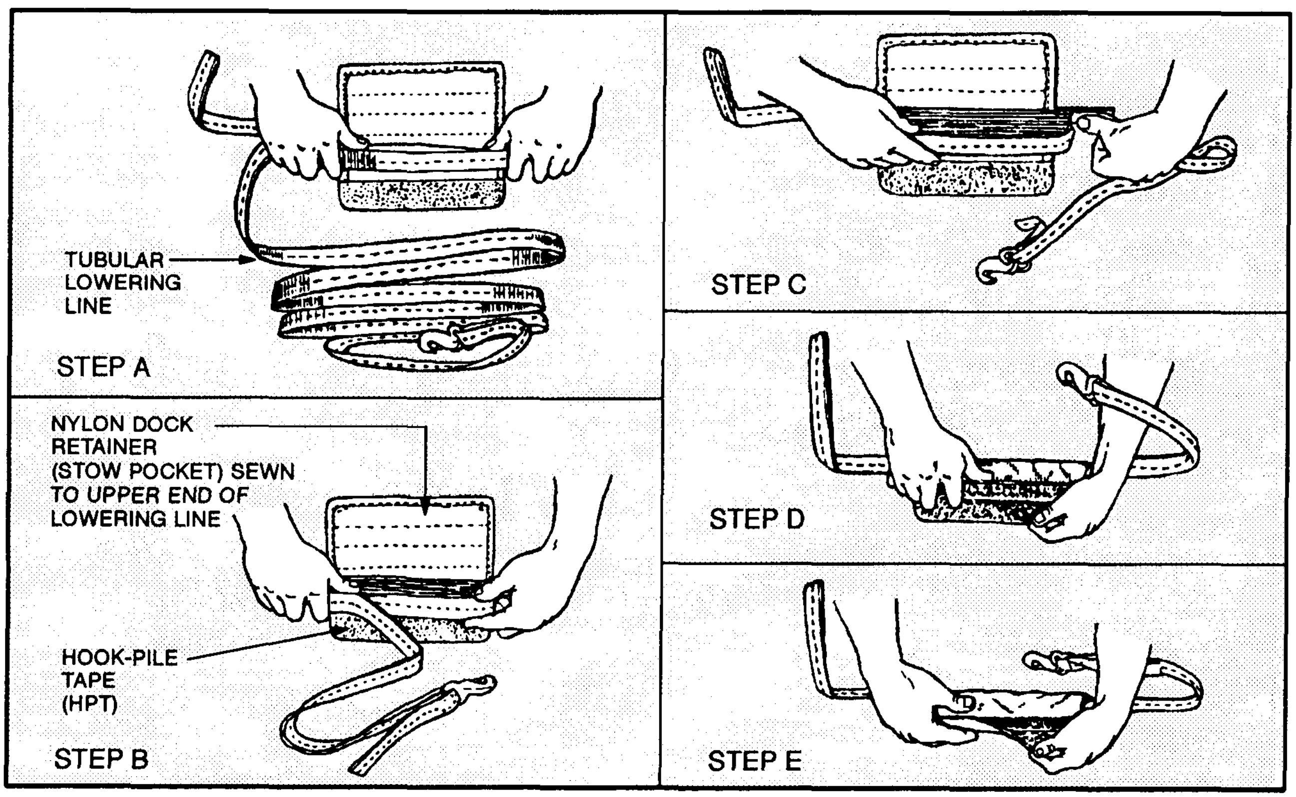


Figure 4-7. Stowing the HPT lowering line assembly.

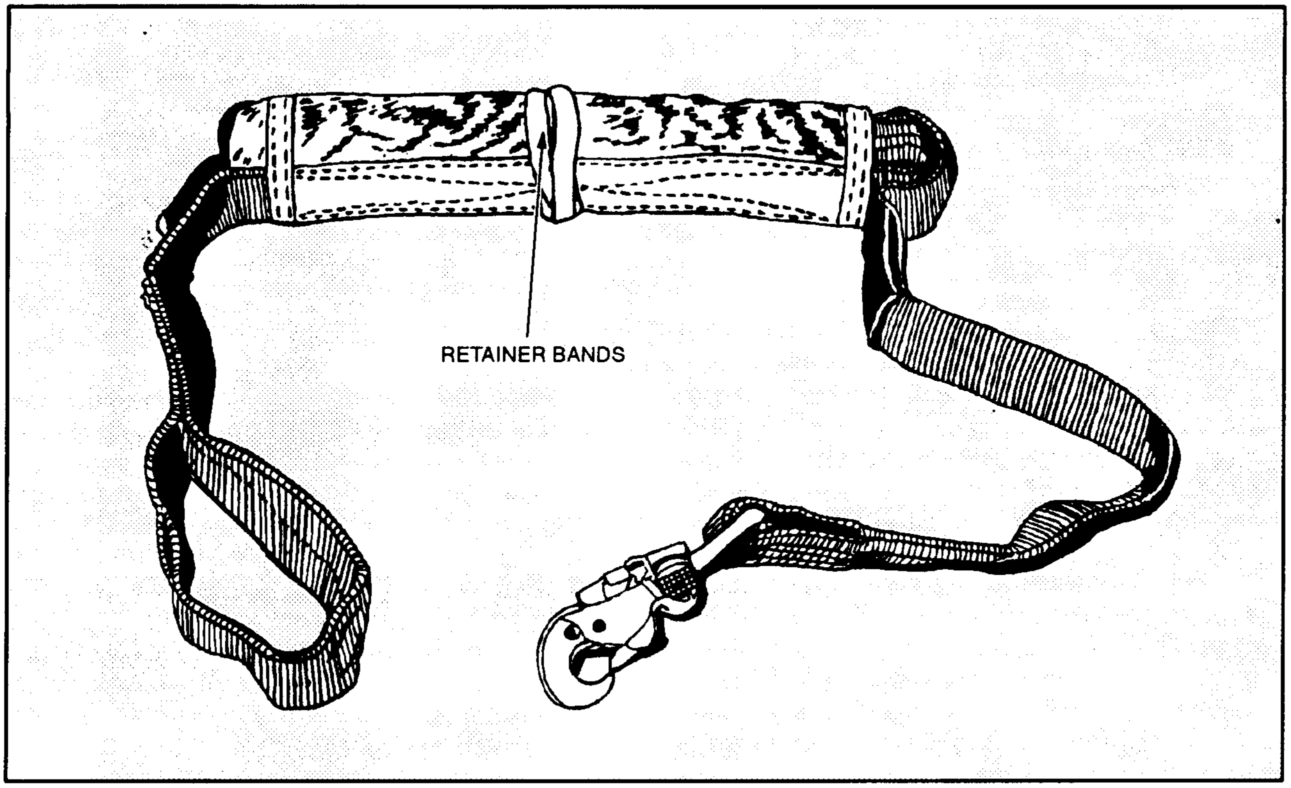


Figure 4-8. Stowed lowering line with retainer bands emplaced.

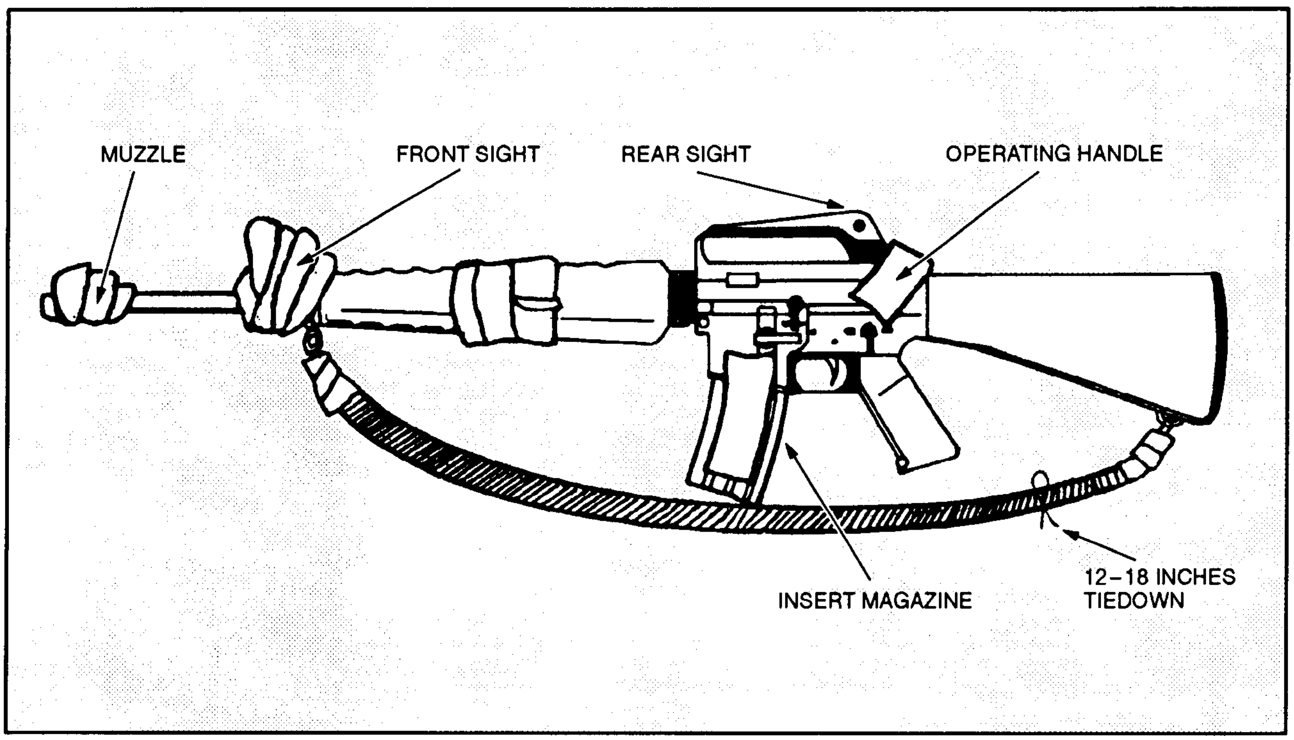


Figure 4-9. The M16A1/A2 rigged for jumping.

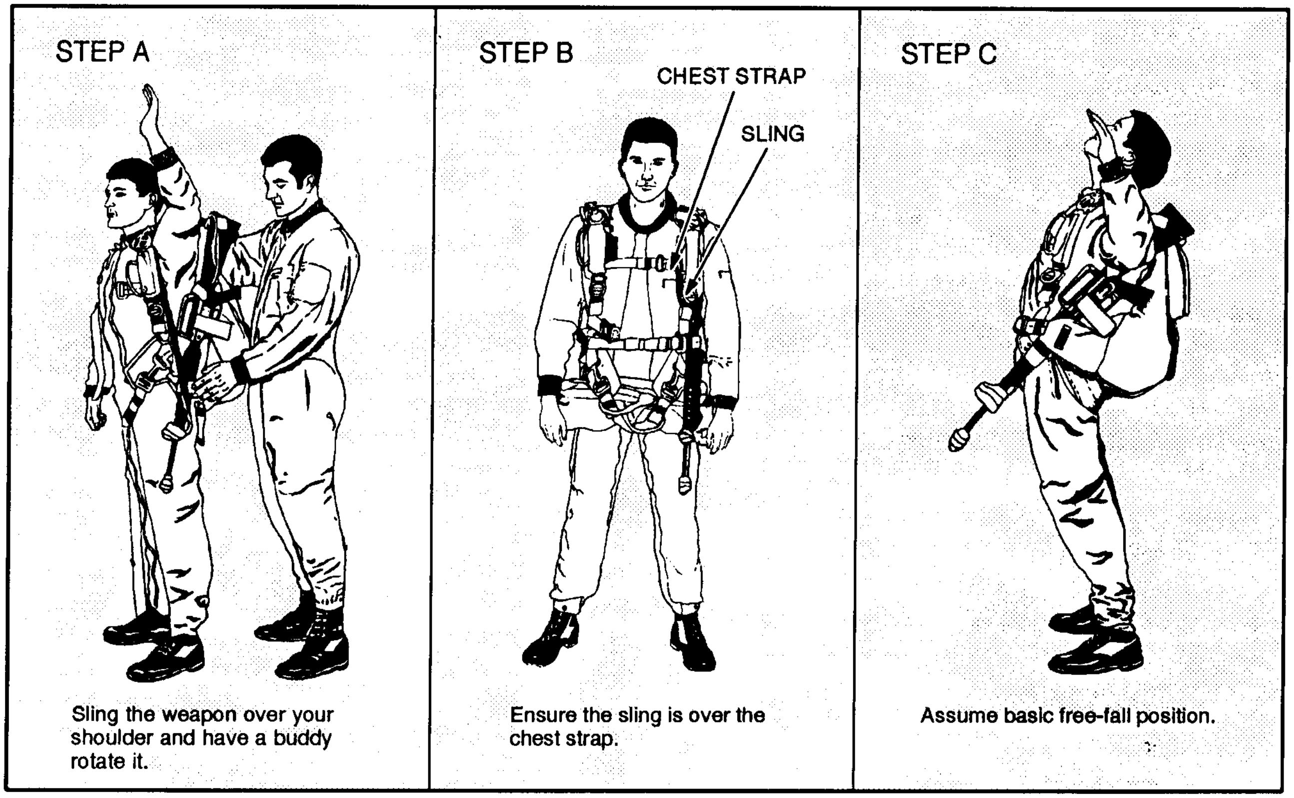


Figure 4-10. Positioning the weapon on the parachutist.

M203 Grenade Launcher

The parachutist prepares the grenade launcher the same as he does the M16A1/A2 as previously outlined. He tapes the handguard and grenade launcher barrel together with the barrel latch covered. He removes the quadrant sight. He tapes down the leaf and rear sights. Figure 4-11 shows the M203 rigged for jumping.

Tie-Downs. He uses the same procedures as for the M16A11A2.

Positioning. He uses the same procedures as for the M16A17A2.

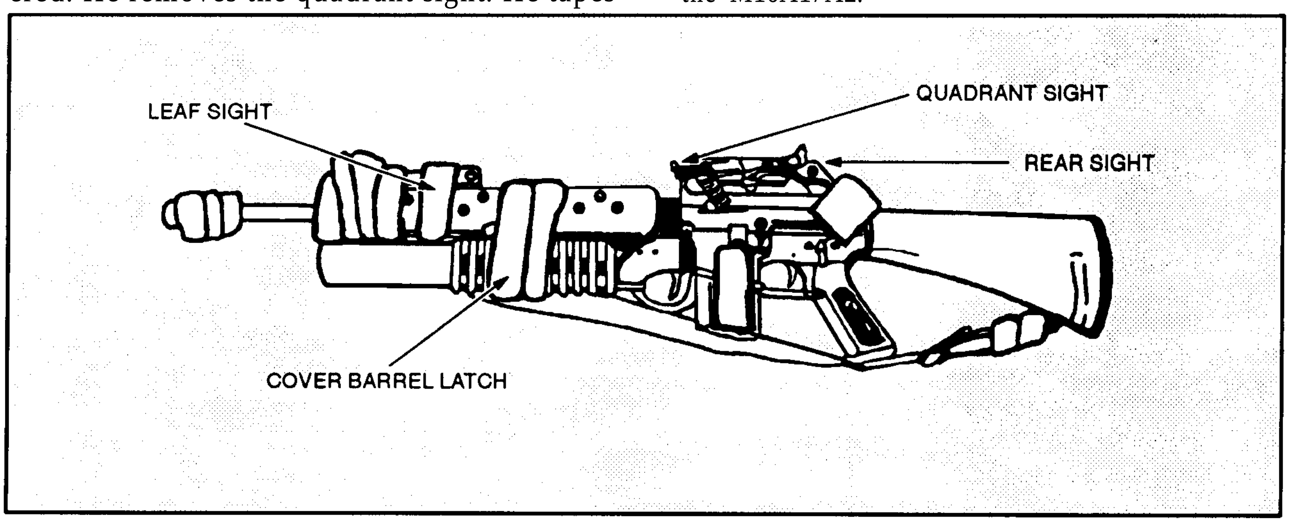


Figure 4-11. The M203 rigged for jumping.

M14, G3, and FN FAL Rifles

The parachutist prepares each of the weapons by removing the sling from the weapon and the sling-keeper from the sling. He forms a loop by running the sling through the slinghook. He replaces the sling by placing the loop around the small of the stock. He replaces the slingkeeper and secures the sling to the barrel, just below the front sight, with a half bitch. He tapes the butt plate closed. He pads and tapes the flash suppressor, front sight, and bayonet lug. He removes the optical sight and packs it in his equipment container. Figure 4-12 shows the M14 rigged for jumping.

TieDowns. He prepares a 12-to 18-inch tie-down as for the M16A1/A2 rifle.

Positioning. With the help of a buddy he slings the weapon over his left shoulder, muzzle down, and rotates the operating handle away from his body. He secures the weapon in the same manner as the M16A1/A2.

Submachine Guns, Caliber .45, MP5, MP5A3, and MP5K

The parachutist prepares each of these weapons by removing the sling from the upper swivel as well as all the sIack. He folds the end of the sling and runs the fold through the upper sling swivel. He passes the tip of the sling through the fold and fastens the snap. He closes the cover and removes the magazine. He collapses the stock. He tapes one magazine to the left of the receiver or carries it elsewhere. He covers and tapes the muzzle. Figure 4-13 shows the MP5 rigged for jumping.

Tie-Downs. He prepares a 12-to 18-inch tie-down as for the M16A1/A2 rifle.

Positioning. With the help of a buddy, he slings the weapon over his left shoulder, muzzle down, pistol grip forward, and secures it in the same reamer as the M16A1/A2 rifle.

M79 Grenade Launcher

The parachutist prepares this grenade launcher by letting the sling out about three-quarters of the way and tapes the keeper in place. He places the leaf-type sight in the down position and pads and tapes it to avoid snagging. He also tapes the lower sling swivel, breech lock, and muzzle. Figure 4-14 shows the M79 rigged for jumping,

Tie-Downs. He prepares a 12-to 18-inch tie-down as for the M16A1/A2 rifle,

Positioning. With the help of a buddy, he slings the weapon over his left shoulder, muzzle down, pistol grip forward, and secures it in the same manner as the M16A1/A2 rifle.

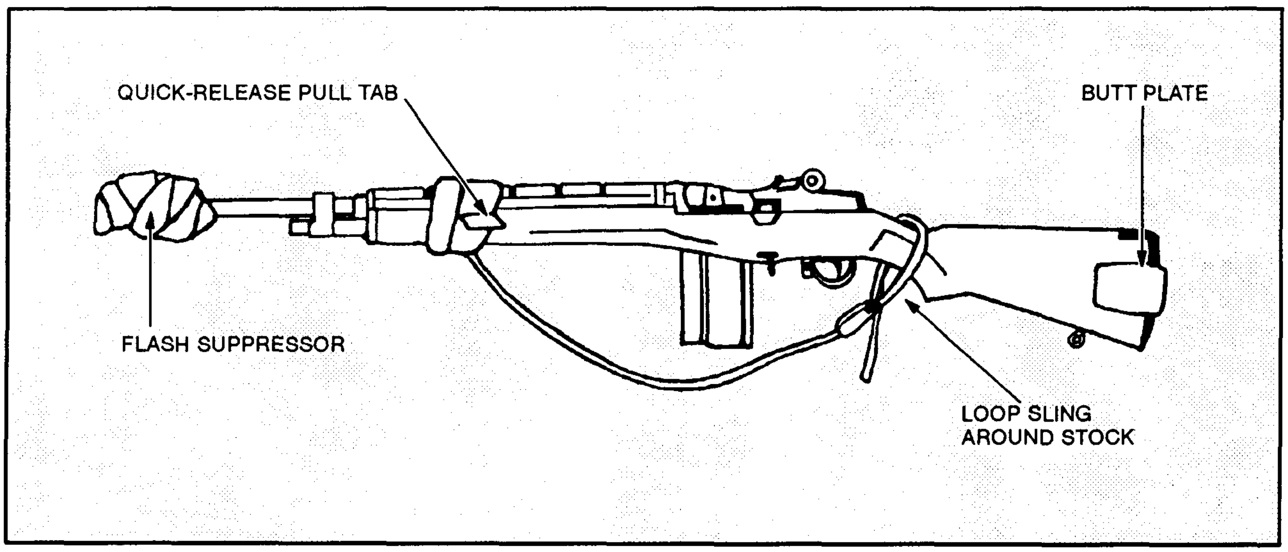


Figure 4-12. The M14 rigged for jumping.

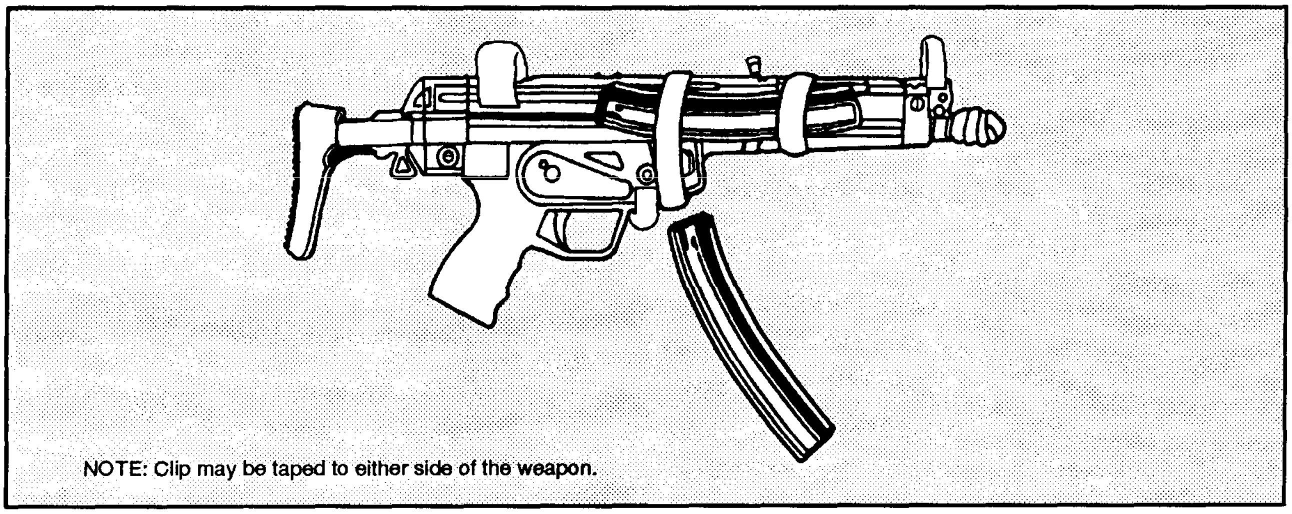


Figure 4-13. The MP5 rigged for jumping.

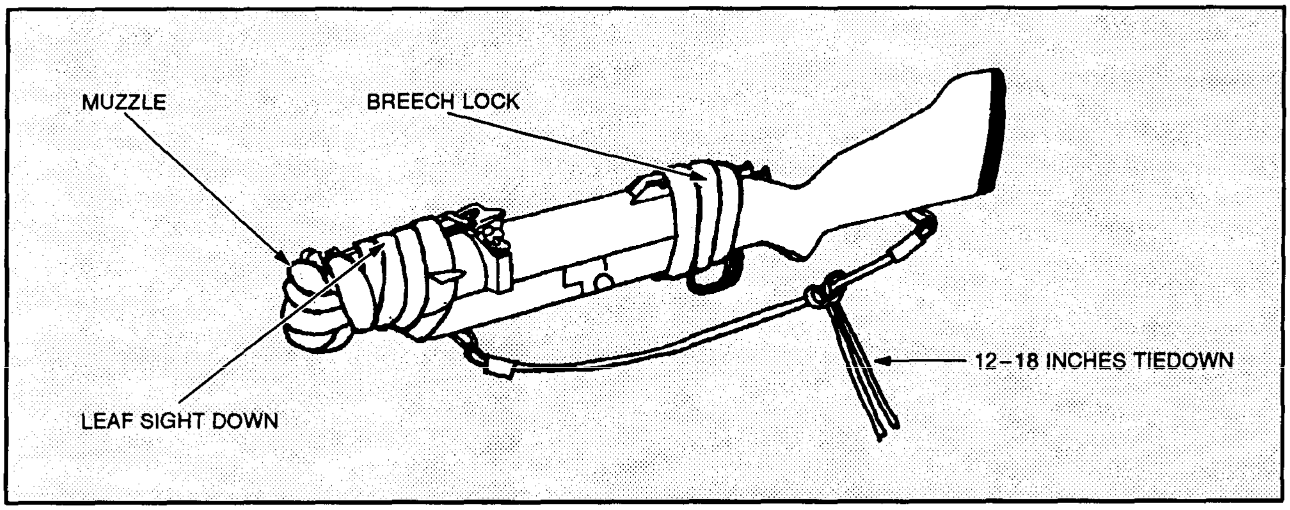


Figure 4-14. The M79 rigged for jumping.

Pistols

The parachutist can jump with a pistol in a shoulder holster or packed in an equipment container. He wears the shoulder holster under his jumpsuit or other protective clothing. He secures the pistol in the holster by taping the holster closed or by using a lanyard.

M60 Machine Gun, M224 60-mm Mortar, M249 Squad Automatic Weapon (SAW)

The parachutist does not jump with these weapons exposed during MFF operations. He breaks them down and packs them in a front-mounted equipment container or kit bag.

Other Weapons

The parachutist can rig other weapons using the methods previously described. User unit SOPs should specify ways to pack or rig similar type weapons consistent with safety requirements. Units requiring technical help should contact B Company, 2d Battalion, 1st Special Warfare Training Group, USAJFKSWCS, DSN 236-7601/7796.

Combat Packs and Other Equipment Containers

This paragraph discusses the use of harnesses, equipment attachment slings, and lowering lines in preparing and rigging kit bags and different packs.

H-Harness (Modified)

The modified H-harness consists of two 84-inch nylon straps held together by two Ii-inch straps (Figure 4-15). One end of each strap has two friction adapters attached 3 inches apart. Two 24-inch or 36-inch equipment attachment straps with adjustable lugs and two quick-release ejector snap hooks are part of the assembly. Figure 4-16 shows the steps used to lever an ejector snap hook. The H-harness is used to rig the kit bag and combat packs to the parachute harness.

Improved Equipment Attachment Sling

The improved equipment attachment sling was a component of the MC-3 military free-fall system (Figure 4-17). The parachutist modifies this sling by removing the leg straps with HPT closures or folds and tapes the leg straps so that he cannot use them. This sling is used to rig combat packs to the parachute harness.

Aviator's Kit Bag

The parachutist uses the canvas kit bag to jump individual equipment such as the load-carrying equipment (LCE) or machine gun groups that have been properly padded. It has two carrying handles and a slide fastener and snaps that extend across the top of the bag to secure it.

Preparing the Bag. The parachutist packs the equipment JAW unit SOP. He carefully places sharp-edged objects in the bag so that they are not against his body when he attaches the bag to the parachute harness. He unfastens the snaps, undoes the slide fastener, and folds down the top of the kit bag (about one-half its filled bulk) to pack the equipment. When packed, he zips the bag and fastens the snaps. He gathers up the excess bag material and folds it on top so as to expose the handles.

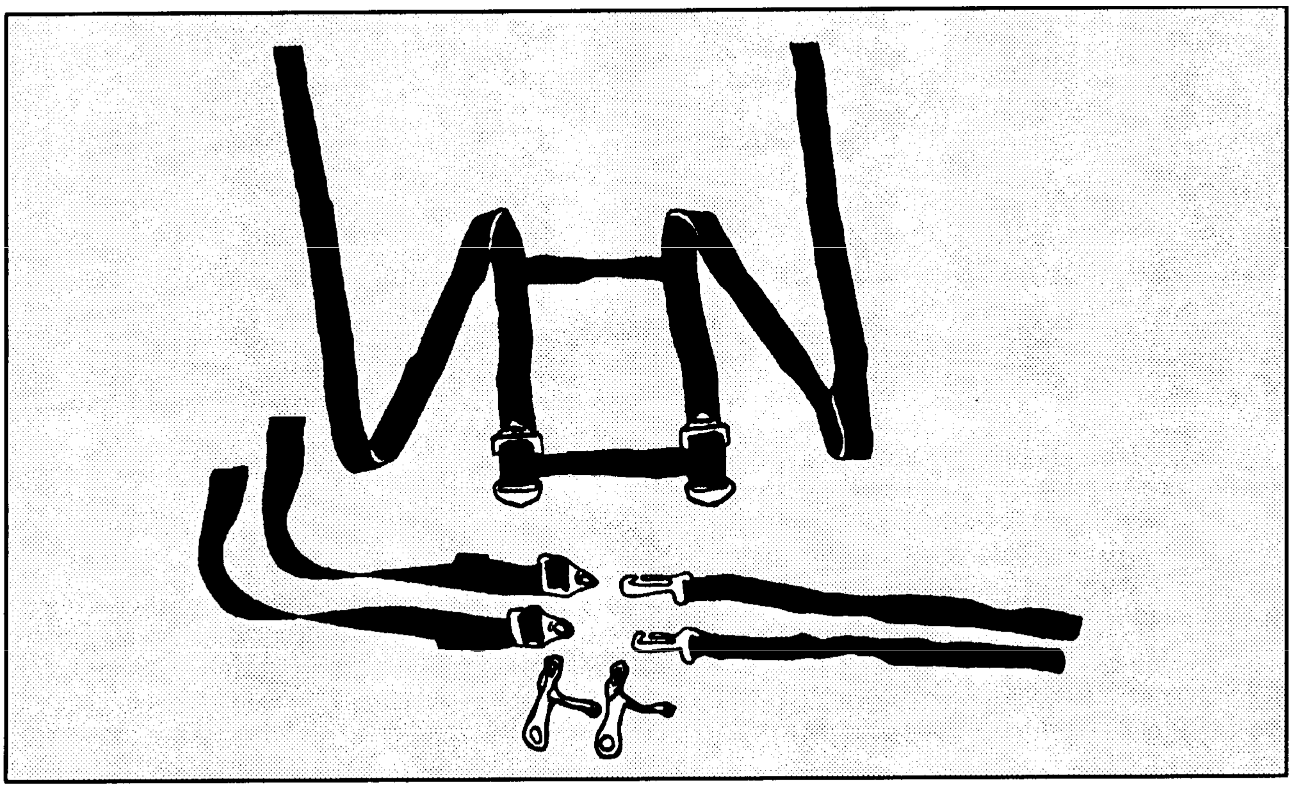


Figure 4-15. Modified H-harness with attaching straps.

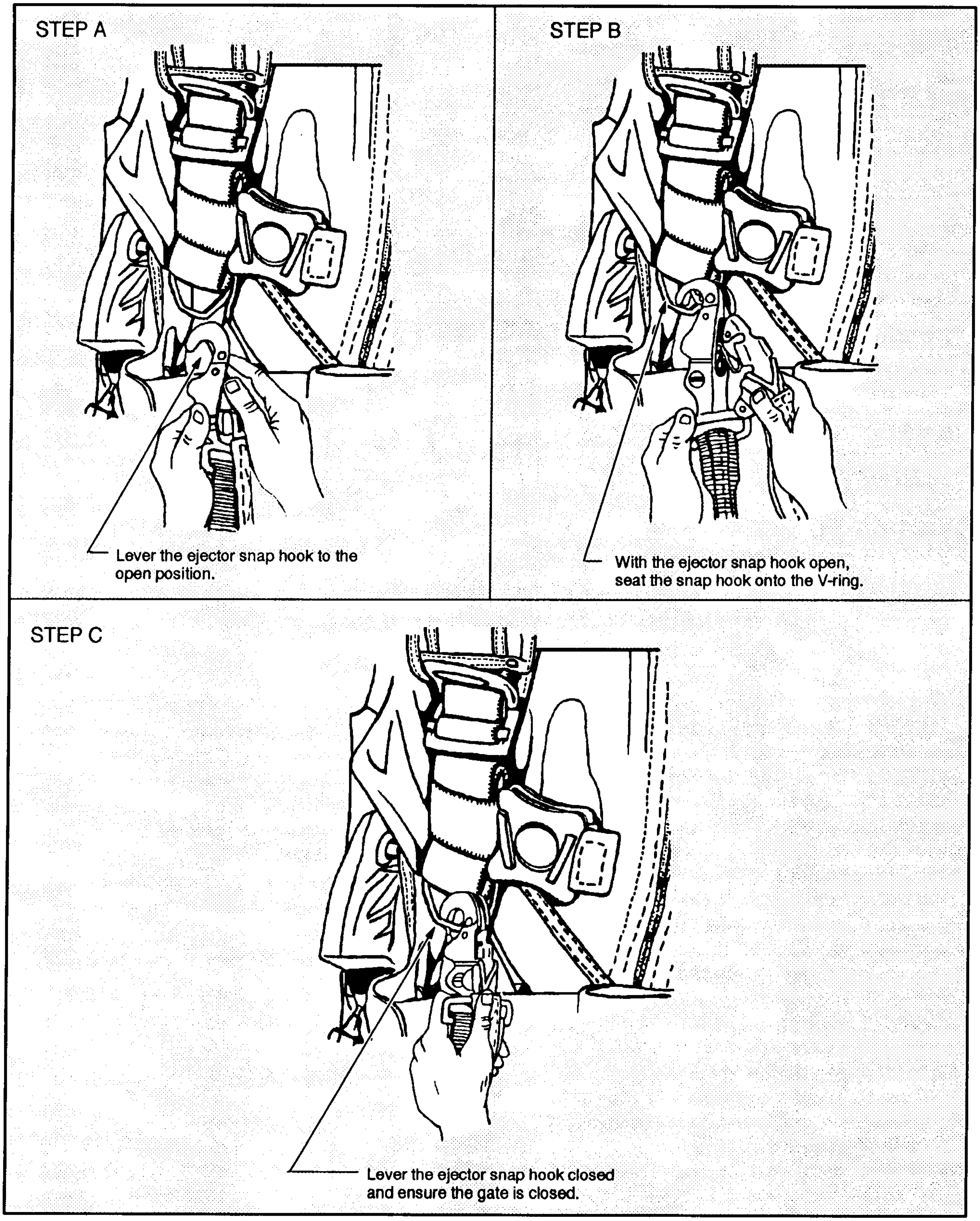


Figure 4-16. Levering the ejector snap hook.

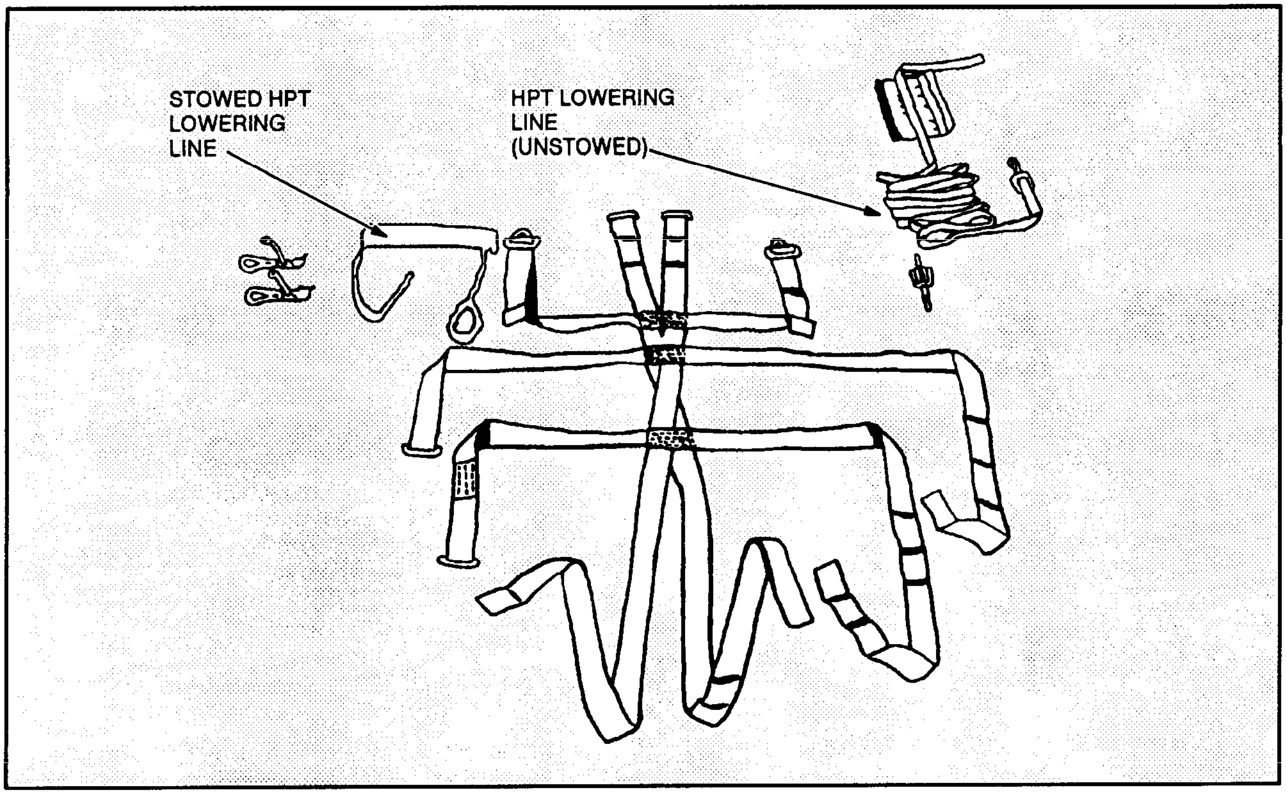


Figure 4-17. Improved equipment attachment sling and lowering line.

Attaching the Modified H-Harness to the Kit Bag. The parachutist takes the two end web adapters and lays out the harness (with the adapters nearest the body and the second two adapters on top). He connects the equipment attachment straps as follows: With the adjustable lug nearest the body, he threads the attachment strap's end under the attaching bar of the second friction adapter and back over the top of the bar. He tightens the strap leaving about 3 inches between the nap and the bar. He repeats this step for the remaining strap. He places one quick-release snap hook on each adjustable lug. He lays out the modified H-harness with the attachment straps down and the snap hook openings up. He attaches the modified H-harness to the kit bag by centering the bag on the harness 6 inches from the snap hooks. He places the modified H-harness straps around the kit bag and threads them through the friction adapters to form a quick release. He threads the snap hooks on the attaching straps through the handles of the kit bag. He rolls and tapes any excess strap (Figure 4-18).

Attaching the Kit Bag to the Parachutist. When completely rigged, the parachutist attaches the modified H-harness to himself by running the attachment straps through the handles of the kit bag and then attaching them to the equipment attachment rings on the parachute harness. If wearing a front-mounted aviator's kit bag and a rear-mounted combat pack, he hooks up the kit bag quick-release snap hooks to the equipment attachment rings first. He then hooks up the combat pack quick-release snap hooks to the outside of the kit bag's snap hooks.

Combat Packs, Medium and Large

The parachutist attaches the medium and large combat packs to himself using the modified H-harness or the improved equipment attachment sling. He can attach the combat pack either to his front or rear (Figure 4-19).

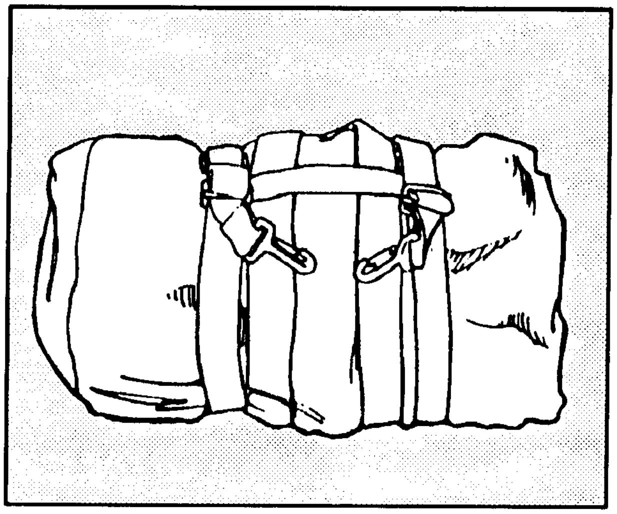


Figure 4-18. The modified H-harness attached to the kit bag.

Packing the Combat Pack. The parachutist inserts equipment in the combat pack and places padding between the load and the front portion of the pack. He fills the outside pockets with nonfragile items as the full pockets help to position the modified H-harness and attachment sling. He closes the combat pack by engaging the drawstrings and tie-down straps. He routes the running ends of the waist straps behind the frame and secures them by tying or taping.

Rigging the Medium Combat Pack Without the Pack Frame. The parachutist turns the pack upside down. He places the modified H-harness on his pack so that the cross straps are in front of the pack and the friction adapters are touching the bottom of the pack. He runs the harness straps over the top of the pack and crosses the straps at the center of the back of the pack. He runs the straps through the friction adapters. He threads the equipment attaching straps through the intermediate fiction adapters. He attaches the quick-release snap hooks to the adjustable lugs.

Attaching the Rear-Mounted Combat Pack. The parachutist loosens the shoulder straps. He steps through the shoulder straps, one leg through each strap (Figure 4-20). He attaches the lowering line to the right side lowering line attachment V-ring on the parachute harness (Figure 4-21). He attaches the quick-release snap hooks to the equipment rings on the main lift webs.

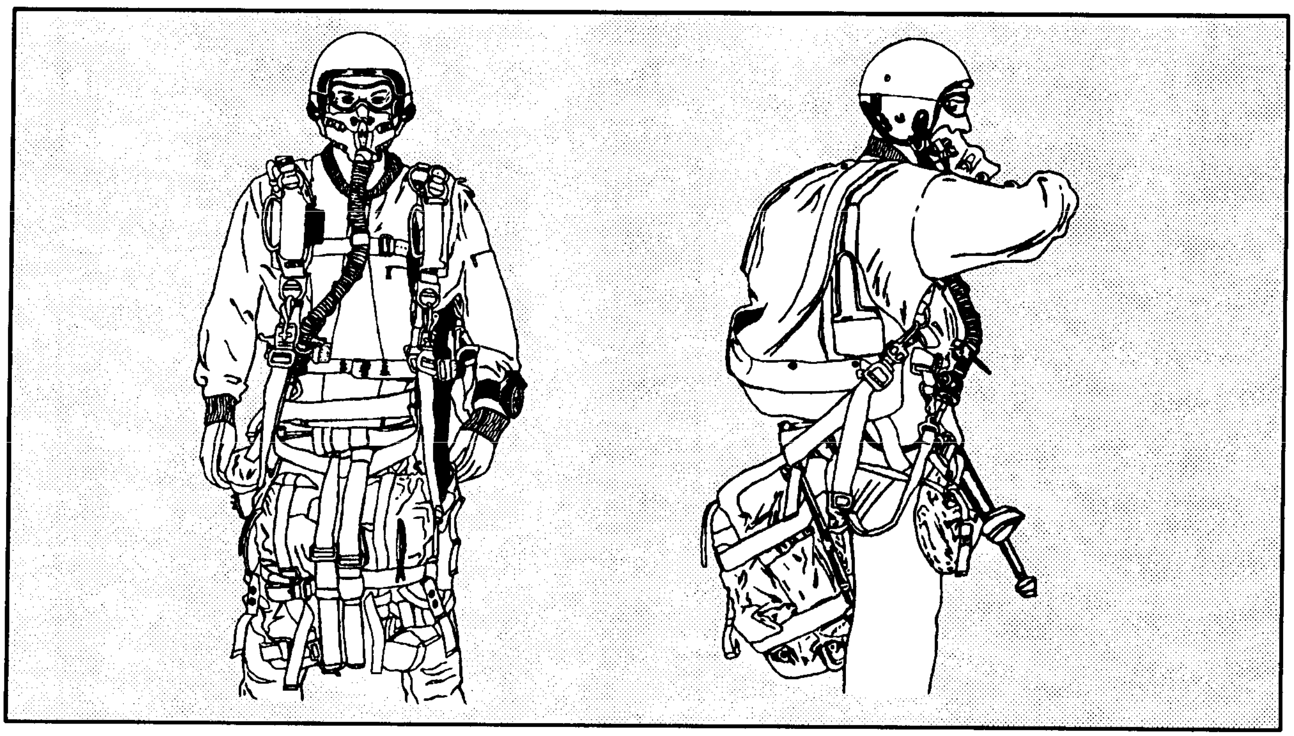


Figure 4-19. Front- or rear-mounted combat pack.

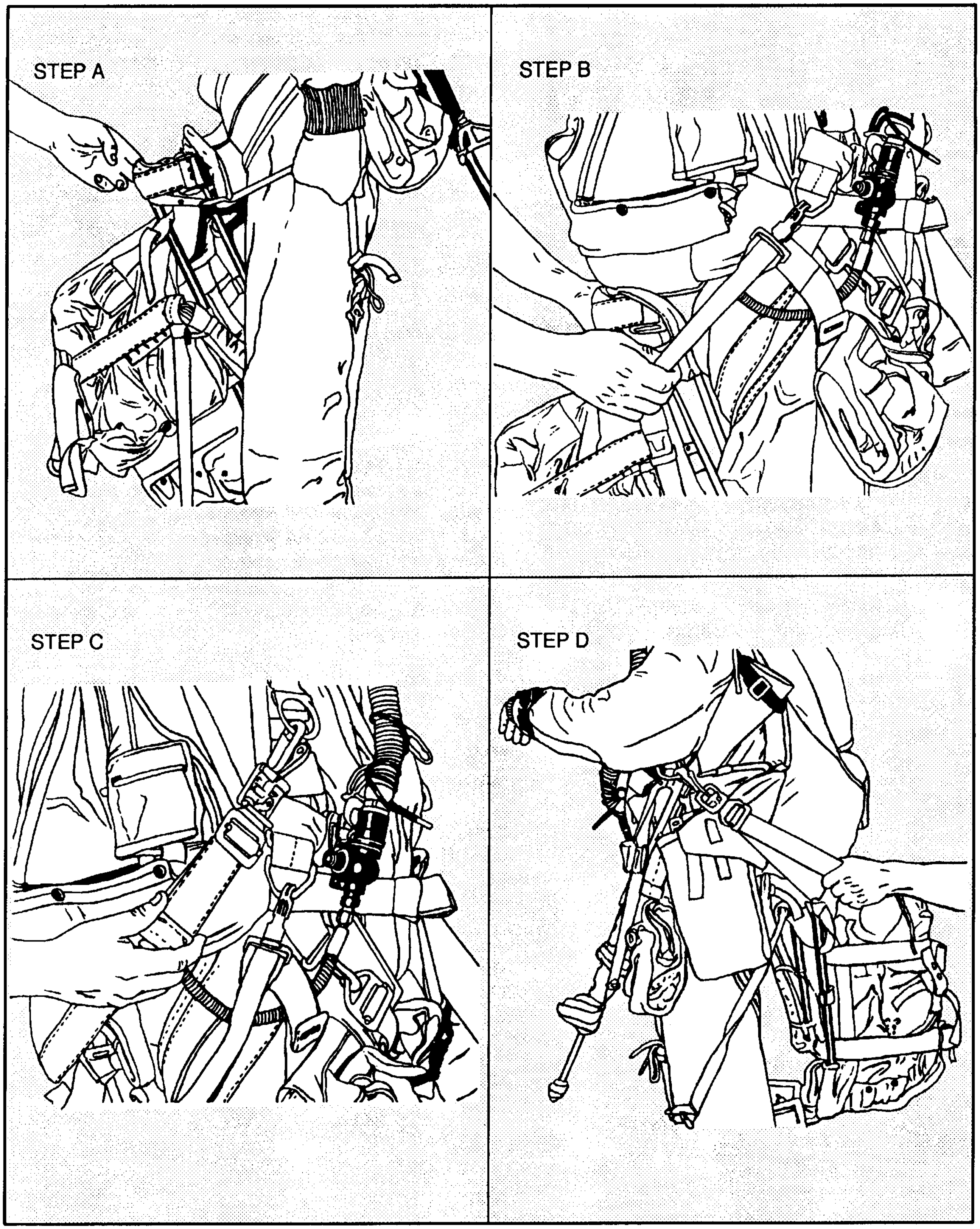


Figure 4-20. Attaching the rear-mounted combat pack.

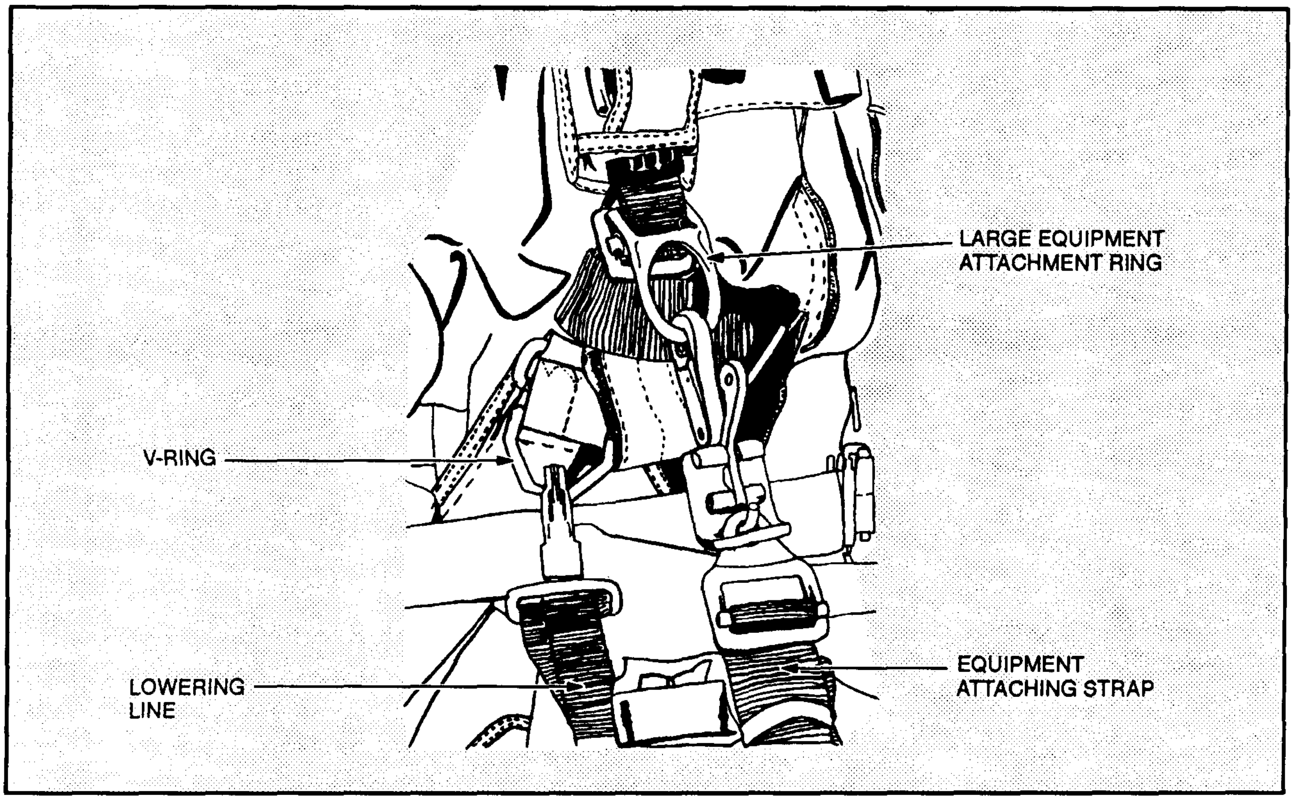


Figure 4-21. The lowering line attached to the lowering line attachment V-ring.

Attaching the Front-Mounted Combat Pack (Figure 4-22). The parachutist loosens the shoulder straps. He faces the combat pack (as in Figure 4-22, Step A) and steps through the shoulder straps, one leg through each strap (as in Figure 4-22, Step B). He attaches the lowering line to the right side lowering line attachment ring on the parachute harness (Figure 4-21). He attaches the quick-release snap hooks to the equipment rings on the main lift webs (Figure 4-22, Step C). Figure 4-23 shows a side view and a front view of a front-mounted combat pack.

Rigging the Medium and Large Combat Packs with the Pack Frame, Modified H-Harness, and Lowering Line. The parachutist—

- Turns the pack upside down. He places the modified H-harness on the pack ensuring the cross straps are to the top of the pack and the friction adapters are touching (or near) the bottom of the frame (Figure 4-24).
- Runs the harness straps over the top of the pack load and then under the top portion of the frame.
- Runs the harness straps under the horizontal bar of the frame and crosses them at the center of the back of the pack. He routes the loop end of the lowering line under the crossed diagonal straps. He passes the running end of the lowering line through its own loop and tightens it, ensuring he centers the lowering line at the intersection of the straps.
- Continues to run the straps under the frame and secures them to the friction adapters.
- Secures the lowering line stow pocket to the pack frame with retainer bands. He leaves the portion with the quick-ejector snap free for attachment to the parachute harness.
- Threads the equipment attaching straps through the intermediate friction adapters, attaches a quick-release snap hook to each adjustable lug, and rolls and tapes any excess straps.

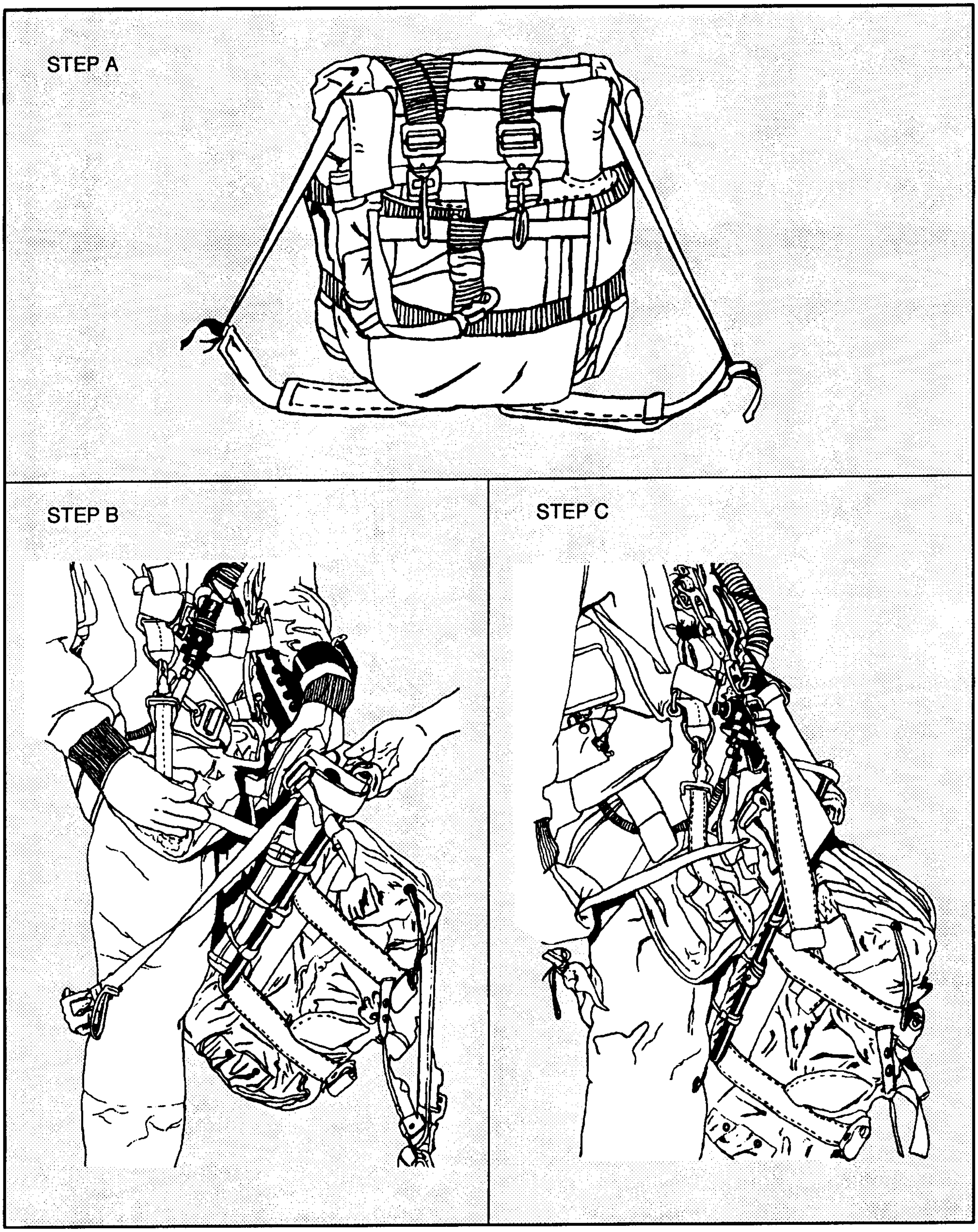


Figure 4-22. Attaching the front-mounted combat pack.

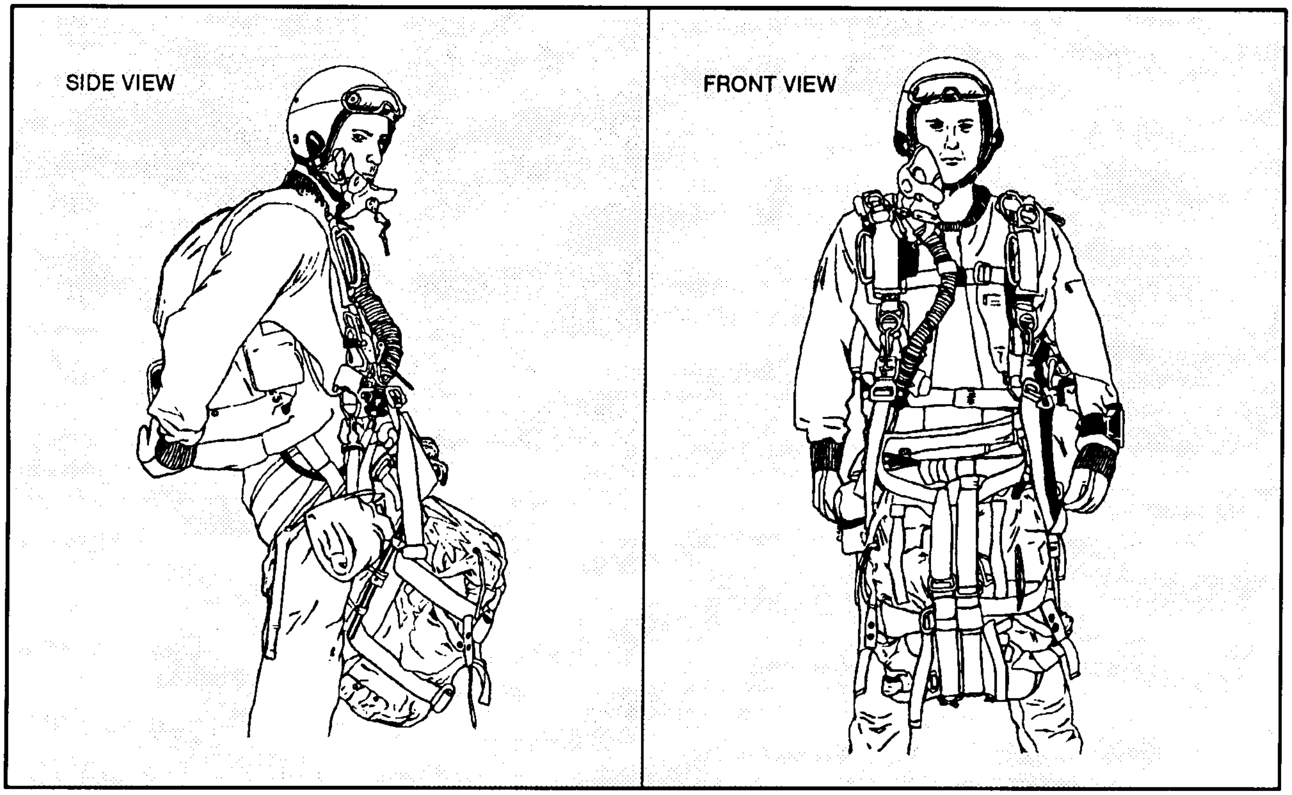


Figure 4-23. Parachutist with front-mounted combat pack.

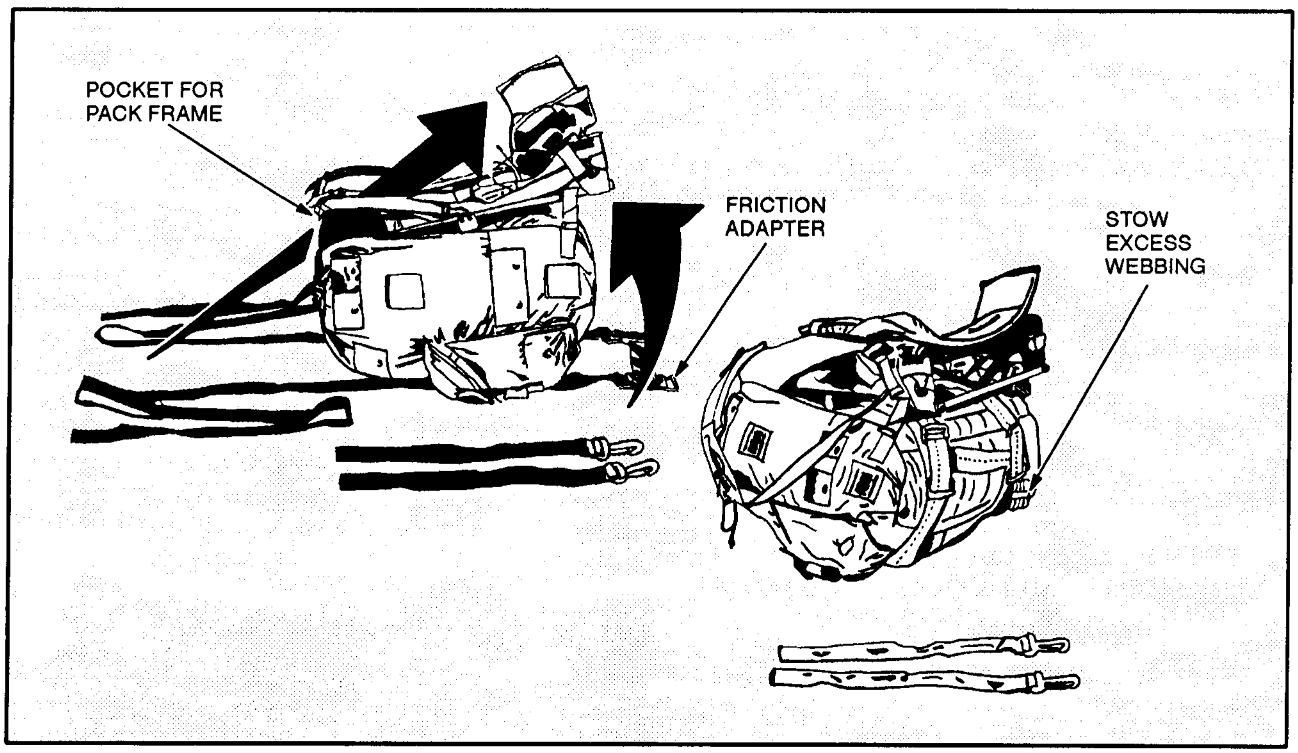


Figure 4-24. The combat pack and frame rigged with the modified H-harness.

Attaching the Combat Pack With Frame. The parachutist attaches the combat pack with frame to himself in the same manner as the combat pack without frame.

Rigging the Large Combat Pack With the Improved Equipment Attachment Sling and Lowering Line. The parachutist—

- Tightens and secures all straps on the pack and positions the pack with the frame up (Figure 4-25). He positions the harness on the frame with the friction adapters on the diagonal locking straps at the bottom of the frame and the running ends at the top of the frame. He routes the friction adapters of the diagonal locking straps under the pack frame's base. He routes the anchor straps (parachute harness attaching straps with adjustable quick-release lugs) and lateral locking straps under the shoulder straps and over the pack frame.
- Turns the pack over. He routes the running ends of the diagonal locking straps around the long axis of the pack, across the straps at the center of the back, and secures them to their respective friction adapters that protrude beneath the bottom of the pack frame. Using one turn of single Type III nylon cord (550-pound suspension line), or one turn of double l/4-inch cotton webbing, he ties the two diagonal strap friction adapters to each other leaving an 8-inch space between the two adapters.
- Tightens the lateral locking straps and secures them around the pack and to their respective friction adapters.

NOTE: If the pack is small, the parachutist crosses and tightens the lateral locking straps and secures them around the pack and to their opposite friction adapters.

- Folds and secures the running ends of all straps to themselves with tape or ties them with l/4-inch cotton webbing.
- Places the combat pack in an upright position.
- Attaches a quick-release snap hook to each adjustable lug so that the latch handles face away from his body when attaching the combat pack to the equipment rings.

WARNING

The parachutist tapes all combat pack shoulder strap quick-ejector releases to preclude inadvertent release in free-fall causing instability.

Attaching the Lowering Line. The parachutist routes the loop end of the lowering line under the crossed diagonal straps between the diagonal straps and the loop on the backside of the diagonal straps. He passes the running end of the lowering line through its own loop and tightens it (Figure 4-26).

The parachutist makes S-folds with the remainder of the lowering line, places it into the retainer pocket, and secures this pocket to the appropriate side of the pack frame (right side for front mount, left side for rear mount) with retainer bands. He uses three retainer bands: two on the frame and one double wrapped around the center of the lowering line. He removes the yellow disconnect lanyard. He then attaches the lowering line quick-ejector snap to the right side lowering line attachment V-ring.

Releasing the Combat Pack. After his canopy deploys and he is clear of other parachutists and has canopy control, the parachutist loosens the combat pack's shoulder straps and pulls them clear of the kit bag. At the same time he detaches the combat pack's right side quick-ejector so that the pack falls cleanly when released. About 200 feet above the ground, he activates the remaining quick-release snap hook to allow the combat pack to fall to the end of the lowering line. To jettison the combat pack, he releases the lowering line's quick-ejector snap, allowing the pack to fall free.

WARNING

The parachutist lowers all rear-mounted combat packs with frames to avoid injury upon landing.

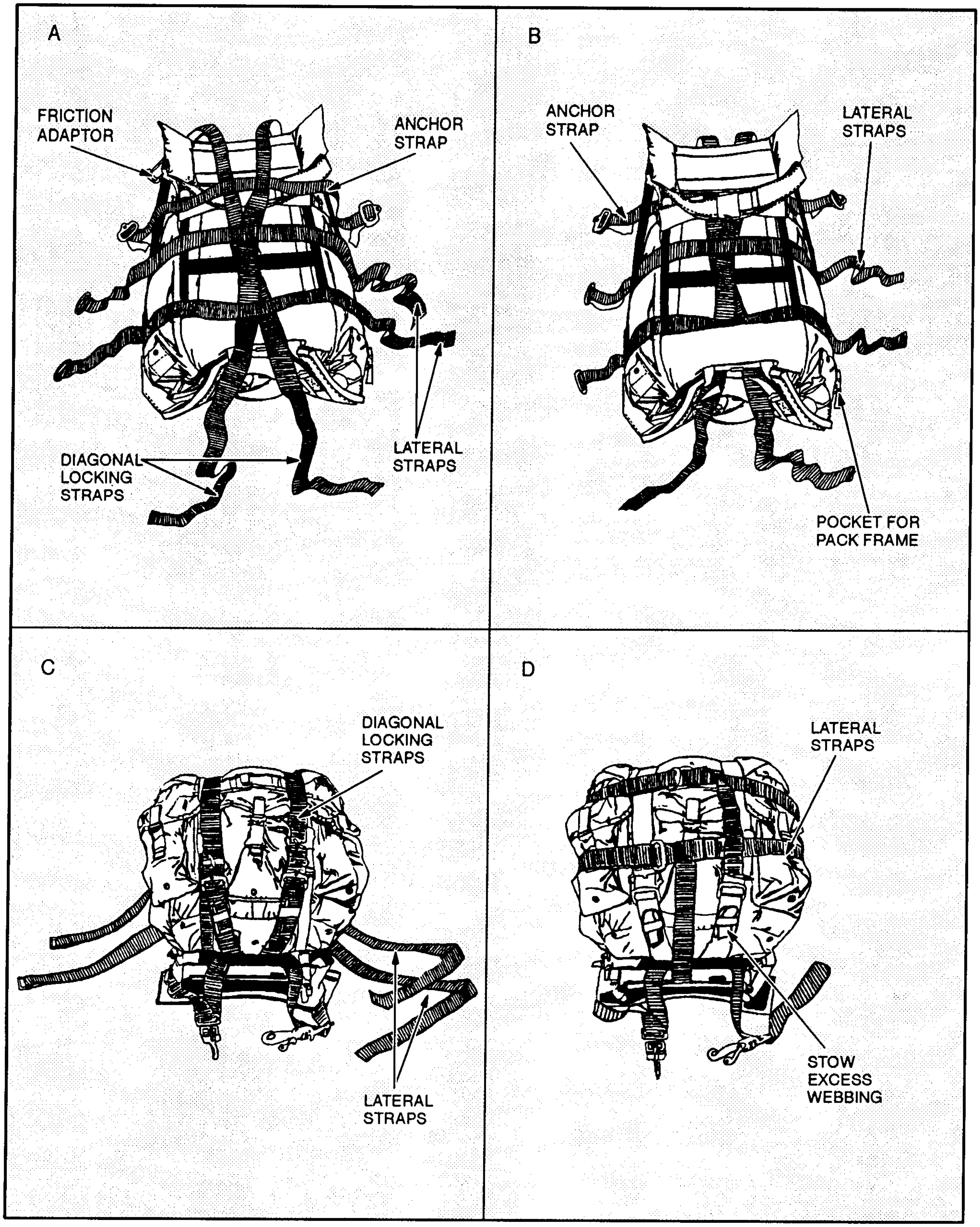


Figure 4-25. The combat pack and frame rigged with the improved equipment attachment sling.

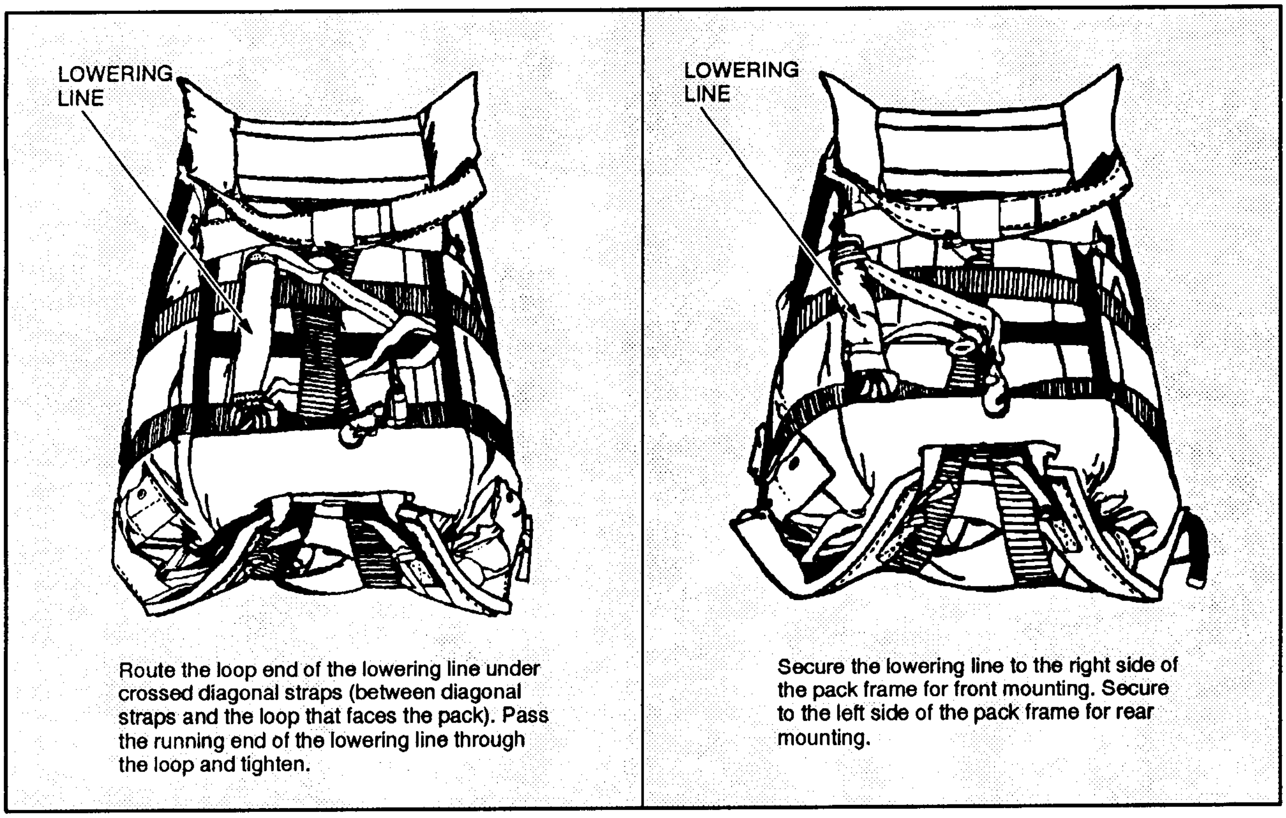


Figure 4-26. Attaching the lowering line to the combat pack.

CHAPTER 5

BODY STABILIZATION

The MFF parachutist must be able to exit an aircraft with his combat equipment, fall on a designated heading, and manually deploy his main parachute without losing stability. These body stabilization skills allow the parachutist to group in free-fall, cover small lateral distances with a rucksack, move off a lower parachutist's back in free-fall, and turn to keep the DZ or group leader in sight. The MFF parachutist maintains this skill through regular MFF jumps and periodic refresher training. This chapter addresses the body stabilization skills needed to make a night, tactical MFF jump with combat equipment from oxygen altitudes. Appendixes C and D provide recommendations for an MFF proficiency training program and suggested sustained airborne training.

Tabletop Body Stabilization Training

Any stable tabletop or flat surface can be used for body stabilization training. The parachutist lies on his stomach on the tabletop. At the command "go," he lifts his arms and legs from the tabletop, assumes the poised or diving exit position, then moves to the stable free-fall position (Figures 5-1 through 5-3). Controlled movement positions during free-fall include body turns, push turns, gliding, altimeter check, and main rip cord pull (Figures 5-4 through 5-8).

Recovery From Instability

Instability creates a hazard to the parachutist and to other parachutists in the air. Instability is the primary cause of MFF malfunctions. There are a variety of reasons for instability. Inmost cases it is caused by a parachutist who does not present a symmetrical body position to the relative wind, either on exit or in free-fall. A contributing factor to instability in free-fall is the inadvertent shift or release of combat equipment. A flat spinning or tumbling body motion characterizes instability. It is dangerous not only to the parachutist experiencing it but often to other parachutists in free-fall with him. It prevents tactical grouping.

Recovery From a Flat (Horizontal) Spin

If the parachutist's is spinning or filling on his back, he must first return to a face to earth free-fall altitude by arching his body Depending upon the speed of his spin, sometimes this movement alone is enough to slow or stop a flat spin. If he is still spinning after facing the earth, he must counter the direction of the spin. He does this movement by looking in the opposite direction of the spin (for example, if spinning clockwise, he looks counterclockwise) and making a hard body turn in that direction. He holds this body position until the spin slows and stops. Depending on the amount of momentum he developed before he started countering the spin, he may have to hold this body position for several revolutions. Once the spin has stopped, he checks his body position, makes an altimeter check, and continues with the mission.

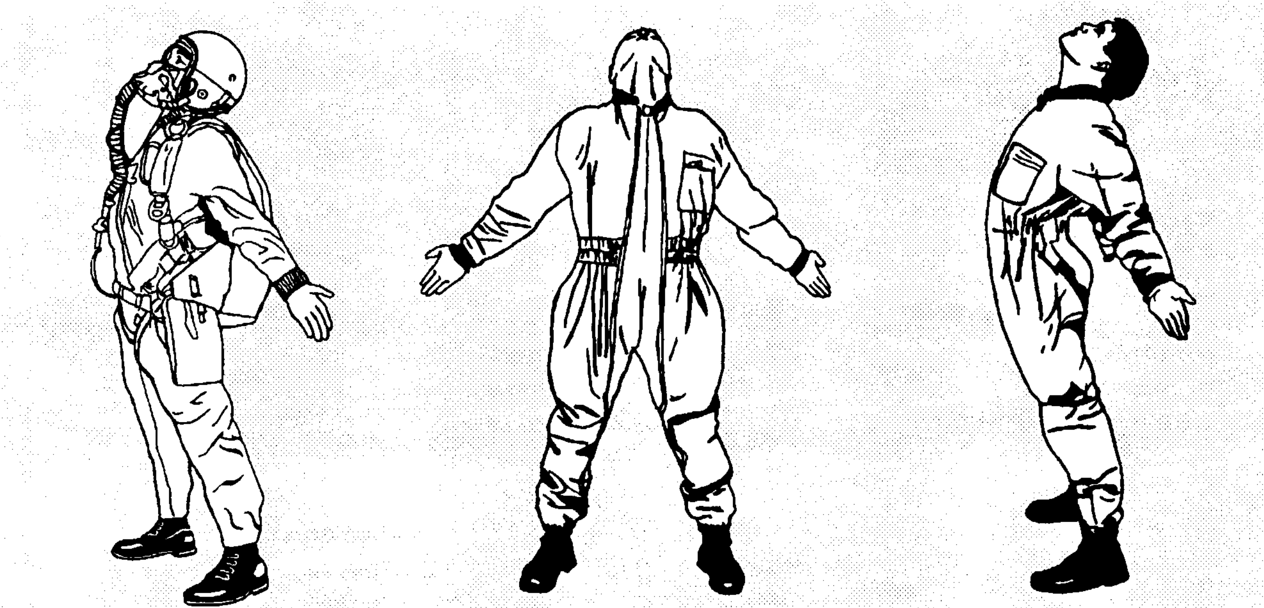


Figure 5-1. Poised exit position

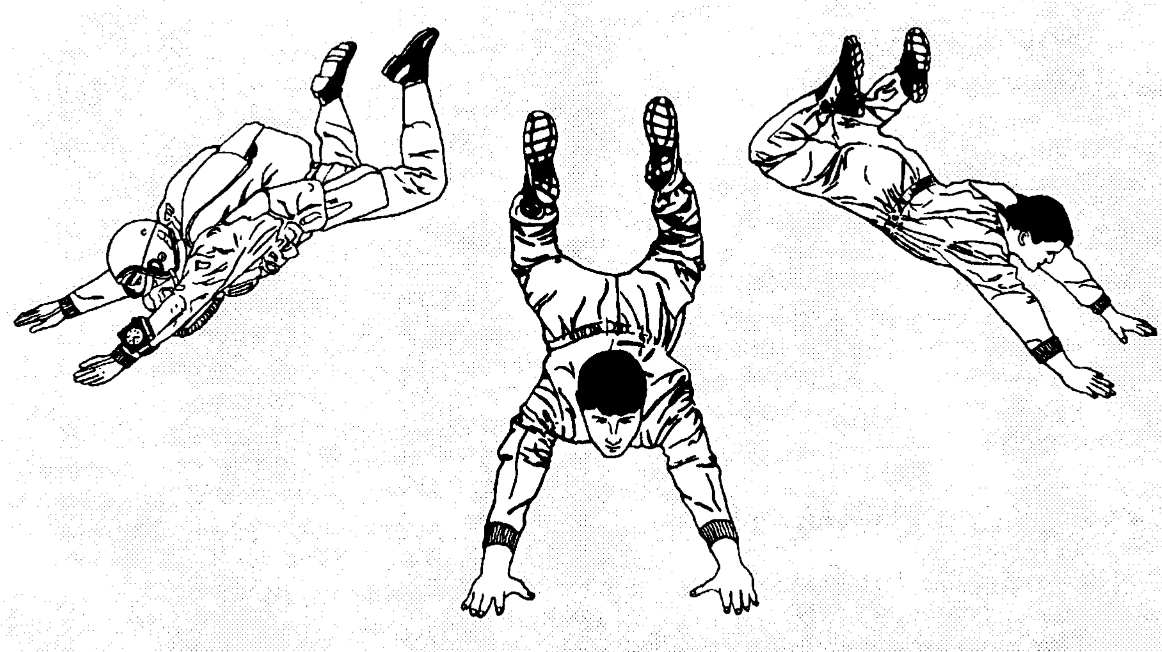
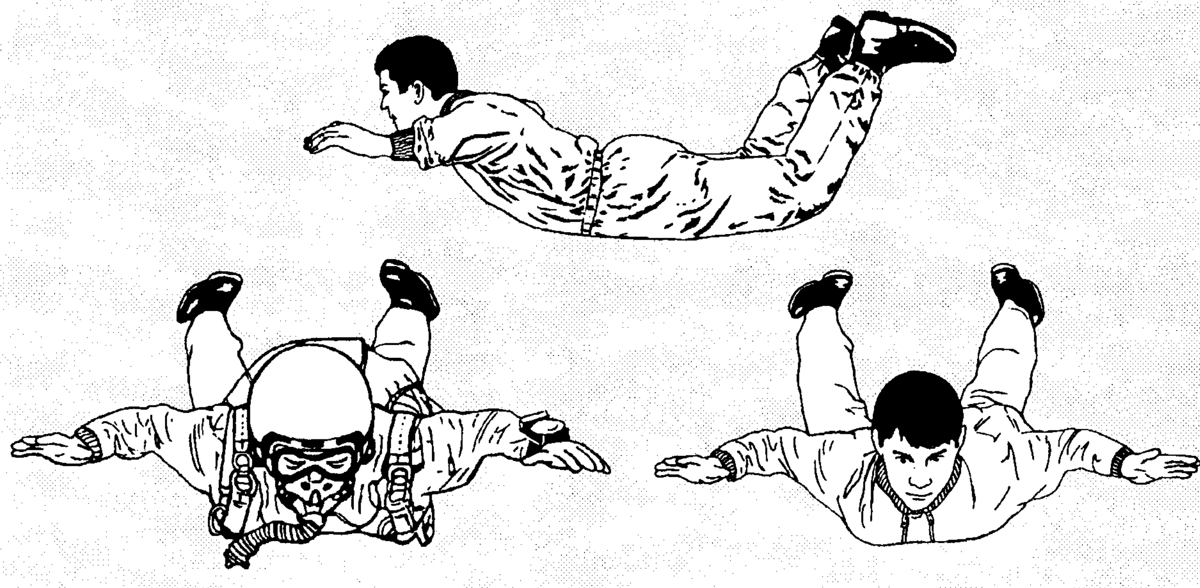
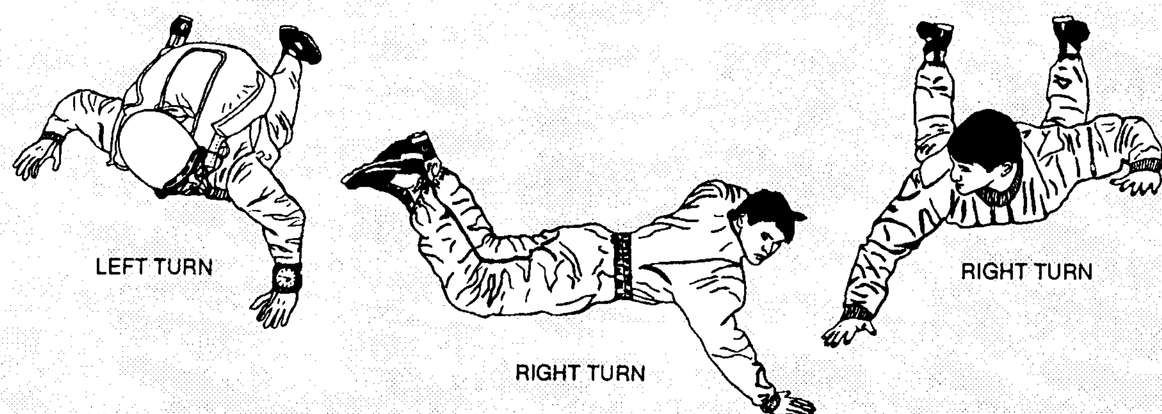


Figure 5-2. Diving exit position.



In the stable free-fall position, arch your back and hold your head up and back. Extend your arms horizontally, elbows bent at 90-degree angles. Hold your hands at eye level, palms down and slightly cupped, fingers spread. Hold your legs about shoulder width apart, with your knees bent at a comfortable angle.Your knees should be higher than your thighs.

Figure 5-3. Stable free-fall position.

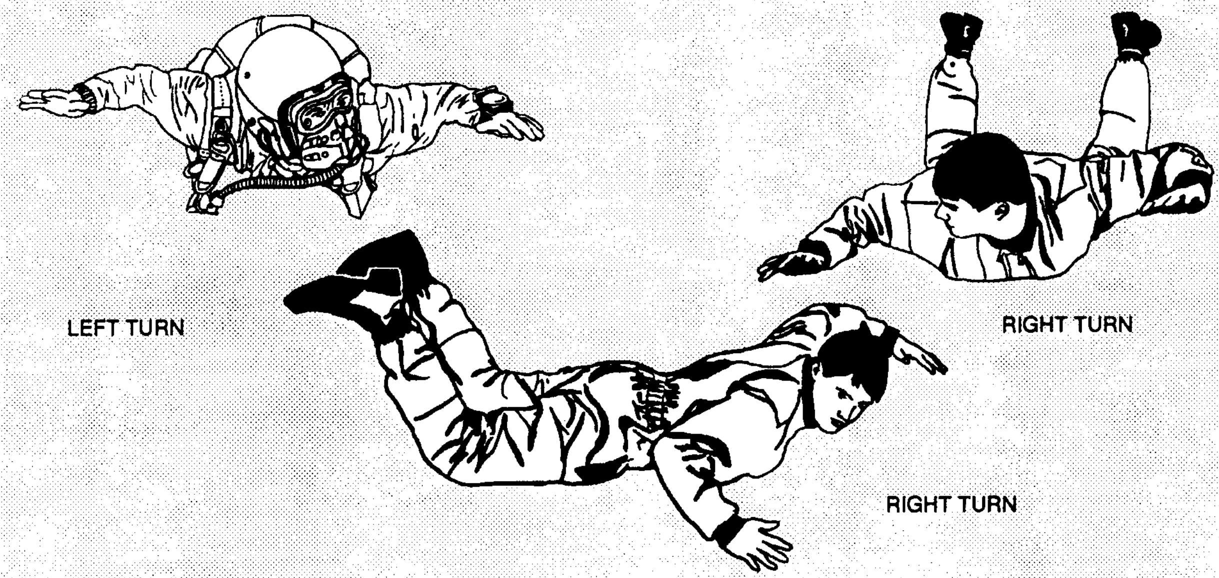


To execute the push turn, look in and push a hand and arm straight down from your body (right or left) in the direction of the turn. Counter and stop this turn by looking in and pushing your other hand and arm straight down just before reaching the desired heading. Upon reaching the desired heading, resume the stable free-fall position.

CAUTION

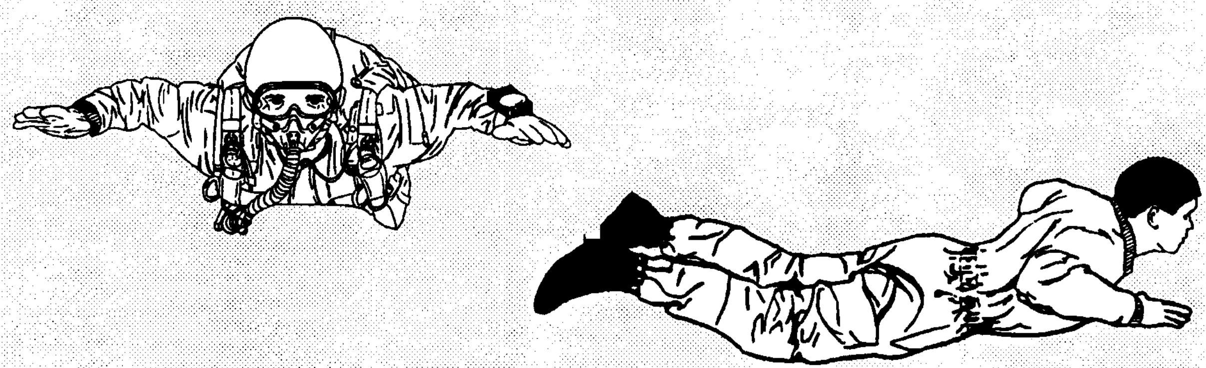
The farther the hand and arm are pushed straight down, the faster the turn will go! The parachutist executes this movement slowly!

Figure 5-4. Push turn.



To execute the body turn, look in and bend the trunk of your body in the desired direction. Counter and stop this turn by looking in and bending the trunk of your body in the opposite direction just before reaching the desired heading. Resume the stable free-fall position upon reaching the desired heading.

Figure 5-5. Body turn.



The glide is a controlled lateral movement. It allows you to maintain relative position with a designated group leader or bundle. To glide, bring your arms back with your elbows held near your sides and your forearms at about a 90-degree angle to your body. Rotate your shoulders up and forward to cup your upper body. Then straighten your legs from the knees. The straighter you hold your legs, the faster the glide will be. To stop the glide, return to the stable free-fall position.

CAUTION

Considerable forward momentum and speed will be acquired in a continuous glide relative to another parachutist. The parachutist returns to a neutral stable free-fall position from a glide before initiating a main rip cord pull sequence.

Figure 5-6. Gliding.

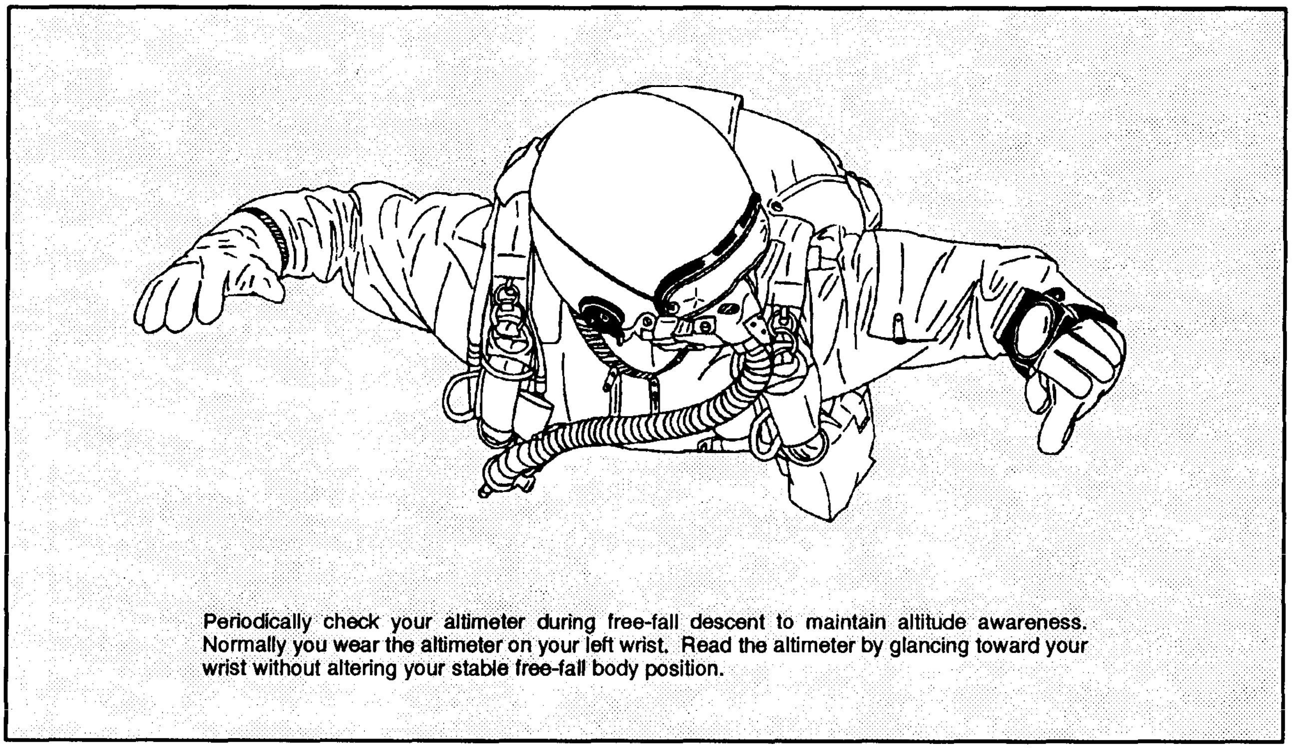


Figure 5-7. Altimeter check.

If a shift of the combat pack causes a flat spin, the parachutist may have to adjust his body position to obtain stability or maintain a heading. The severity of the shift (versus an inadvertent release) determines how much adjustment of the knees, the angle of the lower leg, hand and arm placement, or cocking of the hips he must make to counter the effect of a combat pack that is now not symmetrical or square to the relative wind.

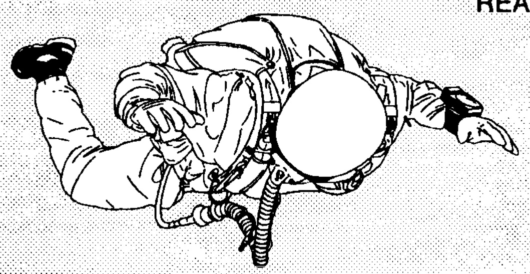
Recovery From Tumbling

A bump during a group exit or breaking the arched body position normally causes tumbling. If tumbling, the parachutist assumes the hard arch body position until he faces the earth. Once he faces the earth, he relaxes the hard arch to a stable free-fall body position. How long it takes him to return to a face-to-earth position will vary with the severity of the tumble, his body area surface, and his combat equipment's configuration. Presenting a symmetrical body position to the relative wind on exit from the aircraft is the most significant factor in preventing tumbling.

Altitude Awareness

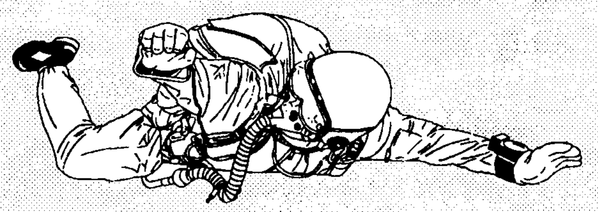
A parachutist who is unstable must remain altitude aware. The stress created by instability can cause a normal human phenomena of temporal (time) distortion. The resultant eflect varies from individual to individual. It can appear to be either a time compression or a slowing down of perceived time passage. He must not get so caught up in his attempts to recover stability that he loses altitude awareness and forgets to manually activate his parachute. He must never sacrifice the pull altitude for stability or the continued attempts to obtain stability before the pull. An unstable parachutist must remember that as he is falling, an area of low pressure is created above him. Any altimeter reading while in this low pressure area will not reflect the correct altitude AGL. An example is a parachutist falling back to earth who looks at his altimeter while holding it in front of his face. Due to the low pressure zone in which the altimeter is located, the parachutist will read a higher altitude than where he actually is in feet AGL. Remember, this pressure differential can cause the altimeter to be off as much as 1,000 feet.

Execute the main rip cord pull at the predesignated altitude. Look at the main rip cord handle on the right main lift web. Extend your left arm beyond your head with your hand held palm down. Grasp the main rip cord handle with your right hand, pull the handle from the rip cord pocket, and extend both arms forward, pulling the main rip cord cable to full extension. Then look over your right shoulder for main canopy deployment.

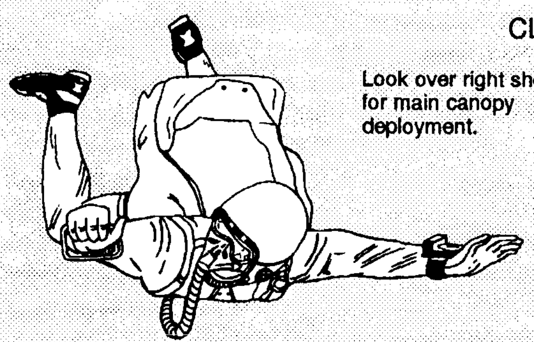


WARNING

When wearing the oxygen mask, look at and feel the main rip cord handle. At the designated pull altitude, pull the main rip cord handle and not the oxygen hose.



Execute the main rip cord pull in a smooth, continuous motion of look, reach, pull, and clear. After canopy deployment, slip the main rip cord handle over your wrist or secure it in your jumpsuit until you land.



WARNING

In the event of a main canopy malfunction, immediately discard the main rip cord handle.

Figure 5-8. Main rip cord pull.

CHAPTER 6

AIRCRAFT PROCEDURE SIGNALS AND JUMP COMMANDS

Aircrafl noise, the MFF parachutist helmet, and the oxygen mask make verbal communication extremely difficult. Therefore, the parachutist receives aircraft procedure signals and jump commands (Figure 6-1) by arm-and-hand signals. The MFF parachutist must be thoroughly familiar with all signals and commands and the required actions for each one. Standardization of procedural signals and jump commands permits interoperability of all MFF-capable units. Safety significantly increases when the parachutist understands the jumpmaster's intent and the jumpmaster understands the parachutist's desired response.

Procedure Signals

Signals used between aircraft boarding and the jump command "stand up" are procedure signals. The aircraft procedure signals discussed in the following paragraphs begin before takeoff. The jumpmaster gives these signals.

Don Helmets

The jumpmaster gives the signal "don helmets" before takeoff. He may also give it during the flight. Upon receiving this signal (Figure 6-2), the parachutist dons his helmet, fastens his chin straps, and fastens his seat belt.

Unfasten Seat Belts

The jumpmaster normally gives the signal "unfasten seat belts" upon reaching an altitude of 1,000 feet AGL or when the flight crew chief indicates that it is safe to do so (Figure 6-3). If the aircraft descends back through 1,000 feet AGL later in the flight, the parachutist refastens his seat belt upon receiving the signal.

Mask

The jumpmaster signals "mask" when the parachutist must begin using supplemental oxygen. Upon receiving this signal, the parachutist masks and checks to ensure the oxygen system is functioning properly (Figure 6-4).

Check Oxygen

The jumpmaster signals "check oxygen" immediately after the signal to mask and periodically after that. At a minimum he gives it following the 20- and 10-minute time warnings. Upon receiving this signal, the parachutist returns the signal if everything is functioning correctly. If there is a problem, the parachutist extends an arm in front of his body with his hand open, palm down (Figure 6-5).

Time Warnings

The jumpmaster receives time warnings from the flight crew. The jumpmaster signals the "time warnings" to the parachutist to allow him adequate time to prepare for the jump. The parachutist receives the time warnings normally 20 minutes and 10 minutes before time over target (TOT) (Figure 6-6).

AIRCRAFT PROCEDURE SIGNALS	JUMPMASTER ACTIONS	PARACHUTIST ACTIONS
DON HELMETS	Gives command prior to takeoff or landing. ***CAUTION*** ***If the helmet is removed after the JMPI, the jumpmaster ensures there is no twist in the oxygen delivery hose.***	Dons helmets, fastens chin straps and seat belts.
UNFASTEN SEAT BELTS	Normally gives command upon reaching an altitude of 1,000 feet AGL or when notified by the flight crew that it is safe to do so.	Disconnects seat belt and stows it to the left and right for easy retrieval.
***MASK**	***Turns on own console and masks.**	***Turns on console. Secures mask to face and assures proper attachment and seal. Checks delivery of oxygen.**
***CHECK OXYGEN**	***Gives signal immediately following the command "mask" and then periodically.** ***Gives signal after the 20- and 10-minute warnings.**	***Checks own oxygen and returns the thumbs up signal to the jumpmaster. In the event of an oxygen problem,extends arm straight forward, palm down.**
***NOTE: Mask and oxygen checks will be determined by flight plan and mission profile when given.** ***NOTE: Console monitor checks gauges.**		
TIME WARNING 20-Minute Warning		***All parachutists must be awake.** First pass attaches combat equipment.
***CHECK OXYGEN**		***Checks own oxygen and returns the thumbs up signal to the jumpmaster. In the event of an oxygen problem, extends arm straight forward, palm down.**
TIME WARNING 10-Minute Warning	Ensures RED jump/caution light is on.	Second pass attaches combat equipment.
WIND SPEED	Normally gives signal immediately after the 10-minute warning, if known, and updates to remain current with the DZ party's information.	
***These signals, commands, and actions are used only during oxygen jumps with prebreather.**		

Figure 6-1. Aircraft procedure signals and jump commands (oxygen and nonoxygen jumps).

AIRCRAFT PROCEDURE SIGNALS	JUMPMASTER ACTIONS	PARACHUTIST ACTIONS
ARM ARR	Normally gives signal immediately after the 10-minute warning and wind speed. Ensures aircraft is at least 2,500 feet above activation altitude set on ARR before giving command. Arms own ARR first and is checked by another parachutist while seated.	Removes arming pin from ARR, receives a check, and passes the thumbs up signal from the last one in the front of the aircraft to the rear, and then to the jumpmaster.

JUMP COMMANDS	JUMPMASTER ACTIONS	PARACHUTIST ACTIONS
STAND UP	Gives command approximately 2 minutes prior to TOT.	Stands, faces the rear, and checks own equipment. Checks the pins ***and oxygen pressure gauge** of the man in front and taps him to indicate he is OK. The last two parachutists check each other. ***NOTE: During an oxygen jump, the right hand should be on the disconnect for the console hose and the left hand on the ON/OFF switch of the oxygen ballout bottle.**
MOVE TO THE REAR	Gives command approximately 1 minute prior to TOT.	Tightens shoulder straps of rucksack and puts goggles down. ***Turns on oxygen ballout bottle and disconnects from the console.** Moves to within 1 meter of the jump door or to the hinge of the ramp.
STAND BY	Gives command approximately 15 seconds prior to TOT.	Returns thumbs up signal and moves to 1 foot of the edge of the ramp or door. Focuses attention on the jumpmaster.
GO	Ensures GREEN jump/caution light is on. Ensures aircraft is over release point.	Exits the aircraft.
ABORT	Gives command anytime an unsafe condition exists inside the aircraft, outside the aircraft, or on the DZ. Gives command when the RED jump/caution light is on. ***Reconnects own console and turns off own oxygen ballout bottle.**	Returns to seat. ***Reconnects to console and turns off oxygen ballout bottle.**

Figure 6-1. Aircraft procedure signals and jump commands (oxygen and nonoxygen jumps) (continued).

JUMP COMMANDS	JUMPMASTER ACTIONS	PARACHUTIST ACTIONS
***CHECK OXYGEN**		***Checks own oxygen and returns the thumbs up signal to the jumpmaster. In the event of an oxygen problem, extends arm straight forward, palm down.**
DISARM ARR	Gives command when jump is aborted and doors have been closed. Gives command prior to the aircraft descending below 2,500 feet above activation altitude set on ARR.	Reinserts the arming pin of the parachutist to his left and gives him a check.

Figure 6-1. Aircraft procedure signals and jump commands (oxygen and nonoxygen jumps) (continued).

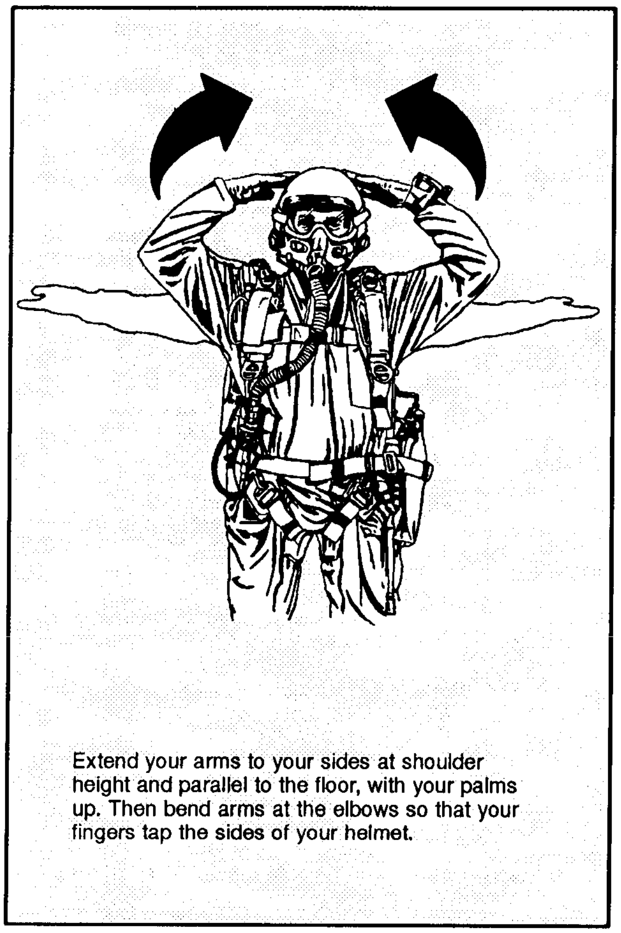


Figure 6-2. Don helmets.

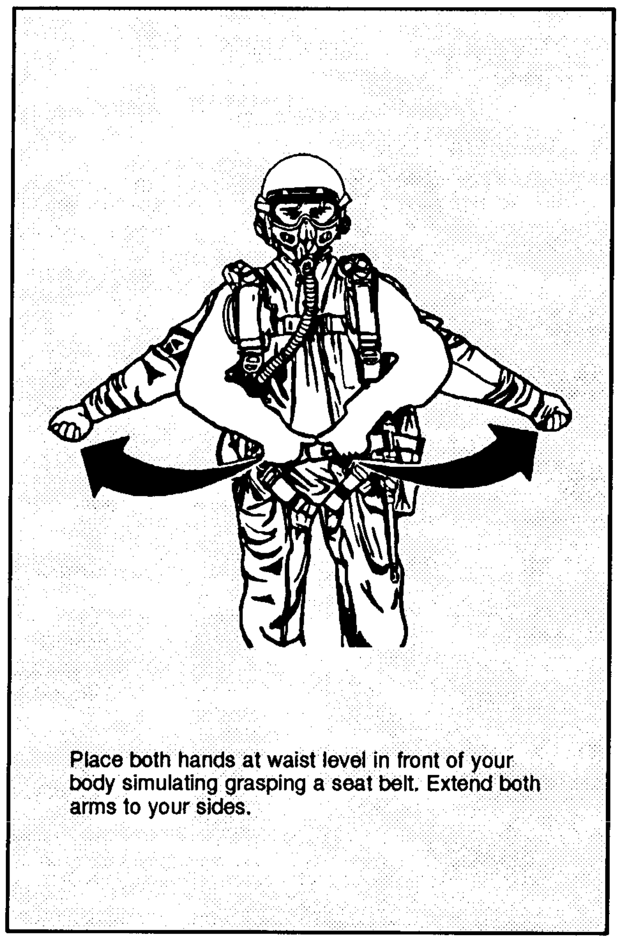


Figure 6-3. Unfasten seat belts.

Place your right thumb on your right cheek and rotate the palm and fingers of your right hand across your nose and mouth.

Figure 6-4. Mask.

Extend your right arm in front of your body with closed fist and thumb extended upward.

If there is a problem, extend your arm in front of your body with your hand open, palm down.

Figure 6-5. Check oxygen.

Raise your left arm, elbow at shoulder level and forearm parallel to the ground. Next, tap your left wrist with your index and middle fingers of your right hand. Finally, indicate the time by extending your arms forward and slightly to your sides, with your fingers indicating the appropriate time.

NOTE: If jumping with combat pack, the parachutist dons it after the 20-minute warning.

Figure 6-6. Time warning.

Wind Speed

The jumpmaster signals “wind speed after the 10-minute time warning (Figure 6-7). In gusting wind conditions, the jumpmaster gives the wind speed signal first to indicate the lower wind speed. He follows with the “gusting winds” signal to indicate the higher wind speed (Figure 6-8).

Arm ARR

The jumpmaster normally signals "arm ARR" after the 10-minute time warning. He can also give this signal any time the aircraft reaches an altitude at least 2,500 feet above the activation altitude set on the ARR. Upon receipt of this signal, the parachutist removes the arming pin from the ARR (Figure 6-9).

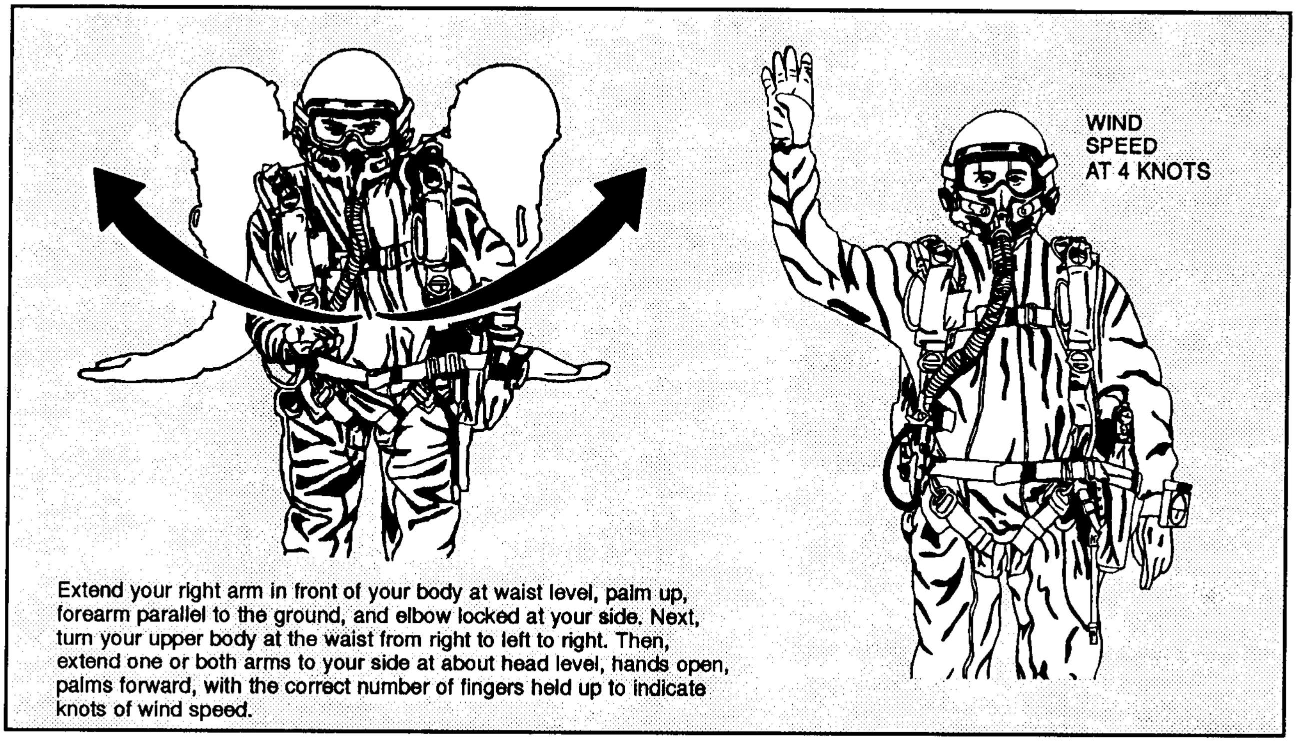


Figure 6-7. Wind speed.

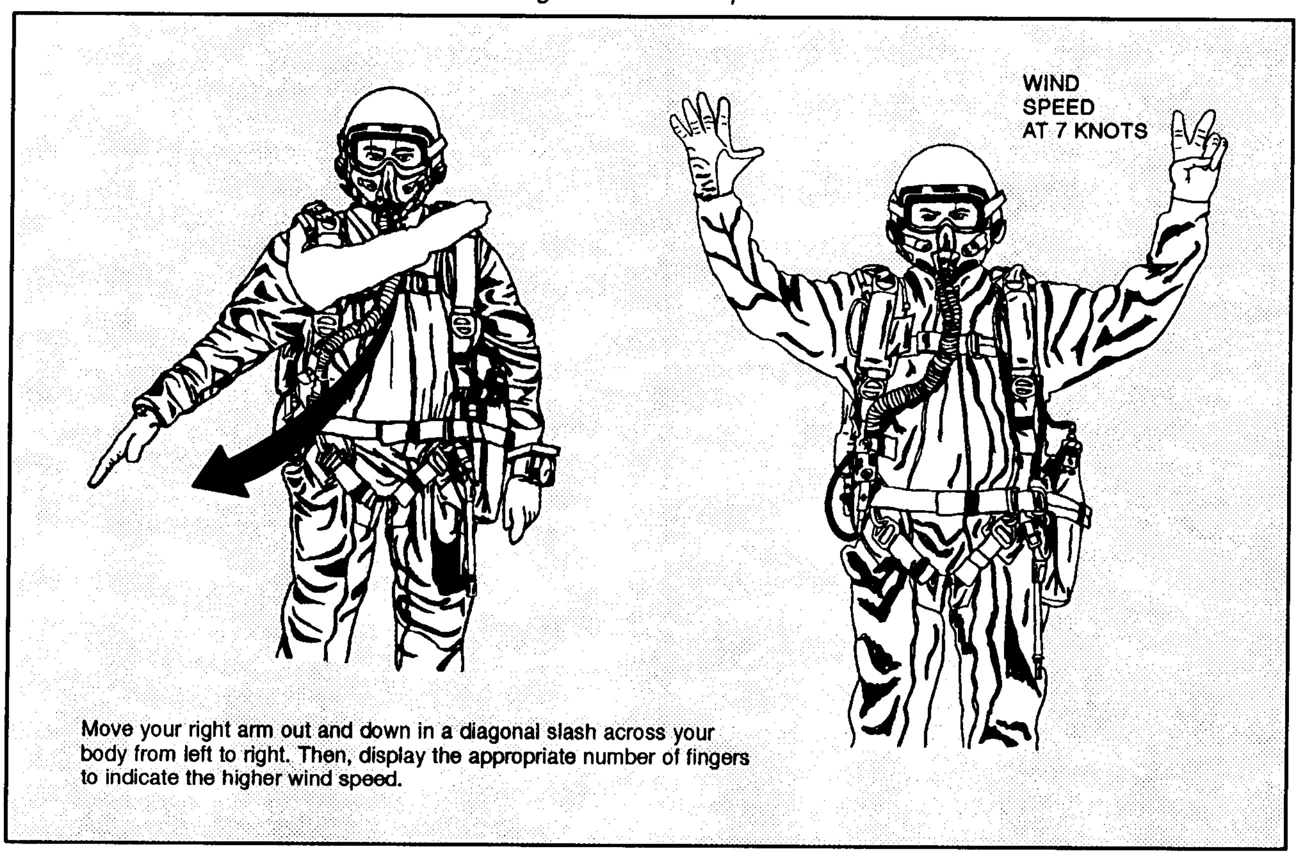
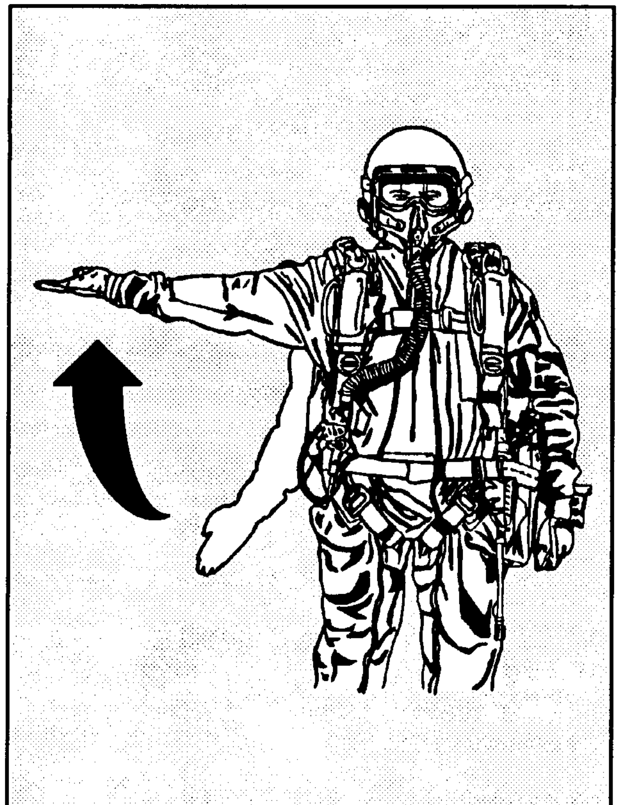


Figure 6-8. Gusting winds.

Face toward the right side of the aircraft. Place your left hand on your left hip, then extend your arm forward at about a 45-degree angle.

Figure 6-9. Arm ARR.



Raise your arm in an arc, palm facing up, from your side (or the floor, if kneeling) to shoulder level.

Figure 6-10. Stand up.

Jump Commands

The jump commands discussed in the following paragraphs begin as early as 2 minutes before the actual jump is made. The jumpmaster gives these commands.

Stand Up

The jumpmaster commands "stand up" about 2 minutes before TOT (Figure 6-10). Upon receiving this command, the parachutist stands up, faces the jumpmaster, and checks his equipment. If jumping oxygen, the parachutist also places his left hand on the ON/OFF valve of the bail-out bottles and grasps the console hose at the AIROX VIII with his right hand.

Move to the Rear

The jumpmaster commands "move to the rear" about 1 minute before TOT (Figure 6-11). Upon receiving this command, the parachutist tightens the combat pack's shoulder straps around his legs, adjusts his goggles, and moves to within 1 meter of the jump door or to the hinge of the cargo ramp. If jumping oxygen, the parachutist must activate the bailout oxygen system, check the flow indicator of the AIROX VIII, and disconnect from the oxygen console before moving to the rear of the aircraft.

Stand By

The jumpmaster commands "stand by" about 15 seconds before the exit (Figure 6-12). Upon receiving this signal, the parachutist signifies readiness by returning the jumpmaster's signal and then moves to the jump door or the cargo ramp.

Figure 6-11. Move to the rear.

Figure 6-12. Stand by.

Go

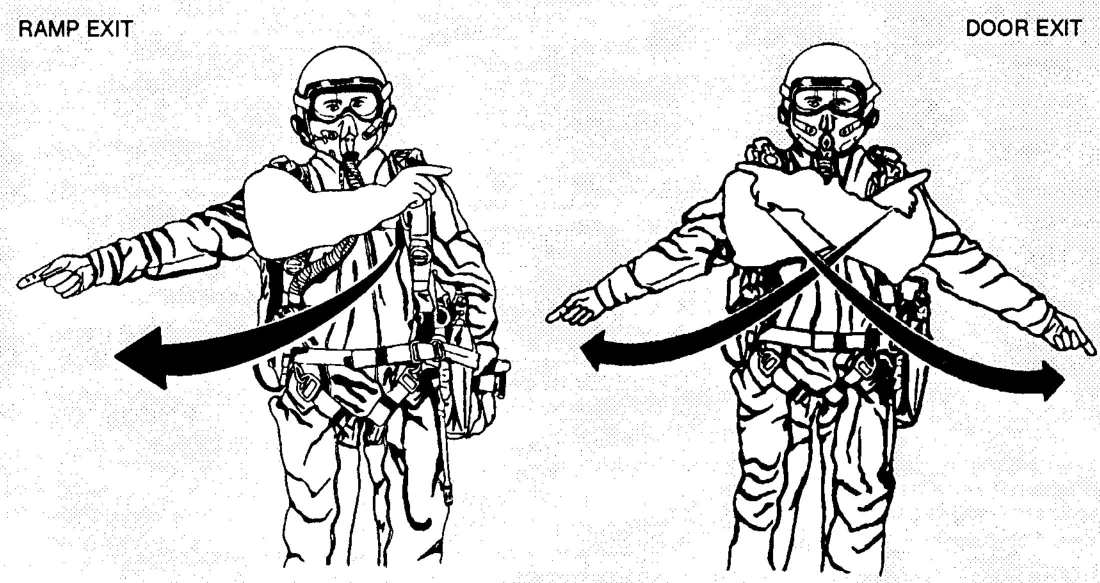
The jumpmaster commands "go" when the aircraft is over the release point and the green jump light is on (Figure 6-13).

Abort

The jumpmaster commands "abort" anytime an unsafe condition exists inside or outside the aircraft (red jump light comes on) or on the DZ (Figure 6-14). Upon receiving this command, the parachutist returns to his seat and sits down. If jumping oxygen, the parachutist reconnects to the oxygen console, turns off the bailout system, and then sits down.

Disarm ARR

The jumpmaster gives the signal "disarm ARR" (reinsert arming pin) by reversing the arm ARR signal. The safety or the assistant jumpmaster checks the ARR arming pin and the pins of the main and reserve parachute. The parachutist on right side of another parachutist can most easily reinsert the arming pin.



Cross one arm across your chest and then move your arm and hand to point at the exit. If using both troop doors, the jumpmaster moves to the aircraft's centerline and gives the command using both arms.

Figure 6-13. Go.

CAUTION

If the jumpmaster has cocked his arm to give the command go, he must NOT move it when he gives the abort signal. The parachutists may exit if the jumpmaster moves his cocked arm.

Slowly turn away from the exit and face the front of the aircraft. Then lower your head and shake it from side to side while walking toward the front of the aircraft.

Figure 6-14. Abort.

CHAPTER 7

OXYGEN AND LIFE SUPPORT EQUIPMENT

MFF parachuting is physically demanding. It exposes the parachutist to extremes of temperature, rapid pressure changes, and long exposures at altitudes requiring supplemental oxygen. To prepare for this environment, the MFF parachutist must be thoroughly familiar with the use of oxygen, oxygen life support equipment, and the handling of oxygen supplies. All personnel participating in MFF operations must meet the physical requirements outlined in Chapter 1, regardless of altitude and type of aircraft used.

Oxygen Forms

The parachutist uses gaseous oxygen or liquid oxygen (LOX). A discussion follows on these forms of aviator's breathing oxygen and their containers.

Gaseous Oxygen

Gaseous aviator's breathing oxygen is designated Grade A, Type I, Military Specification MIL-0-27210E. No other manufactured oxygen is acceptable. The difference between aviator's and medical or technical (welder's) oxygen is the absence of water vapor. The purity requirement for aviator's oxygen is 99.5 percent by volume, It may not contain more than 0,005 milligram (mg) of water vapor per liter at 760 millimeters (mm) of mercury (Hg) and 68 degrees Fahrenheit. It must be odorless and free from contaminants, including drying agents. The other types of oxygen maybe adequate for breathing, but they usually contain excessive water vapor that, with the temperature drop encountered at altitude, could freeze and restrict the flow of oxygen through the oxygen system the parachutist uses.

Low Pressure. Low-pressure aviator's breathing oxygen is stored in yellow, lightweight, shatterproof cylinders. These cylinders are filled to a maximum pressure of 450 pounds per square inch (psi); however, they are normally filled in the range of 400 to 450 psi. They are considered empty when they reach 100 psi. If a cylinder is stored at a pressure less than 50 psi for more than 2 hours, it must be purged because of the water condensation that forms.

High Pressure. High-pressure aviator's breathing oxygen is stored in lime green, heavyweight, shatterproof bottles stenciled with AVIATOR'S BREATHING OXYGEN. These bottles can be filled to a maximum pressure of 2,200 psi; however, they are normally filled in the range of 1,800 to 2,200 psi.

Liquid Oxygen (LOX)

Liquid aviator's breathing oxygen is designated Grade B, Type II, Military Specification MIL-0-27210E. LOX's most common usage is in storage facilities and for aircraft oxygen supplies because a large quantity can be carried in a small space.

Oxygen Handling and Safety

Due to limited contact with oxygen and its handling, personnel may not fully appreciate the danger involved. Improper use and handling can result in property damage, serious injury, and death. Personnel handling oxygen must—

- Keep oil and grease away from oxygen. They must not handle oxygen equipment with greasy hands or clothing. They do not let fittings, hoses, or any other oxygen equipment get smeared with oil, grease, hydraulic fluid, or dirt. A drop of oil in the wrong place can cause an explosion.

- Keep oxygen away from fires. Small fires rapidly become large fires in the presence of oxygen supplies. Personnel handling oxygen must never permit smoking near oxygen equipment, while handling oxygen supplies, or when using oxygen life support equipment.

- Handle cylinders and valves carefully. Before opening cylinder valves, they ensure the cylinder is firmly supported. They never let a cylinder drop or tip over. Dropping a cylinder can damage or break the valve, allowing the gas to escape and to propel the cylinder a great distance, an obvious hazard. These personnel open and close the valves only by hand. If they cannot open and close them by hand, the cylinder must be returned to the depot for repair.

Oxygen Requirements

The lower density of oxygen at high altitude causes many physiological problems. For this reason, MFF parachutists and aircrews need additional oxygen. Figure 7-1 contains United States Air Force (USAF)-established requirements for supplemental oxygen for the MFF parachutist during unpressurized flight, Military Airlift Command (MAC) Regulations 55-130 and 55-141 outline these requirements. The following paragraphs briefly describe the requirements.

All personnel will prebreathe 100 percent oxygen at or below 10,000 feet MSL or cabin altitude below 10,000 feet MSL on any mission scheduled for a drop at or above 18,000 feet MSL.

The required prebreathing time will be completed prior to the 20-minute warning and before the cabin altitude ascends through 10,000 feet MSL.

A break in prebreathing requires restarting the prebreathing period or removing the individual(s) whose prebreathing was interrupted from the mission.

Prebreathing requires the presence of an Air Force physiological technician on board the aircraft.

All personnel on board during unpressurized operations above 10,000 feet MSL and higher will use oxygen. (Exception Parachutists may operate without supplemental oxygen during unpressurized flights up to 13,000 feet MSL provided the time above 10,000 feet MSL does not exceed 30 minutes each sortie.) See Figure 7-1.

Life Support Equipment

Life support equipment consists of the oxygen mask, the portable/bailout oxygen system with the AIROX VIII assembly and the six-man prebreather portable oxygen system. This equipment is discussed in the paragraphs below.

Oxygen Mask

The oxygen mask is designed to be worn with parachutist helmets that have receivers for the bayonet lugs of the mask's harness assembly. Oxygen enters the facepiece through the valve located at the front of the mask. Exhaled air passes out through the same valve. The construction of the valve's exhalation port allows a pressure of only 1 millimeter of mercury greater than the pressure of the oxygen being supplied by the regulator to force open the valve and allow exhaled air to pass to the atmosphere. A 17.5-inch long convoluted silicone hose with a 3/4-inch internal diameter attaches to the mask. Inside the hose is an anti-stretch cord that prevents extreme stretching and hose separation in the windblast during free-fall. The mask has an integral microphone that adapts to the aircraft's communication system.

DEPLOYMENT ALTITUDE (IN FEET)	ON BOARD AIR	HALO OPERATIONS	HAHO OPERATIONS
BELOW 10,000 MSL	None	None	None
AT OR ABOVE 10,000 MSL BELOW 13,000 MSL See Note 1	Supplemental oxygen at normal when unpressurized flight exceeds 30 minutes	None	None
AT OR ABOVE 13,000 MSL BELOW 18,000 MSL See Notes 1 and 2	Supplemental oxygen at normal before ascending thru 10,000 feet MSL or cabin altitude	Supplemental oxygen at normal from 1-minute warning until canopy deployment below 10,000 feet MSL	Supplemental oxygen at normal until descent below 10,000 feet MSL
AT OR ABOVE 18,000 MSL BELOW 25,000 MSL See Notes 1 and 2	Prebreathe supplemental oxygen at 100% for 30 minutes	Supplemental oxygen at normal from 1-minute warning until canopy deployment below 10,000 feet MSL	Supplemental oxygen at normal from 1-minute warning until descent below 10,000 feet MSL
AT OR ABOVE 25,000 MSL BELOW 30,000 MSL See Notes 1 and 2	Prebreathe supplemental oxygen at 100% for 30 minutes HALO 45 minutes HAHO		
AT OR ABOVE 30,000 MSL BELOW 35,000 MSL See Notes 1 and 2	Prebreathe supplemental oxygen at 100% for 60 minutes		
AT OR ABOVE 35,000 MSL See Notes 1 and 2	Prebreathe supplemental oxygen at 100% for 75 minutes	Supplemental oxygen at 100% from 1-minute warning until free-fall below 35,000 feet MSL Supplemental oxygen at normal from below 35,000 feet MSL until canopy deployment below 10,000 feet MSL	Supplemental oxygen at 100% from 1-minute warning until free-fall below 35,000 feet MSL Supplemental oxygen at normal from below 35,000 feet MSL until canopy descent is below 10,000 feet MSL

NOTES:

1. Supplemental oxygen means each parachutist will have his own oxygen mask and regulator.
2. All prebreathing will be conducted at or below 10,000 feet MSL or 10,000 feet MSL cabin altitude.

Figure 7-1. Supplemental oxygen requirements for parachutists.

Types of Oxygen Masks. There are two types of oxygen masks currently in use. These masks are described in the paragraphs below.

The MBU-5/P pressure-demand oxygen mask has been a military standard for over 15 years (Figure 7-2). It has a soft, pliable silicone rubber facepiece with a separate plastic outer shell. Four facepiece sizes are available to fit the personnel.

The MBU-12/P pressure-demand oxygen mask is a replacement for the MBU-5/P mask (Figure 7-3). It has a soft, supple silicone rubber facepiece integrally bonded to a plastic hardshell. It seals firmly during pressure breathing and its four sizes provide proper fit and superior comfort during extended wear. The lower profile design and four-point suspension are more stable during free-fall. Antiroll webs at the nose seal prevent downward roll off. The integral facepiece and hard-shell design permits good downward vision and increased head mobility.

Fitting the Oxygen Mask. Trained personnel must supervise mask fitting (Figure 7-4). When tie mask fits properly, it should create a leak-tight seal around the sealing flange throughout the range of pressure breathing forces administered by regulators. The mask has a four-point suspension harness with offset bayonet connectors that the parachutist attaches to the receivers mounted on his helmet to fit the mask. For safety and to ensure

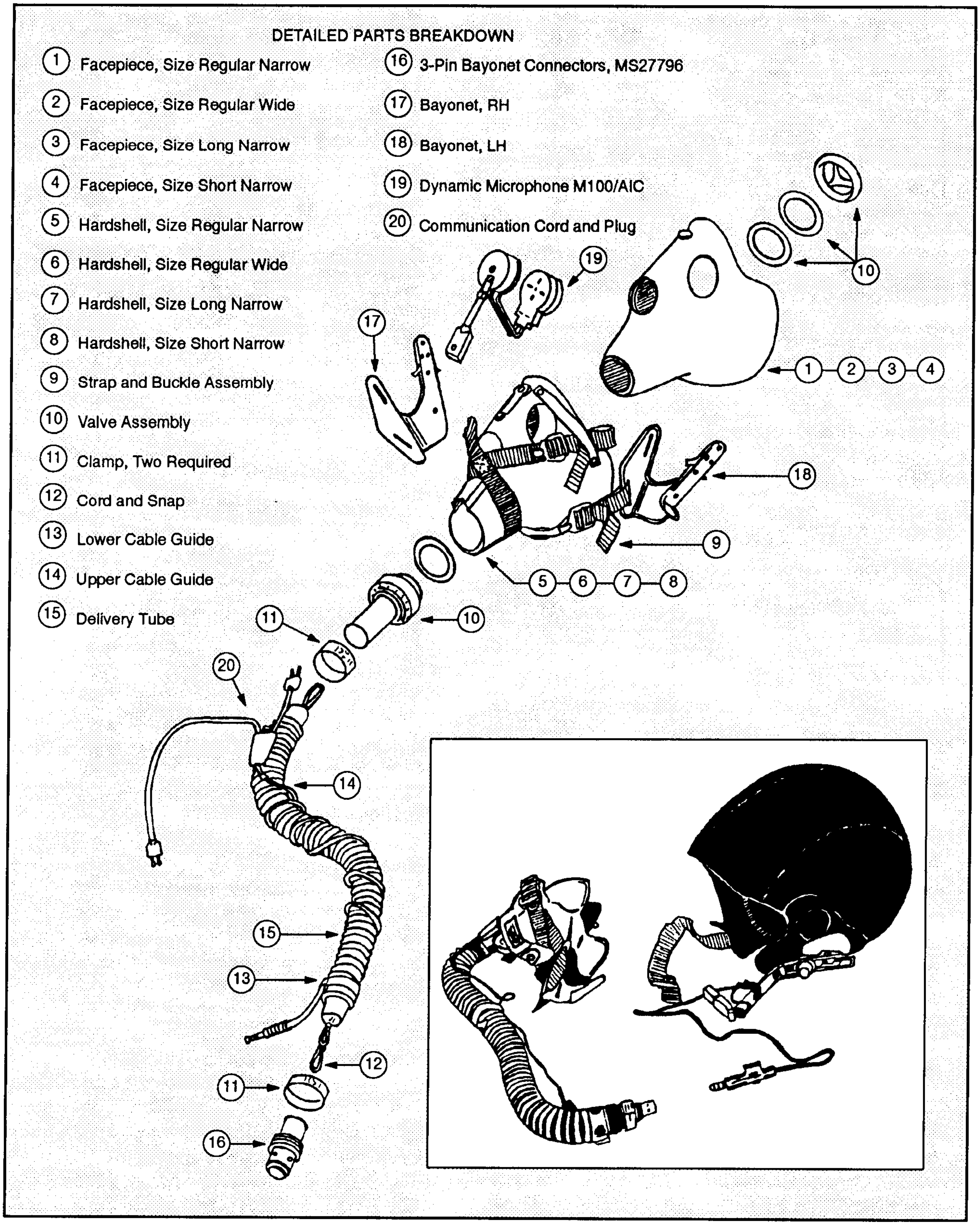


Figure 7-2. MBU-5/P pressure-demand oxygen mask.

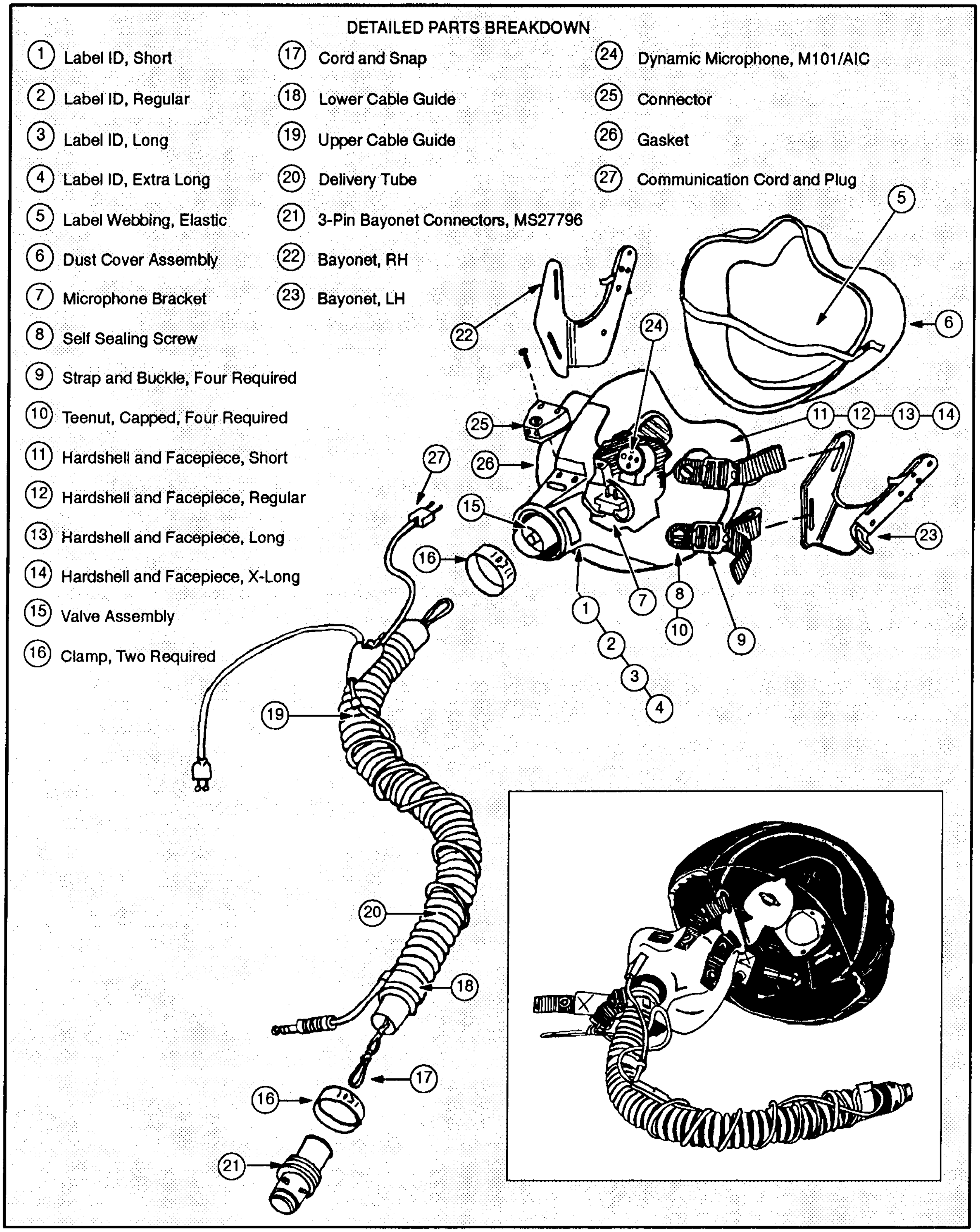


Figure 7-3. MBU-12/P pressure-demand oxygen mask.

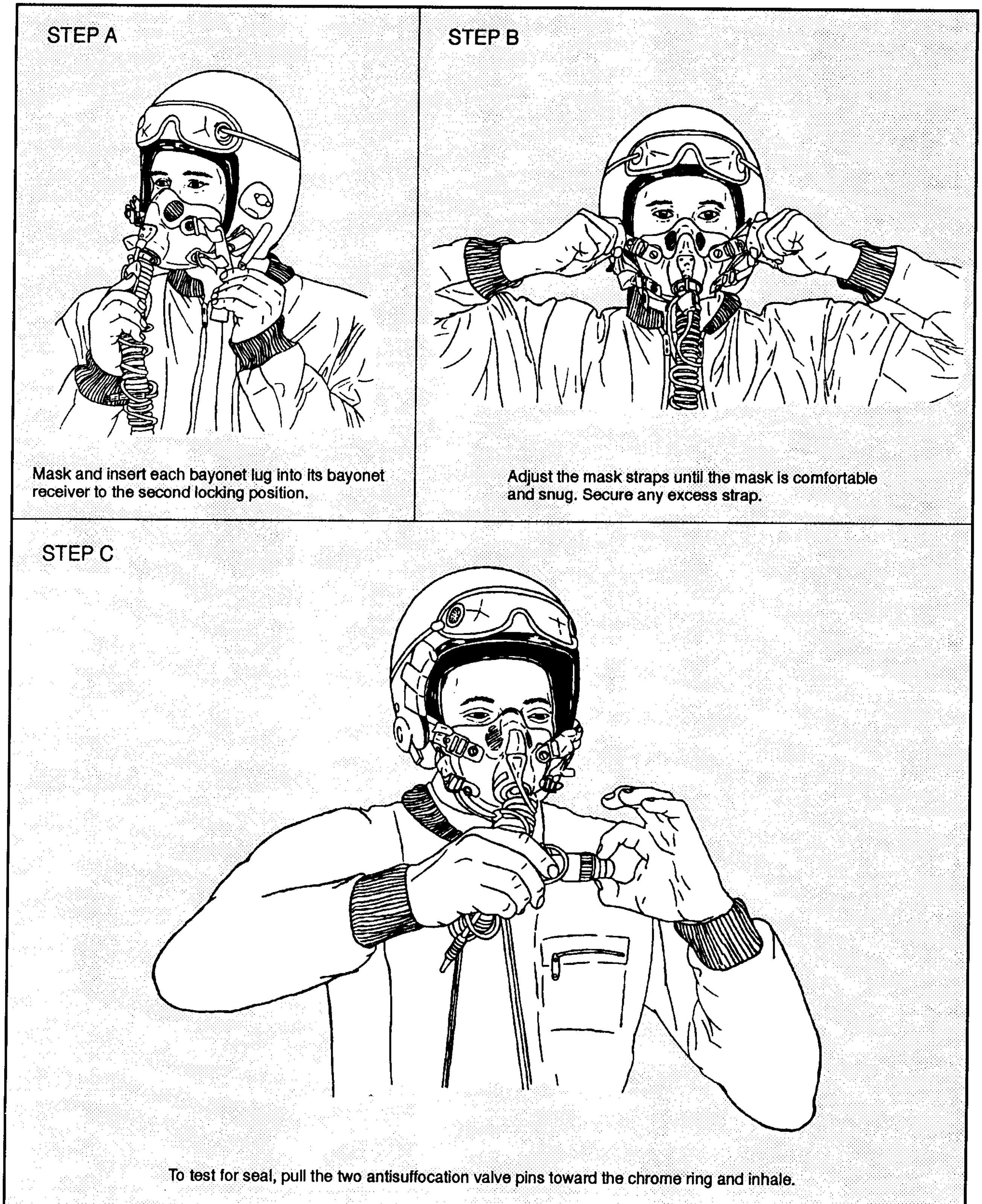


Figure 7-4. Fitting the oxygen mask.

proper fit, the MFF parachutist should be issued the same mask and helmet for each operation. To fit the oxygen mask the parachutist—

- Loosens the adjustment screws on the receivers on their helmets.
- Masks and inserts each bayonet lug into its bayonet receiver to the second locking position.
- Adjusts the mask straps until the mask is comfortable and snug but not so snug that the mask influences his vision. He secures any excess strap.
- Tests for seal by pulling the two pins of the antisuffocation valve towards the chrome ring closing the valve and inhaling.
- If the mask leaks around the face portion, readjusts the four straps and once again checks for seal. (If any other portion of the mask leaks, the mask must be replaced.)
- If a seal cannot be made at the face portion, exchanges the mask for the next size and repeats the fitting process.
- Tightens the receiver adjustment screws and secures the excess straps if a seal is achieved.

Cleaning the Oxygen Mask. The parachutist cleans his oxygen mask after each use IAW TM 55-1660-247-12. He carefully wipes all surfaces with gauze pads or a similar lint-free material dampened with 70 percent isopropyl alcohol (rubbing alcohol). If isopropyl alcohol is not available, he uses a solution of warm water and a mild liquid dishwashing detergent such as Ivory, Joy, or Lux. To rinse, he carefully wipes the masks with swabs soaked in clean water. He must take care not to wet the electronic parts. He must allow the mask to air dry. The masks must be stored in a dust-free environment, away from heat and sunlight. If the mask needs more extensive cleaning, the unit turns it in to the supporting life-support facility.

The 106-Cubic-inch Portable/Bailout Oxygen System with the AIROX VIII Assembly

The portable/bailout oxygen system with the AIROX VIII assembly is a constant-flow oxygen metering system. This system consists of a pressure reducer and an oxygen and air controller with an integrated prebreather adapter. These components increase oxygen duration and permit comfortable exhalation with standard military pressure demand masks and associated connectors (Figure 7-5). This system—

- Has been approved for use from 0 to 35,000 feet MSL.
- Has an 8.2 liter per minute (LPM) nominal oxygen flow.
- Requires minimum maintenance.
- Has a qualified oxygen reducer.
- Interfaces with the MBU-5/P and MBU-12/P masks.
- Has an oxygen and air controller that mates with the CRU-60/P or MC-3A connectors.
- Has a charging valve.
- Has a 20 Micron oxygen/60 Mesh air inlet filter.
- Contains two 2.6-inch siphon tubes that protect the oxygen reducer from foreign matter in the cylinders.
- Has a toggle-type ON/OFF control valve.
- Has an oxygen relief valve.
- Reduces exhalation difficulty associated with constant-flow oxygen systems.
- Uses two 53-cubic-inch high-pressure cylinders.
- Weighs approximately 10.5 pounds.

AIROX VIII Assembly

The AIROX VIII assembly provides the MFF parachutist with a standoff parachuting capability up to 35,000 feet MSL (Figure 7-6). It extends tie duration of two 53-cubic-inch oxygen cylinders and permits the use of any pressure demand mask and associated oxygen connectors. It eliminates the back pressure associated with constant-flow oxygen systems and has virtually no maintenance.

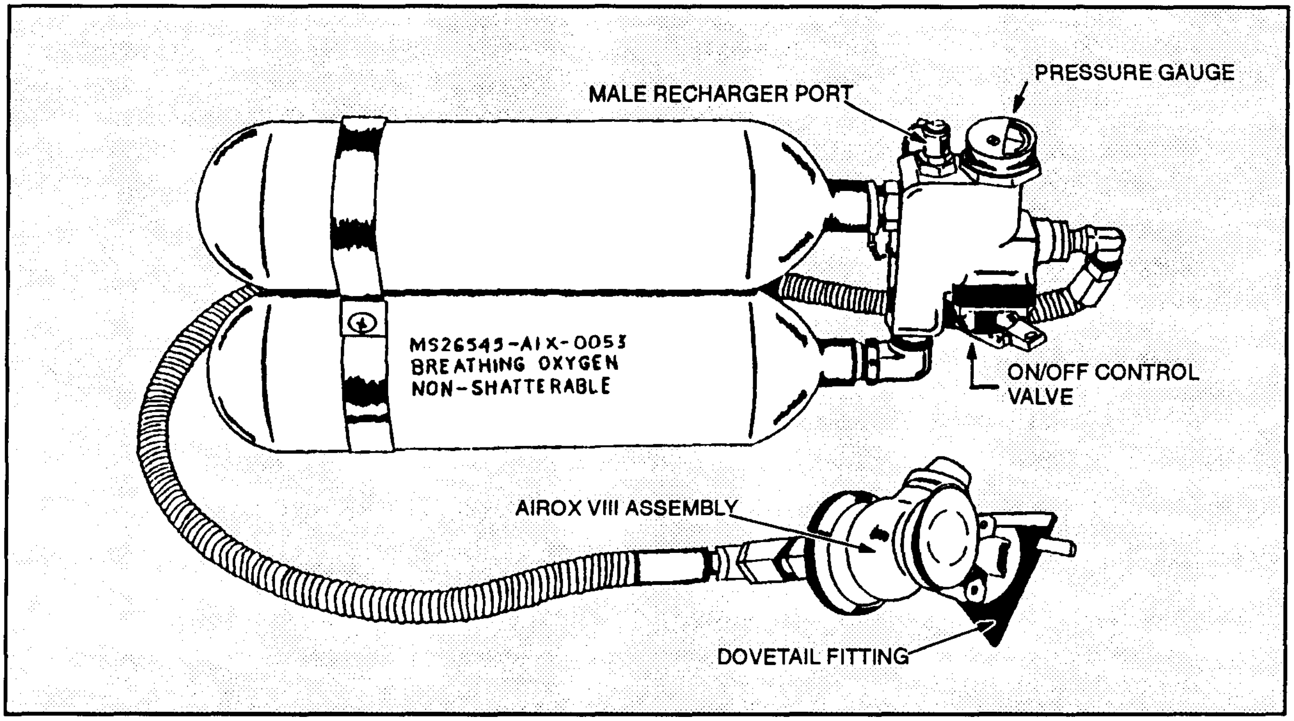


Figure 7-5. The 106-cubic-inch portable/bailout oxygen system with the AIROX VIII assembly.

The parachutist cannot overbreathe the system. When inhaling more volume than the unit delivers, an ambient air valve opens up negating the breathing starvation sensation felt with other constant-flow systems as cylinder pressure decreases.

The AIROX VIII assembly has a special prebreather adapter that allows simultaneous hookup of the prebreather unit and the bailout system to the AIROX unit. The parachutist then connects the AIROX VIII assembly to the MC-3A connector that leads to the oxygen mask. He then makes only one disconnection upon standing up. The connection from the prebreatber connects to the ambient air port on the AIROX unit, thus preventing any ambient air from entering the parachutist's systems while prebreathing. When preparing to exit the aircraft, the parachutist stands up, turns on the bailout system, disconnects from the prebreather, and jumps.

To rig the AIROX VIII assembly with the portable/bailout oxygen system to the RAPS (see Figure 7-7), the parachutist—

- Threads the waistband extension through the keepers on the detachable pouch.
- Places the oxygen cylinders into the detachable pouch with the ON/OFF valve to his front. He secures it with the hook-pile straps.
- Routes the oxygen hose between his back and the parachute container, then between the horizontal adjustment strap and the waistband on his right side.
- Secures the dovetailed fitting in the receiving bracket on the right main lift web.
- Tightens the waistband and secures the left wing flap over the detachable pouch and the weapon (if used).

Six-Man Prebreather Portable Oxygen System

The six-man prebreather portable oxygen system was designed as a self-contained, easy to operate, small, lightweight and virtually maintenance-free oxygen system (Figure 7-8). Oxygen duration is based on altitude and individual consumption requirements. Therefore, the same volume of oxygen based on a given time at sea level will last longer at altitude, based on expansion of the gas.

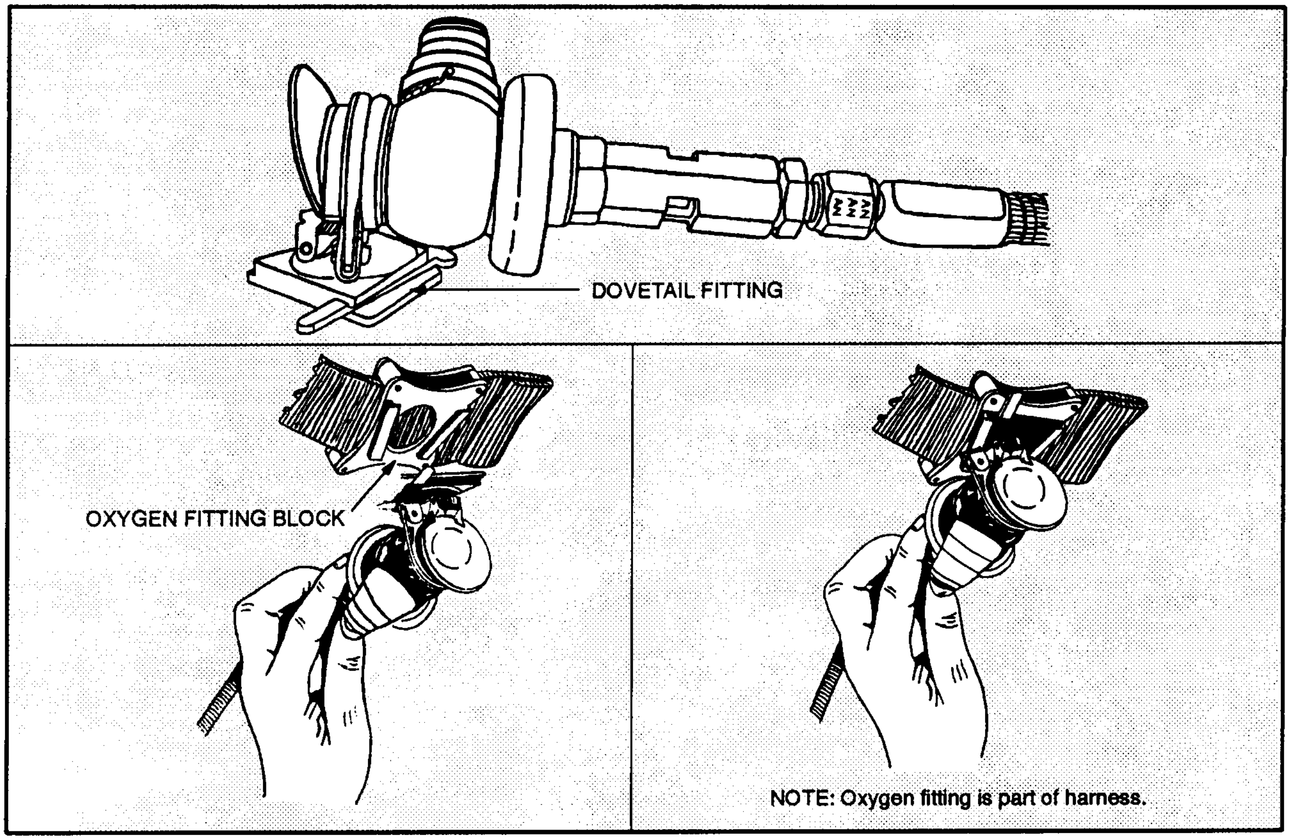


Figure 7-6. AIROX VIII assembly.

The system's size was based on placing it completely under the troop seats on a C-141B Starlifter aircraft and securing it with the existing 10,000-pound floor fittings. On the C130 aircraft, use the 5,000-pound tie downs. Its outer housing is of 4130 aircraft sheet steel, and recesses or steel guards protect the critical components. Color coding identifies certain parts, such as hoses and their mating parts, to prevent their misconnection.

The system has 100 percent oxygen capability for 1 hour for six parachutists while ascending to 35,000 feet MSL.

NOTE: With the CRU-79/P regulator, the system has an operational ceiling of 50,000 feet MSL.

Other system features are listed below:

- Weighs 106 pounds when filled.
- Measures 27.3 inches wide, 13.37 inches deep, and 10.99 inches high.
- Can provide oxygen for one to six parachutists.
- Has modular components.
- Is constructed to survive an 8G forward crash load.
- Has a recessed refilling point.
- Has an easily gripped and guarded ON/OFF knob.
- Has color coded and indexed oxygen connectors to ensure proper hose connections, including optional hose lengths to fit parachutist seating requirements.
- Has a steel guard around oxygen hose connectors.
- Interfaces with any pressure-demand mask and associated connectors.
- Can be refilled while being used.

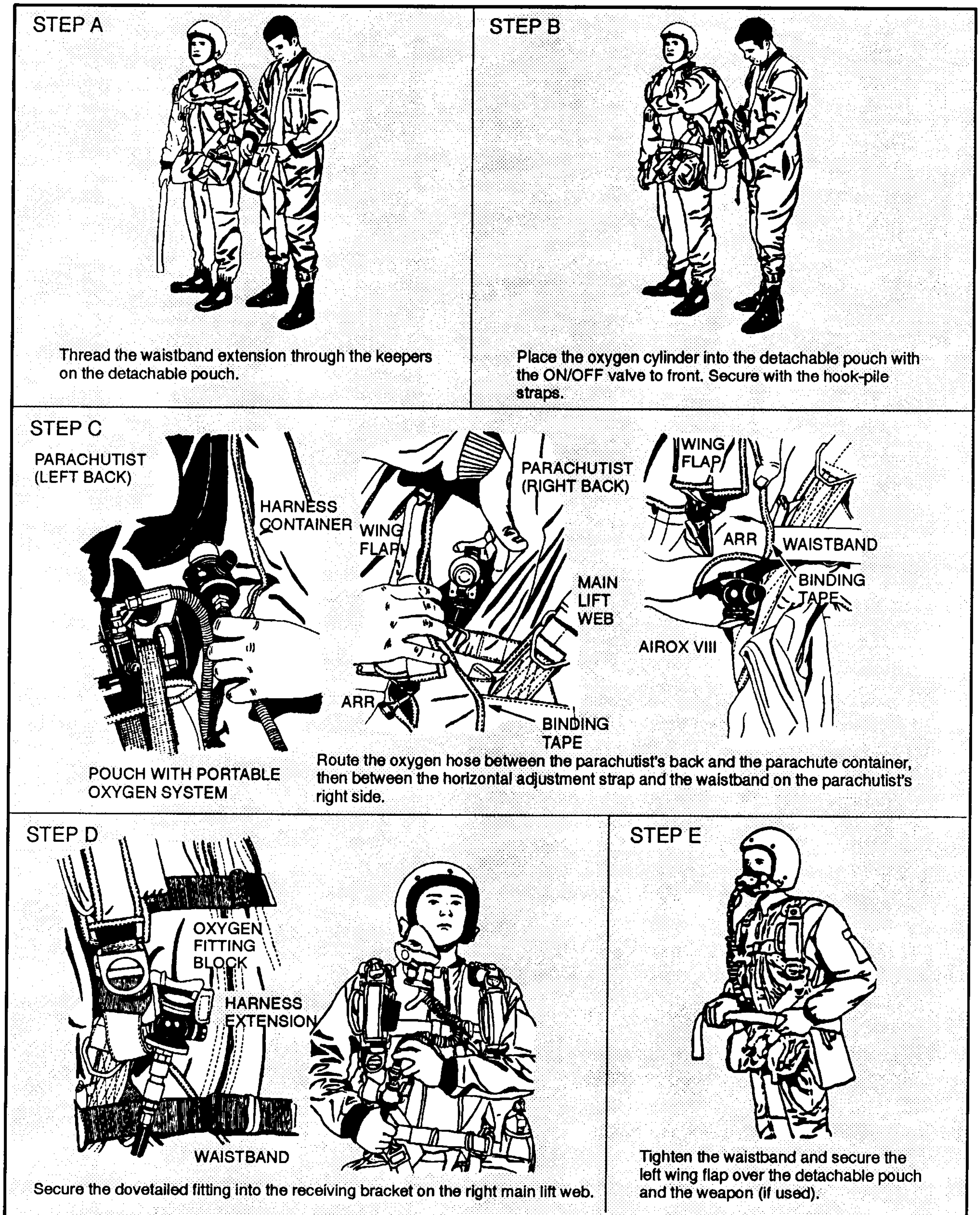


Figure 7-7. Rigging the portable/bailout oxygen system with the AIROX VIII assembly to the RAPS.

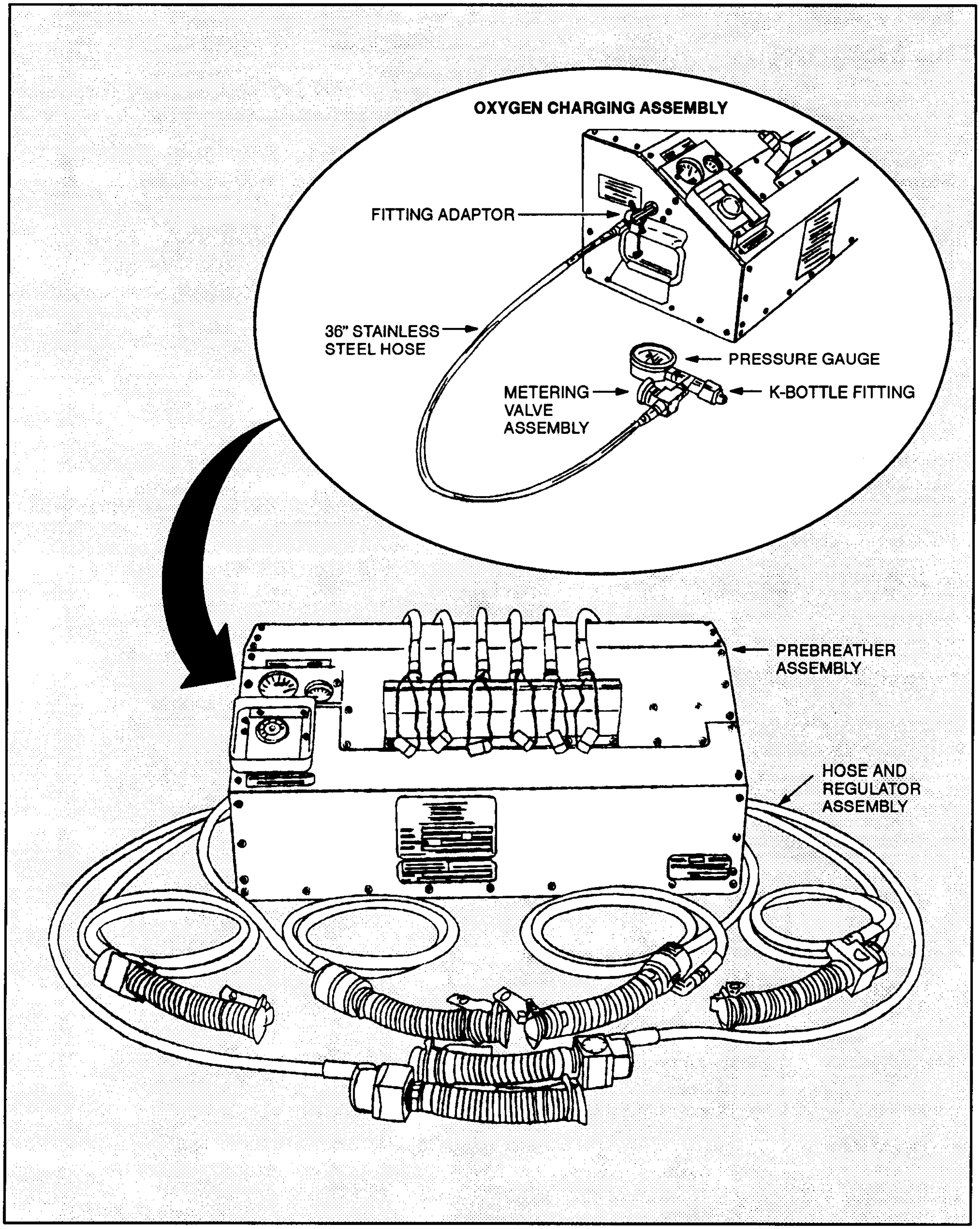


Figure 7-8. Six-man prebreather portable oxygen system.

MA-1 Portable Oxygen Assembly

The MA-1 portable oxygen assembly is a low-pressure system capable of supplying the parachutist with breathing oxygen for normal or emergency use. It is commonly called the walk-around bottle. The MA-1 is filled from the aircraft's oxygen supply. Pressure is indicated on the cylinder pressure gauge. The cylinder is considered full at 300 psi and empty at 100 psi. The MA-1 is operated by placing the selector knob at one of the four settings (NORM, 30M, 42M, and EMER) and breathing directly through the CRU connector receiver port or an attached oxygen mask (Figure 7-9).

The "PRICE" Check

Each letter of the acronym PRICE represents an area of or a specific item of oxygen equipment that the parachutist must check. The PRICE check makes no provision for inspecting the mask or protective helmet. The parachutist checks—

- P - Pressure. He checks for full pressure on the particular system in use.
- R - Regulator, He checks everything on the particular regulator in use. He checks for dents, cracks, broken gauges, grease or oil, and movement of dials and levers. He checks the entire oxygen delivery system for leaks.
- I - Indicator. He checks to ensure the flow indicator shows that gas is flowing through the regulator from the storage system.
- C - Connections. He checks all hose connections.
- E - Emergency equipment. He does a complete PRICE check on any emergency oxygen equipment and the complete bailout system.

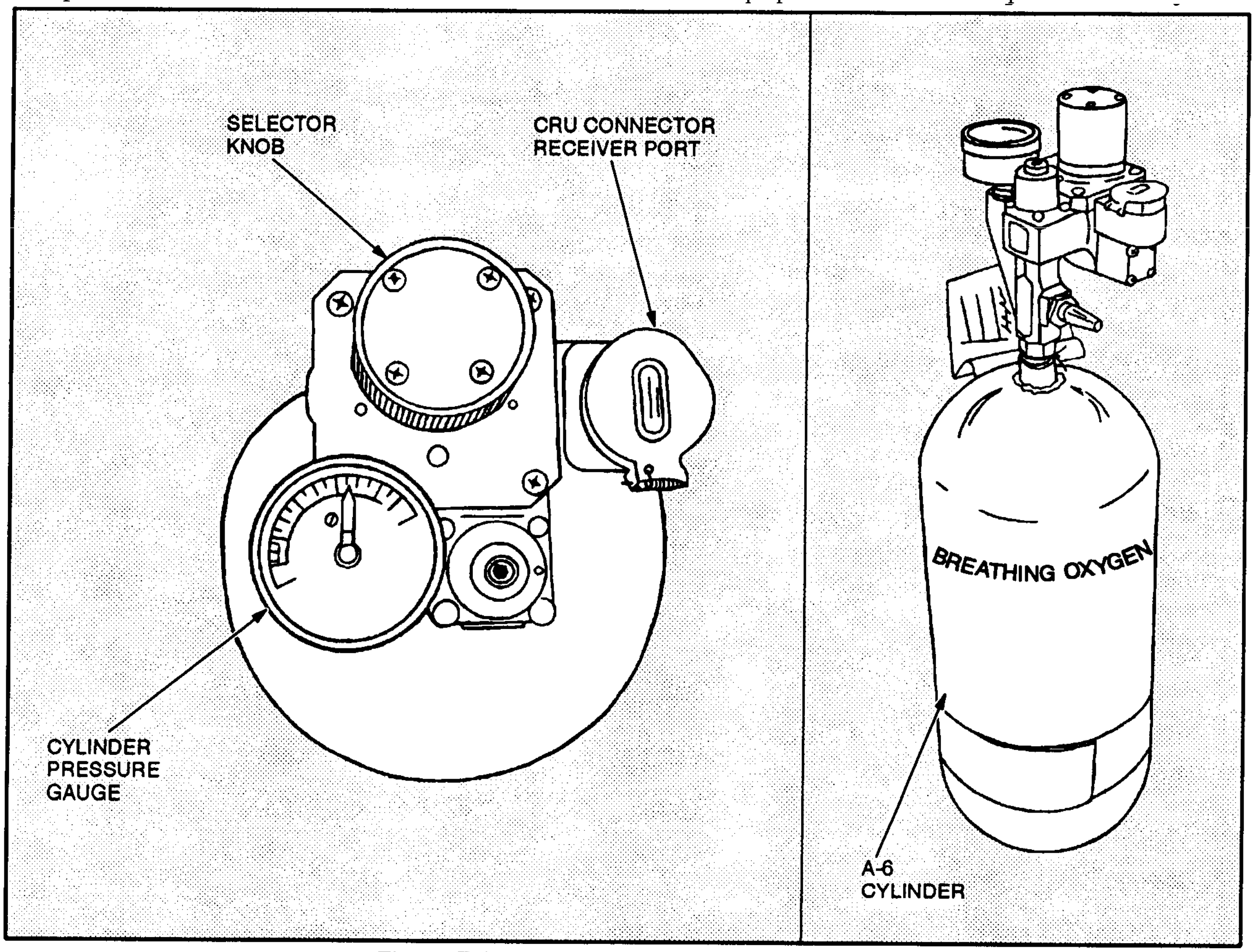


Figure 7-9. MA-1 portable oxygen assembly.

Safety Personnel

There must be oxygen safety personnel on board each aircraft during MFF operations using supplemental oxygen. Air Force physiological personnel must also be on board each aircraft when the mission requires oxygen prebreathing by the flight crew and parachutists. The oxygen safety personnel—

- Plan for all oxygen equipment required for the mission.
- Provide one additional mask of each size and one additional complete bailout system per six parachutists.
- Plan for one additional open oxygen station per every six parachutists in the event of a hose or regulator failure.
- Conduct preflight inspection and preflight operational checks of all oxygen equipment (Figures 7-10 through 7-13).
- Supervise the transportation and installation on board the aircraft of prebreathers and oxygen cylinders.
- Issue oxygen supply hoses to each parachutist and supervise hose connection.
- Ensure the parachutists mask properly, fully open shutoff valves on the prebreathers, and receive oxygen after the aircraft procedure signal "mask" is given.

WARNING

NEVER partially close the shutoff valve during oxygen use; this will result in a restriction of oxygen flow to the parachutist.

- Periodically check oxygen pressure and equipment function during use (approximately every 10 minutes),
- Monitor each parachutist for signs of hypoxia, bends, or chokes.
- Assist the parachutist with the activation of the bailout systems and inspect all bailout systems to ensure they were activated.
- Check the parachutist's hose connections on the AIROX VIII. If the parachutist still indicates a problem, activate the bailout system, move the parachutist to an open station, and deactivate the bailout system.

Prebreather Attachment

The prebreather oxygen assembly is normally located under the troop seats, and the oxygen supply hoses are routed up and behind the seats. The prebreather may also be positioned centerline in the aircraft using 10,000-pound tie-down fittings (C-141B), 5,000-pound tie-down fittings (C-130), or securing straps.

When using 10,000-pound tie-down fittings, the parachutist places the two large holes in the base plate of the prebreather over existing 10,000-pound tie-down fitting holes in the floor of the aircraft. Through the openings in the side of the prebreather, he places two 10,000-pound fittings (one through each end) into the mating receptacle now visible through the prebreather's baseplate. He then locks the fittings in place. These fittings will provide all the security necessary to hold the prebreather in place.

When using oxygen console tie-down assembly, the parachutist places two large holes in the prebreather's baseplate over the attached 5,000-pound ringed tie-down fittings. Next, he places securing adapters over the exposed rings and pushes the pins through the holes in the adapters until they lock. These fittings will provide all the security necessary to hold the prebreather in place (Figure 7-14).

Cargo straps are not necessary for added security when using the 10,000 pound tie-down fittings or oxygen console tie-down assembly. If the parachutist uses cargo straps in place of the tie-down fittings, he places the straps through the securing access holes at each end of the prebreather and cinches tight to existing fittings.

NOTE: The prebreather carrying handles are not stressed for use as securing points.

PREFLIGHT INSPECTION OF 106-CUBIC-INCH PORTABLE/BAILOUT OXYGEN SYSTEM

Check to ensure that—

- ☐ Cylinders are lime green and stenciled in white with the words AVIATOR'S BREATHING OXYGEN.
- ☐ No cracks, dents, or gouges are in the cylinders.
- ☐ Cylinder clamp and roller are on the bottom one-third of the cylinders and secure.
- ☐ Cylinders are tight into the pressure reducer body.
- ☐ Reducer body is not cracked or damaged.
- ☐ Filler valve, pressure gauge, and relief valve are tight into the pressure reducer body.
- ☐ Cap on the filler valve is secure and the filler cap lanyard is secured to both the cylinder and filler valve.
- ☐ Pressure gauge face is not damaged and the dial indicator is not sticking.
- ☐ ON/OFF control valve is secured to the pressure reducer body with four "allen" screws.
- ☐ Guide rails of the ON/OFF control valve are undamaged. Operating lever operates properly and the detent will hold the valve in the ON and OFF position.
- ☐ Union elbow is secured tightly to the top of the pressure reducer body and the elbow directs the hose over the pressure gauge.
- ☐ Hose assembly is not frayed or crushed, and the cloth covering is not worn and is free of oil or other contaminants.
- ☐ Hose assembly is securely attached to the union elbow and flow indicator.
- ☐ There is no obvious damage to the flow indicator body, the arrow points toward the AIROX, and the flow indicator is securely attached to the AIROX.
- ☐ View glass is clear indicating a no flow condition and the white sleeve, yellow sleeve, and spring are present.
- ☐ Blue tamper-proof dot is present directly below the ambient air port.
- ☐ Equalization port is free of foreign objects or debris.
- ☐ Brass set screw and brown tamper-proof dot are present.
- ☐ Body of the AIROX is not damaged or cracked.
- ☐ Ambient air port is securely attached to the AIROX and not damaged and the safety lock wire and screw are intact.
- ☐ Chrome ring is present and rotates freely.
- ☐ Gasket is present, clean, and free of nicks or tears.
- ☐ Inlet orifice is free of foreign objects or debris and the screen is present and not damaged.
- ☐ Cover of the outlet orifice is spring loaded and seats properly.
- ☐ No foreign objects or debris is in the outlet orifice and the screen is present and not damaged.
- ☐ Dovetail mounting plate is securely attached to the bracket.
- ☐ There is no damage to the dovetail mounting plate.
- ☐ Locking lever is spring loaded and functions properly.

PREFLIGHT OPERATIONAL FUNCTION CHECK

- ☐ Ensure the system is fully charged at 70 degrees Fahrenheit.
- ☐ Connect a mask to the outlet orifice and ensure that it is secure and that excessive force is not required to connect and disconnect.
- ☐ Turn the system on and seal the mask to the face.
- ☐ Inhale — yellow sleeve (on flow indicator) rises; exhale — yellow sleeve falls. Inhalation shall be normal with no undue exertion.
- ☐ Ensure there is no oxygen flow from the relief valve.
- ☐ Turn the system off, reseal the mask to the face, and ensure you can breath through the ambient air port.
- ☐ Connect a hose and regulator assembly to the ambient air port, ensure that it is secure and that excessive force is not required to connect and disconnect.

Figure 7-10. Sample portable/bailout oxygen system preflight inspection and preflight operational checklist.

PREFLIGHT INSPECTION OF SIX-MAN PREBREATHER

Check to ensure that—

- ☐ Unit has no obvious damage.
- ☐ Gauge faces are not broken.
- ☐ Dial indicators are not sticking.
- ☐ All screws are present and not coming loose.
- ☐ Handles are not separating from unit.
- ☐ Filler cap is present and tied down to unit.
- ☐ All female disconnect plugs are present and tied down to disconnect.
- ☐ Female disconnects are not distorted and the pins of the male connectors of the hose assemblies will engage with the collar of the female disconnect.
- ☐ Female disconnects are safety-wired to the adjacent female disconnect.
- ☐ Connector manifold guard does not interfere with the operation of the female disconnects or male connectors of the hose and regulator assembly.
- ☐ Both set screws in the on-off knob are present and not backing out.
- ☐ On-off valve stem is not bent.
- ☐ Container is not cut, damaged severely, or corroding.
- ☐ Unit is fully charged to 1800 psi at 70 degrees Fahrenheit.

PREFLIGHT INSPECTION OF THE HOSE AND REGULATOR ASSEMBLY

Check to ensure that—

- ☐ Each male connector has the proper amount of pins (red - 2 pins; yellow - 3 pins; grey - 4 pins) and the mating probe is not distorted.
- ☐ Male connector is tight in the hose assembly.
- ☐ Wire wrapping is not frayed and hose is not crushed.
- ☐ Cloth covering is free of oil or other contaminants.
- ☐ Red male connector is connected to 72-inch hose; yellow connector to 90-inch hose; and grey connector to 98-inch hose.
- ☐ Hose is tightly connected to regulator.
- ☐ Regulator is not cut or cracked.
- ☐ No foreign object or debris is in equalization port.
- ☐ Low-pressure hose is clamped to both the check valve and the regulator, and the clamps are safety wired.
- ☐ Cover is spring loaded and seats evenly over check valve.
- ☐ Check valve is spring loaded.

PREFLIGHT OPERATIONAL FUNCTION CHECK

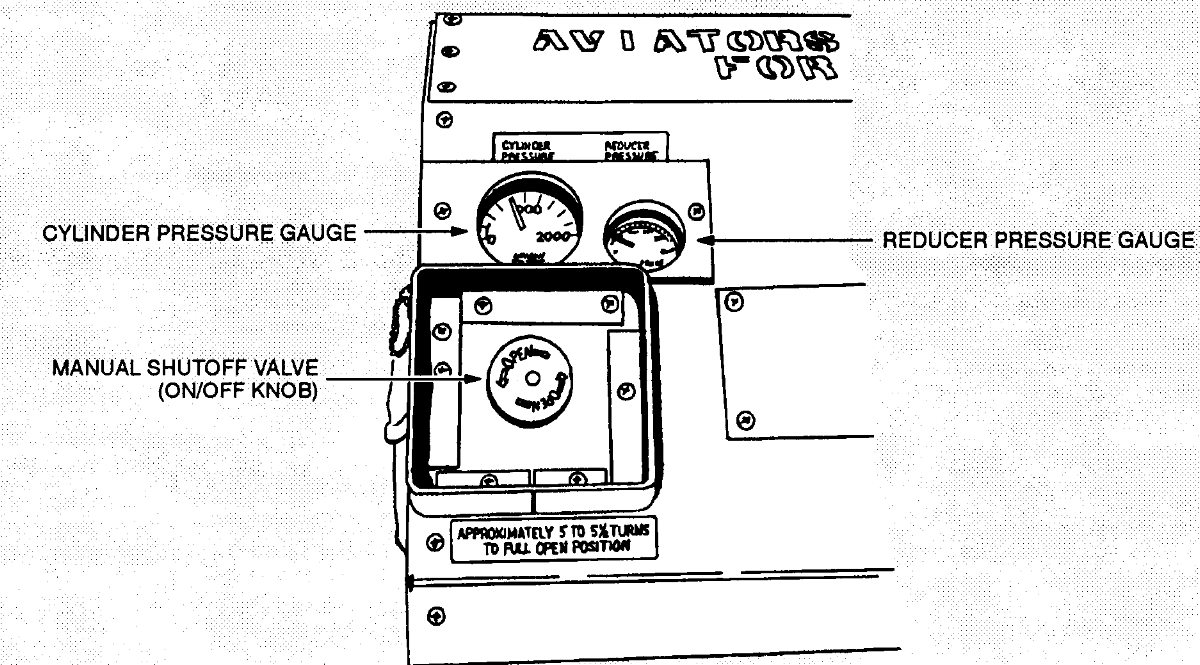
- ☐ Turn the shutoff valve counterclockwise to the fully opened position (approximately $5^1/_2$ turns) (Figure 7-12).
- ☐ Ensure the reducer pressure gauge indicates 40-60 psi (Figure 7-12).
- ☐ Remove each disconnect plug in turn and depress the "popett" of each disconnect (Figure 7-13A) and ensure oxygen flows from each disconnect.
- ☐ Close shutoff valve and ensure reducer pressure remains steady (40-60 psi).
- ☐ Bleed off the pressure through the disconnect manifold.
- ☐ Install all hose and regulator assemblies to their appropriate disconnect (Figure 13B). ***(Ensure manifold pressure is bled before attaching hose and regulator assemblies.)***
- ☐ Connect an MBU-12/P mask to each hose and regulator assembly.

CAUTION

Failure to properly connect the hose and regulator assemblies to the prebreather using the above procedures could possibly damage the diaphragm of the CRU-79/P regulator and render the equipment inoperative.

- ☐ Open shutoff valve (approximately $5^1/_2$ turns).
- ☐ Listen for and feel the oxygen flow from each mask.
- ☐ Disconnect all but one mask and note the reducer pressure for a 3 to 5 second interval. The reducer pressure should not drop below 40 psi.
- ☐ Hold mask up to the face and inhale. Inhalation shall be normal with no undue exertion to breathe oxygen. Remove mask from hose and regulator assembly and ensure check valve closes and there is no flow from the hose and regulator assembly.
- ☐ Repeat the above step for each hose and regulator assembly.
- ☐ Close shutoff valve and bleed manifold pressure through one or more check valves until reducer pressure indicates zero.
- ☐ Monitor reducer pressure for 15 minutes. (Ensure gauge indicator remains at zero.)

Figure 7-11. Sample prebreather preflight inspection and preflight operational checklist.



NOTES:
1. Cylinder pressure gauge needle should indicate 1,800 psi.
2. Reducer pressure gauge needle should indicate 40 to 60 psi.

Figure 7-12. Pressure gauge and manual shutoff valve.

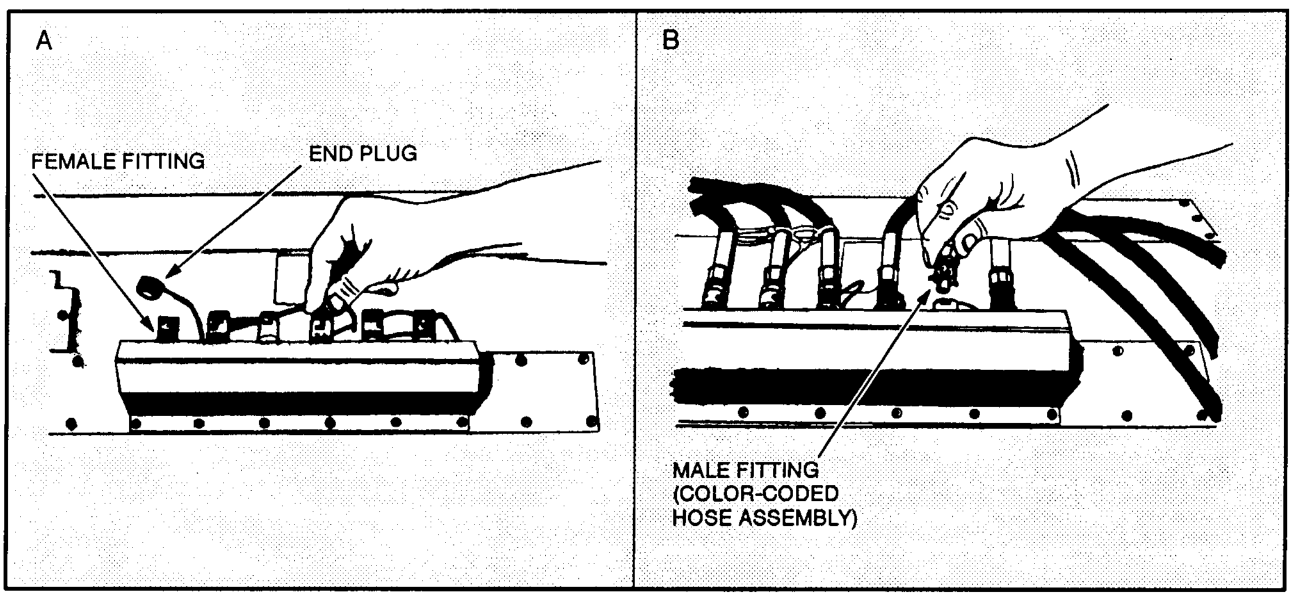


Figure 7-13. Removing end plugs and depressing "poppets".

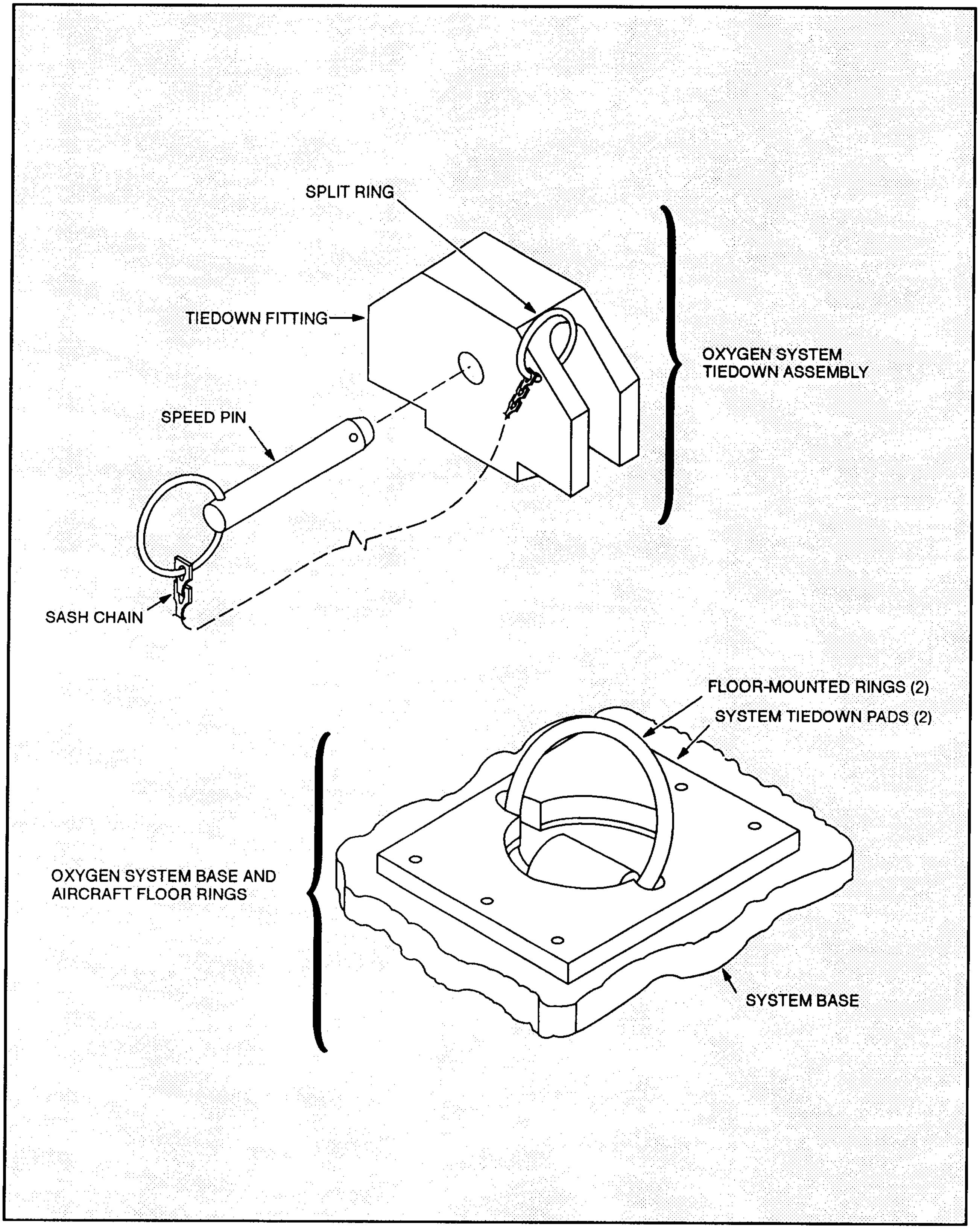


Figure 7-14. Tiedown assembly and installation.

CHAPTER 8

MILITARY FREE-FALL JUMP TRAINING FOR RAM-AIR PARACHUTE

This chapter describes the RAPS' canopy and its components. Also covered is the ram-air parachute deployment sequence, its theory of flight, and its flight characteristics. Finally, canopy control procedures are explained.

Characteristics

The ram-air parachute canopy's design is similar to an aircraft's wings, with curved upper surfaces (top skin) and flat lower surfaces (bottom skin). Support ribs maintain the airfoil shape of the canopy (Figure 8-1).

Reinforced, load-bearing support ribs serve as attaching points for the suspension lines, and non-load-bearing ribs separate a cell into two compartments. Cross-port vent holes in the support ribs equalize the internal air pressure in a canopy (Figure 8-2).

Nose, tail, chord, and span are terms of reference applied to ram-air parachutes. The open portion at the front is called the nose, with the rear being the tail. The distance from left to right is the span, and from nose to tail is the chord (Figure 8-3).

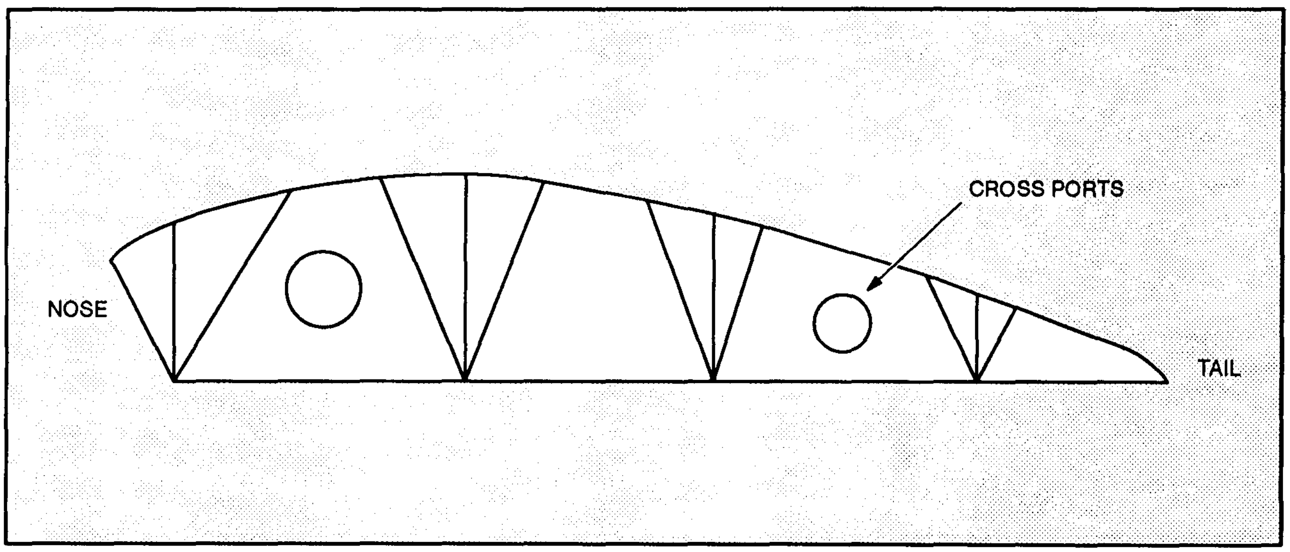


Figure 8-1. Shape of the ram-air parachute canopy.

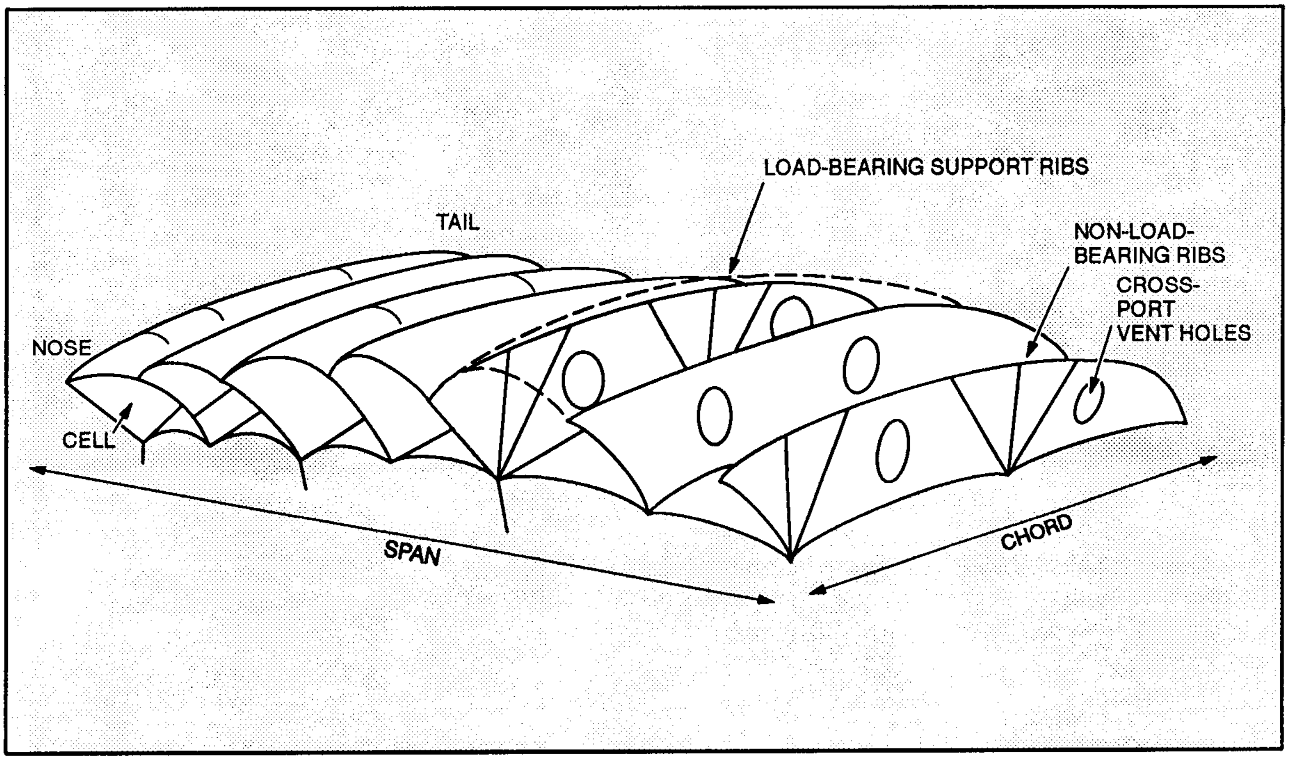


Figure 8-2. Structure of the ram-air parachute canopy.

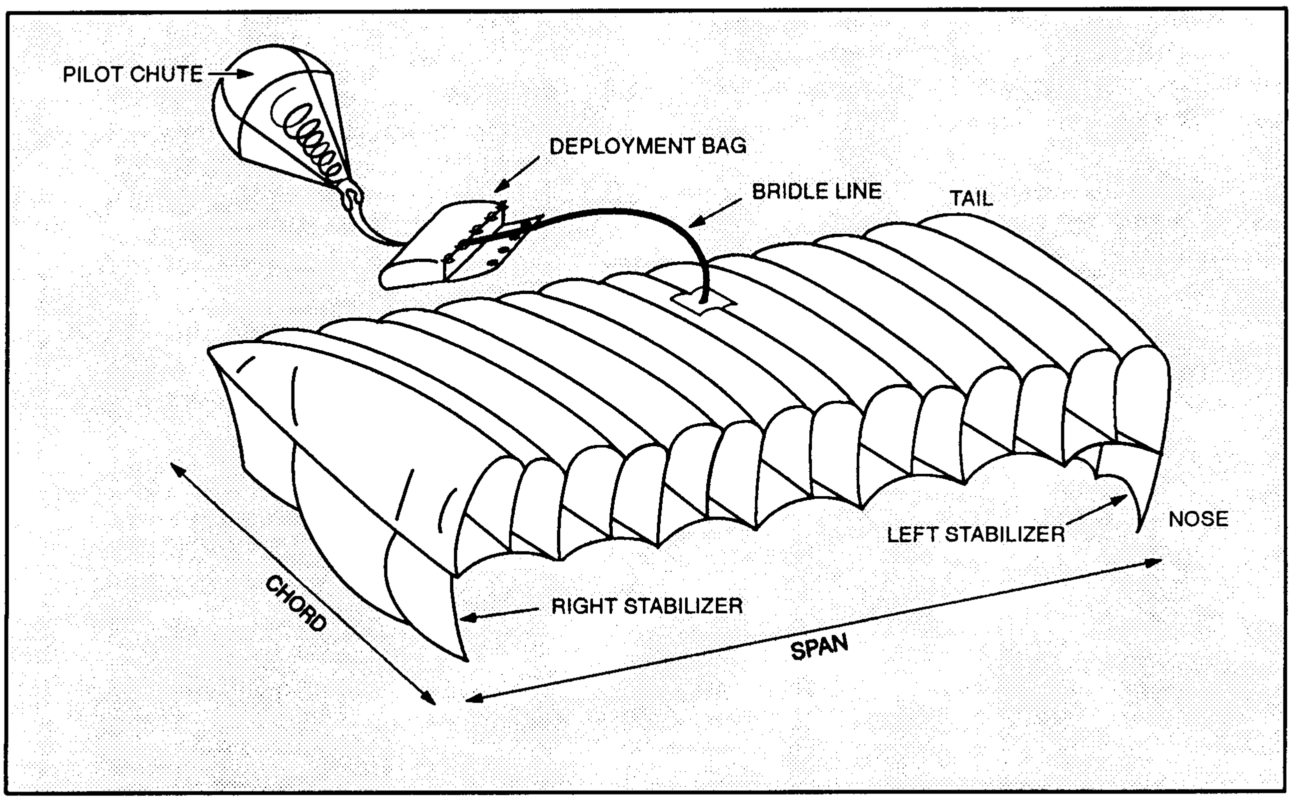


Figure 8-3. Components and nomenclature of the ram-air parachute.

The stabilizers are single-layered extensions of the canopy on the left and right sides of the parachute, They channelize the airflow across the chord and help to maintain straight and stable flight.

The military ram-air canopy has four suspension line groups. They are identified from nose to tail as A, A CASCADE, B, and B CASCADE. They become cascaded line groups when A and A CASCADE and B and B CASCADE are joined at a point below the parachute's bottom skin and connected at the riser in a single line. A continuous line group is a line attached to the parachute's bottom skin that runs directly in the connector link without having another line attached to it. The suspension lines distribute a suspended load under the canopy without distorting the canopy's airfoil shape (Figure 8-4).

Upper control lines converge from points of attachment on the left and right trailing edges of the tail, respectively, to common connection points with the lower control lines. The lower control lines are attached to the upper control lines and have a steering toggle secured to the lower end. Deployment brake loops sewn into the lower control lines set the canopy brakes for deployment.

The sail slider is a rectangular piece of reinforced fabric with a large grommet in each corner. The sail slider is a deployment device that retards the opening of a ram-air parachute (Figure 8-5).

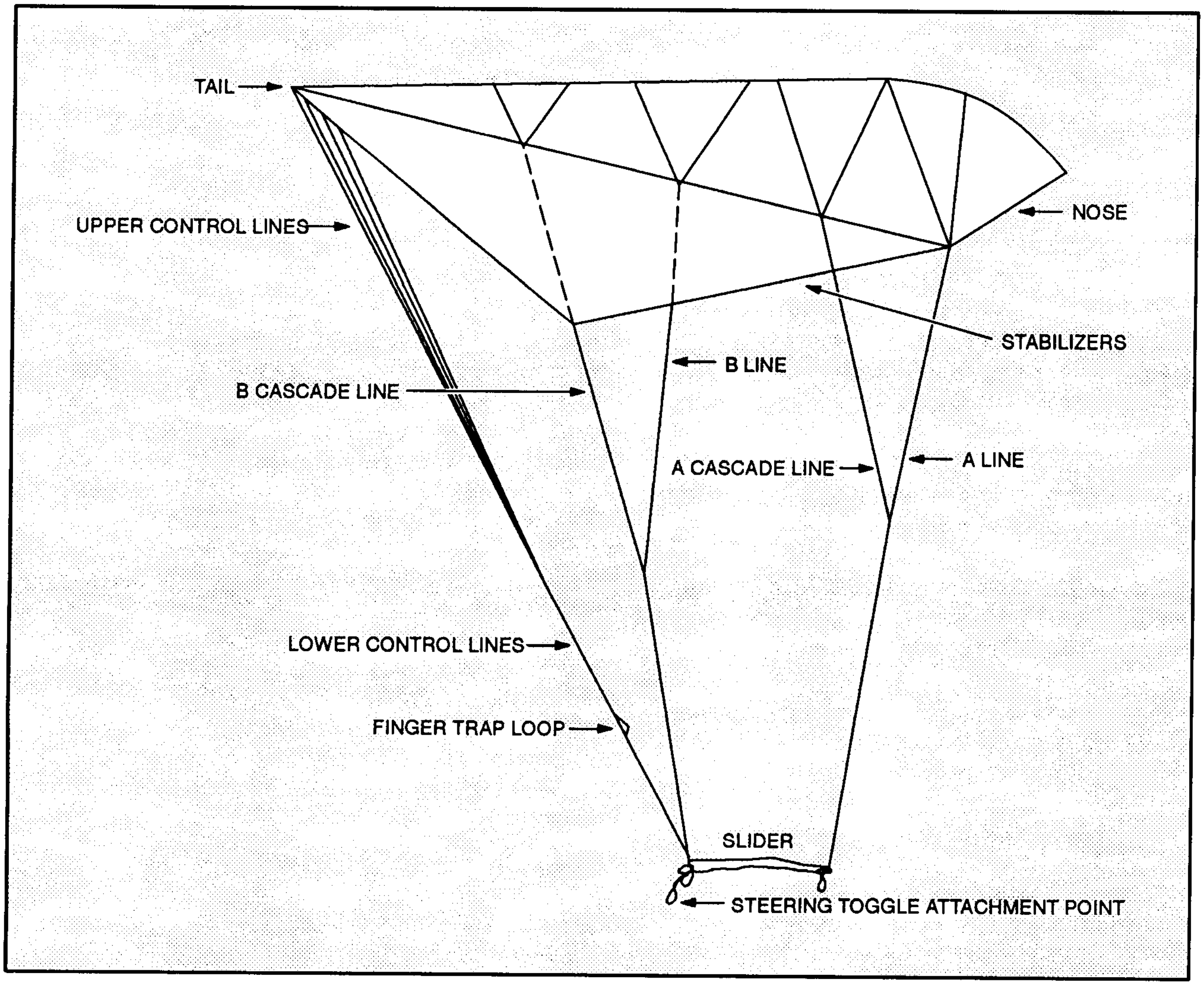


Figure 8-4. Location of components of the ram-air parachute.

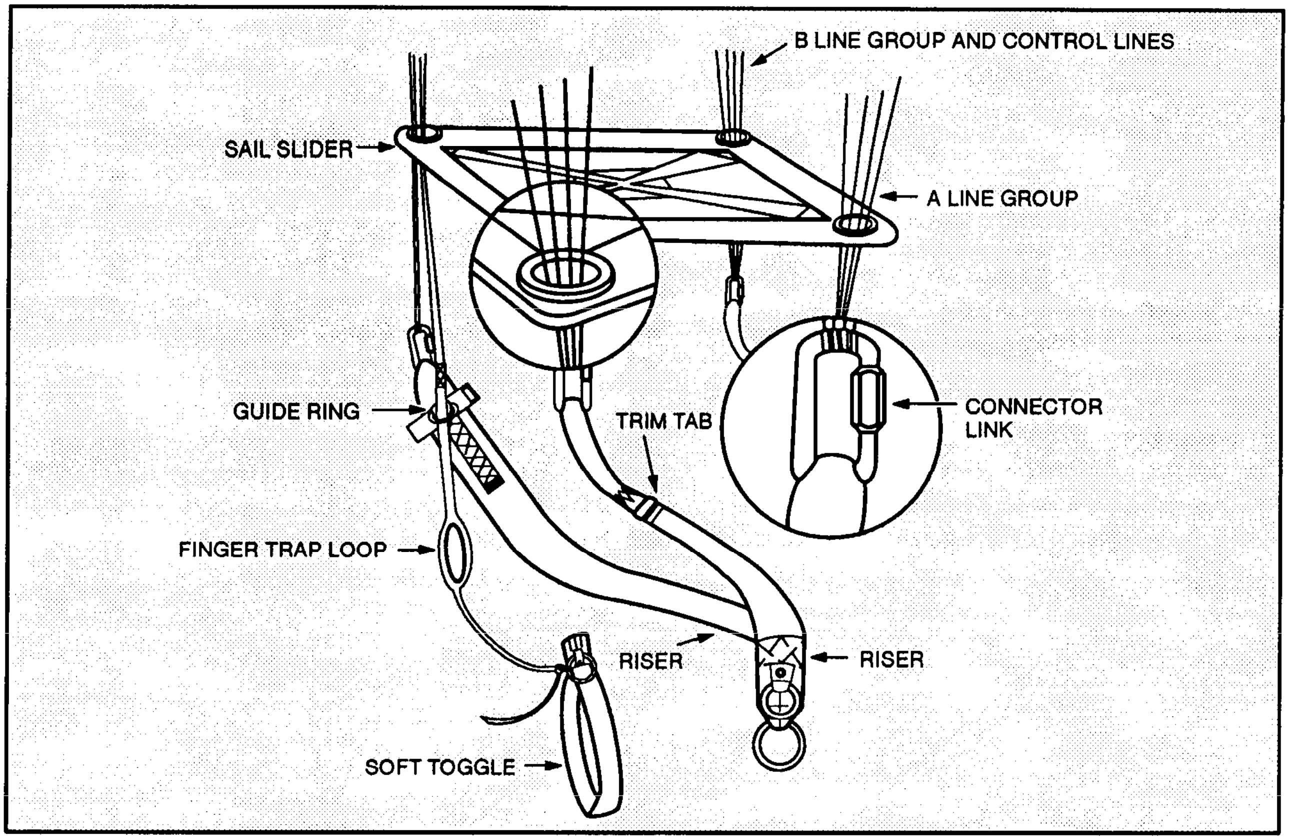


Figure 8-5. Detailed lower portion of the ram-air parachute.

Plastic disks called slider stops are sewn to the stabilizers at suspension line attachment points. These slider stops limit the upward travel of the sail slider.

The suspension lines are attached to a connector link on each riser (Figure 8-5).

Trim tabs on the main parachute's front risers shorten the risers to create an artificial decrease in the canopy's angle of attack into the wind.

Guide rings sewn to the rear risers function as anchor points for the deployment brakes and guides for the lower control lines (Figure 8-5).

Deployment Sequence

At the prescribed parachute deployment altitude, the parachutist manually activates his parachute. He grabs and unseats the main rip cord handle in his right hand and fully extends his arm (Figure 8-6).

When the main rip cord pin clears the closing loop, the main pilot chute opens the closing flaps, launches from the main parachute container, and extends the pilot chute bridle. The bridle extracts the deployment bag from the main container, and the suspension lines unstow from their retainer bands. When the lines are filly extended, they pull the main parachute from the deployment bag, and the canopy begins to inflate (Figure 8-7). The sail slider retards the canopy's deployment. As the canopy inflates, it forces the sail slider down toward the risers as the suspension lines spread apart. After complete canopy deployment, the parachutist pulls the steering toggles from the deployment brake loops to release the control lines from the deployment brakes setting to the full flight setting.

Should the parachutist encounter an uncontrollable situation requiring the initiation of emergency procedures, he discards the main rip cord handle.

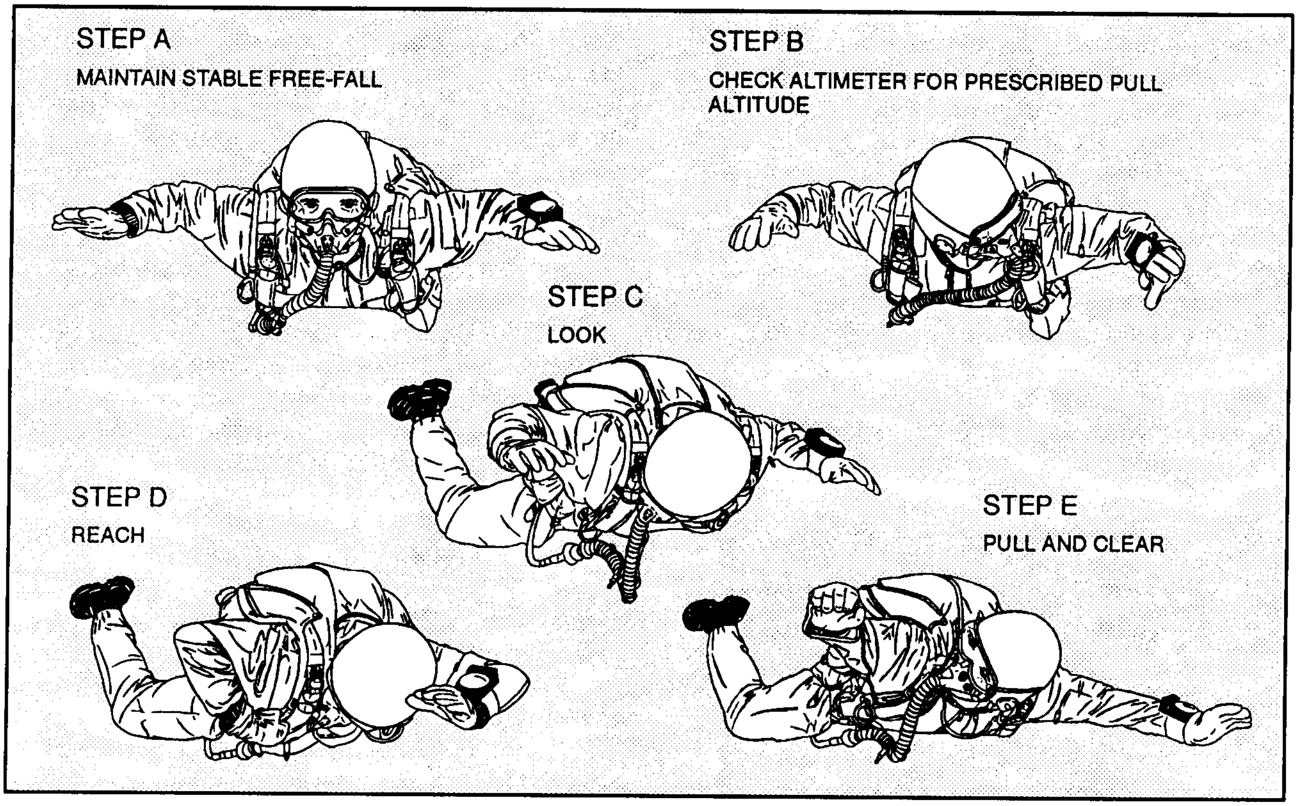


Figure 8-6. Activating the ram-air parachute.

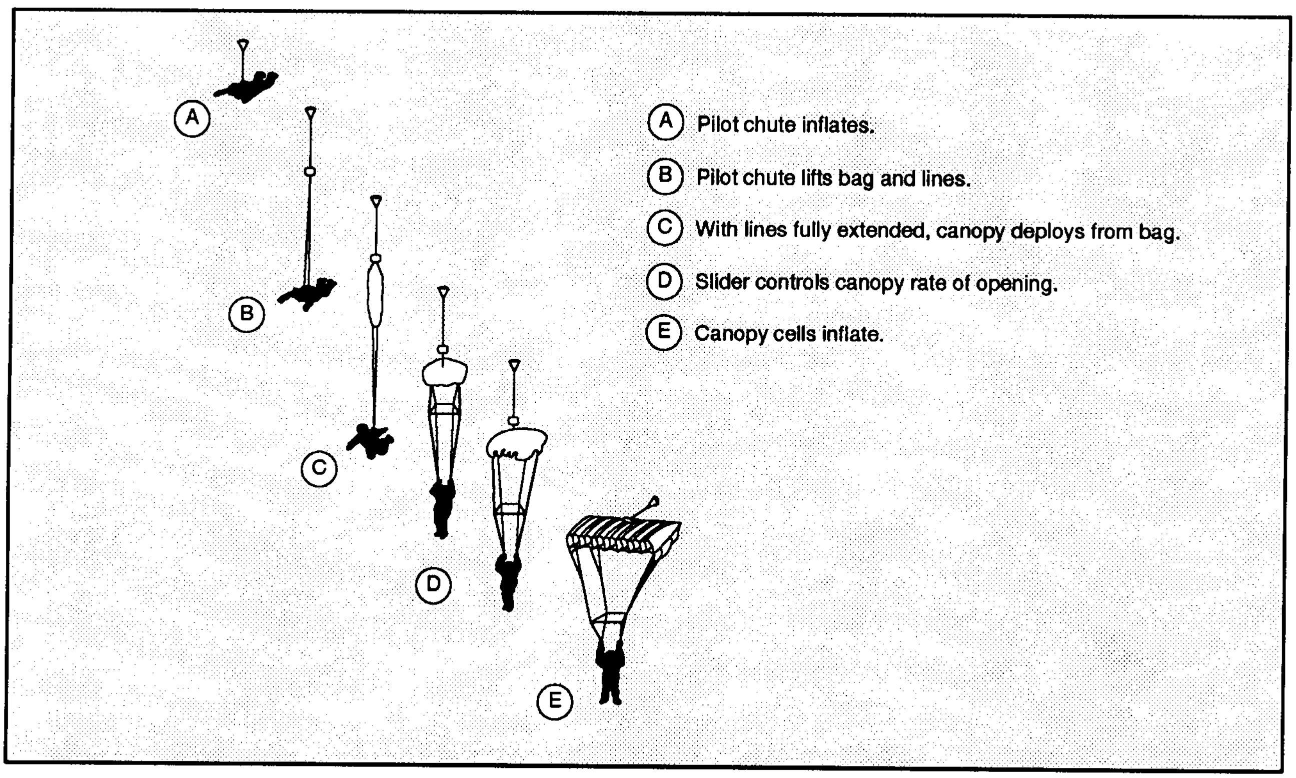


Figure 8-7. Deployment sequence.

He then looks at and secures the cutaway handle with his right hand and the reserve rip cord handle with his left hand and then arches vigorously. He pulls the cutaway handle to full arm extension. He then immediately pulls the reserve rip cord handle to full arm extension. Then he discards both these handles. This action allows the cutaway cables to clear the release loops threaded through the small rings of the canopy release assembly. The three-ring system activates the right side a moment before the left side to prevent an entanglement.

As the left riser set is jettisoned, it pulls the reserve static line, usually deploying the reserve before manual activation of the reserve rip cord (Figure 8-8).

WARNING

The parachutist must first pull the cutaway handle AND THEN the reserve rip cord handle to full arm extension and discard them to ensure complete emergency procedures are followed.

As the reserve rip cord pins clear the closing loops, the pilot chute opens the closing flaps. The pilot chute deploys from the reserve parachute container and, as it catches air, extends the 2-inch-wide high-drag bridle. Upon extraction of the reserve free bag from the container, the free-stowed suspension lines deploy from a pocket on the free bag and extract the reserve parachute from the free bag. The free bag then completely separates from the reserve parachute. As the canopy deploys, it forces the sail slider down the suspension lines. When the parachutist releases the toggles from the deployment brake loops, he releases the control lines from the deployment brake setting to the full flight setting.

Theory of Flight

The ram-air parachute is an inflated and pressurized fabric airfoil that generates lift by moving forward through the air. The relative lengths of the suspension lines maintain the airfoil's angle of attack. In flight, the parachutist keeps the wing's leading edge at a slightly lower angle than the trailing edge.

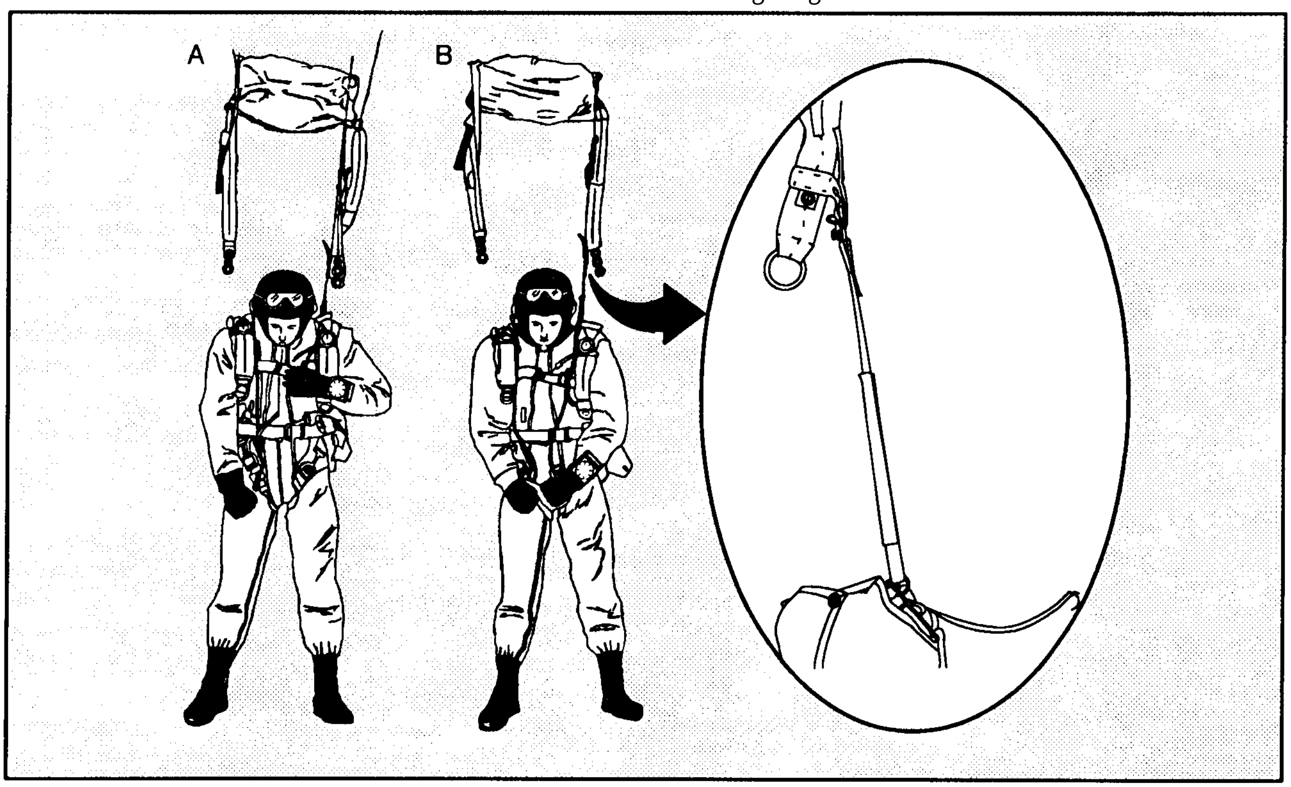


Figure 8-8. Cutaway sequence and deployment of the reserve.

Thus this angle forces the canopy's airfoil-shaped surface to glide or plane through the air, very much like a glider in descending flight. The wing-shaped ram-air parachute generates lift caused by the reduced pressure of the airflow over the curved upper surface.

The ram-air parachute's leading edge is open or physically missing, forming intakes that allow the cells to be ram-air inflated. Internal air pressure pushes a small amount of stagnant air ahead of the airfoil, forming an artificial leading edge. The focal point of this stagnant air acts as a true leading edge, deflecting the relative air above and below. Drag is the only force that retards the wing's forward motion through the air. It is created by the friction of air passing over the canopy fabric, the suspension lines, and the parachutist and his equipment. Gravity, plus the resultant sum of these aerodynamic forces on the upper surface, acts to pull the ram-air parachute through the air and contribute to the flat glide angle of the canopy (Figure 8-9).

Applying brakes on the ram-air parachute causes the trailing edge to deflect downward, creating additional drag (Figure 8-10). This drag produces a proportionate loss of airspeed but generates lift for a short time. Prolonged application of brakes results in a loss of airspeed and generated lift and a steeper approach angle. As full brakes are reached, the wing ceases to generate dynamic lift, resulting in an increased rate of descent at an almost vertical descent angle. Depressing the toggles beyond full brakes causes the parachute to cease flying and enter a stall.

Differential application of brakes (one side only, or one side more than the other) produces an unbalanced drag force at the trailing edge. This drag results in a yaw-type turn toward the side with the highest drag.

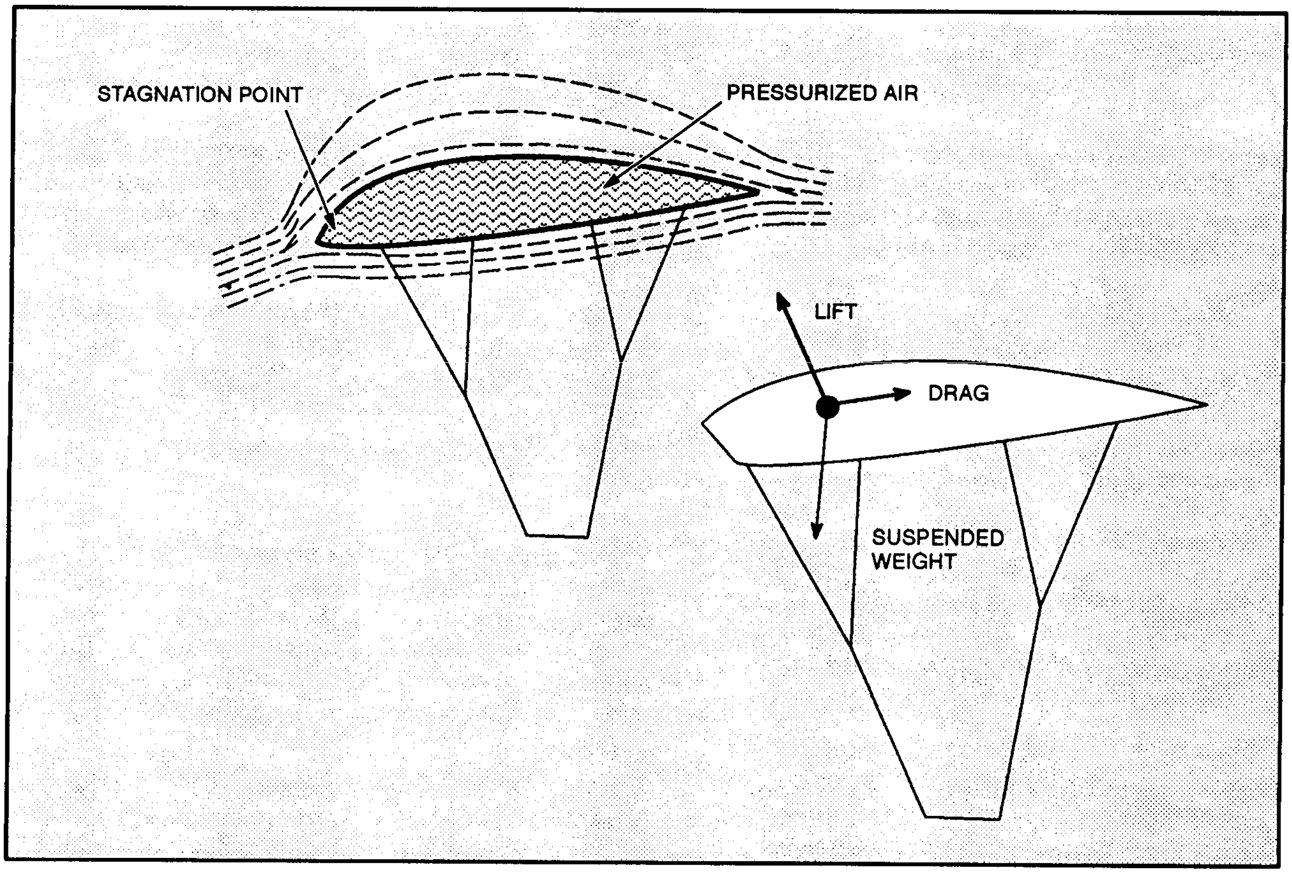


Figure 8-9. Ram-air parachute theory of flight.

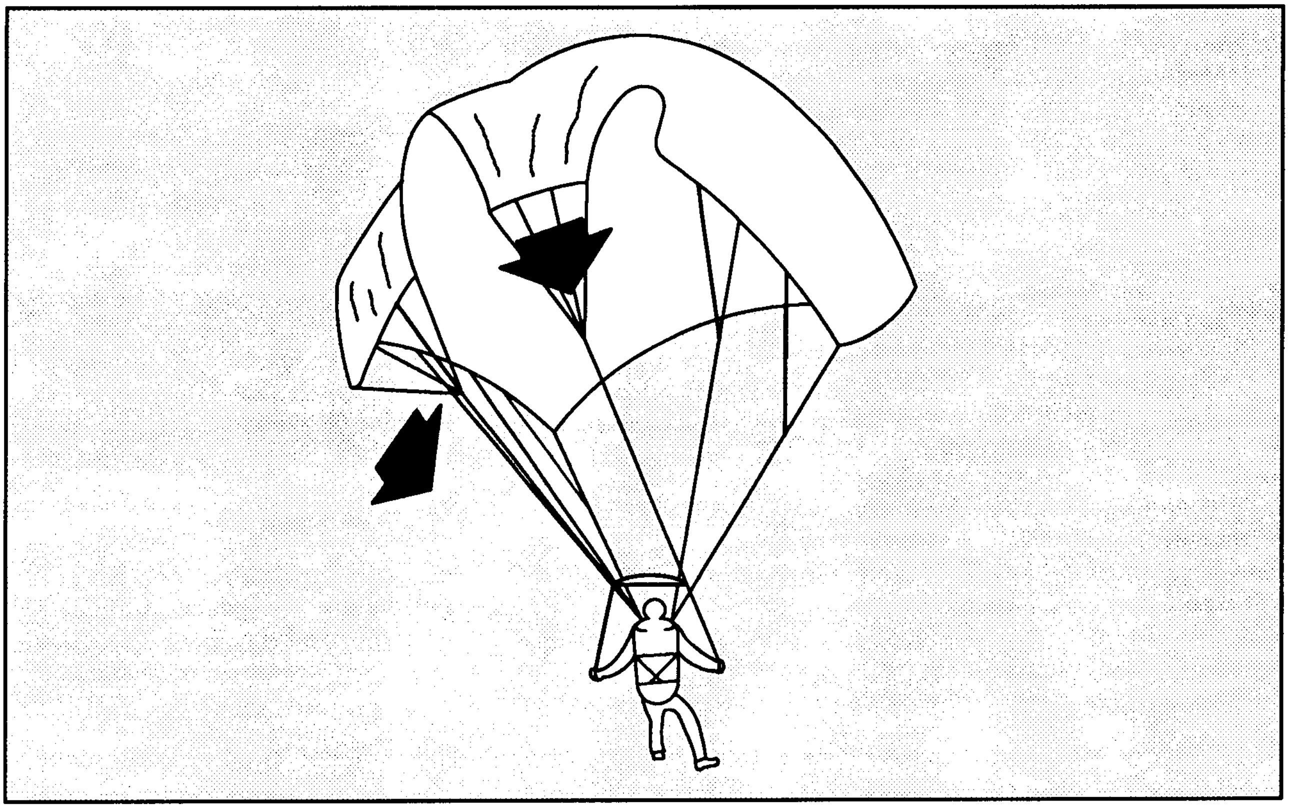


Figure 8-10. Applying brakes on the ram-air parachute.

Because the slow side generates less lift, it tends to drop slightly in a shallow banking motion, much like an airplane. This bank angle increases as differential toggle displacement increases.

Flight Characteristics

Although the ram-air parachute is a very docile and forgiving canopy, ***the parachutist must remember that it is a high peformance gliding system.*** In the hands of an inexperienced parachutist or one ignorant of proper handling techniques, it is, by virtue of its high performance, potentially dangerous. The parachutist must possess a working knowledge of its flight capabilities and limitations and fully understand the canopy control techniques.

The ram-air parachute is not overly complicated. It is basically a fabric wing section. The parachutist must have a very basic knowledge of aerodynamics to better understand its flight and handling characteristics.

The ram-air parachute planes or glides through the air at about 20 to 30 miles per hour (mph). It always flies at this speed regardless of wind conditions, except when the parachutist applies brakes.

The flying speed is called AIRSPEED and remains constant regardless of whether the parachute is headed upwind, downwind, or crosswind. The only variation in flying upwind or downwind is a change in GROUND SPEED, which is often mistaken for a change in airspeed.

Wind affects ground speed only and has no effect on airspeed. Brakes applied with conventional control lines and toggles control the ram-air parachute's airspeed. The parachutist must remember that 50 percent of toggle travel on a ram-air parachute will cause a speed reduction of close to 12 mph.

There is almost no surge on deployment, and there is no wind noise at all until after releasing the brakes. A parachutist who has not been previously exposed to the ram-air parachute's flight characteristics can use the wind noise created by forward speed as a rough airspeed indicator. A reduction in the wind noise level can provide a stall warning.

After the parachutist becomes accustomed to the canopy, he will not notice the wind noise. By this time he will have learned to fly the canopy by feel, and he will have ample stall warning. A parachutist will feel the canopy shudder as it loses lift and begins to stall.

The parachutist must remember that in controlling the canopy's flight, how fast he moves the toggles from one position to another is as critical as the relative position of the toggles. As a rule, rapid and generous (more than 30 percent) application of both toggles will cause a rapid decrease in airspeed, decelerating into the stall range at about 0 to 3 mph. (Depending on the wind speed, the ground speed could still be very high.)

Due to the penetrating ability of the ram-air parachute, it is often difficult to determine wind direction without the aid of a wind sock, streamer, or smoke on the ground. All landings should be made facing into the wind.

The ram-air parachute has a constant airspeed of 20 to 30 mph. If the parachutist points the ram-air parachute downwind with a 10 mph wind, the ground speed will be 30 to 40 mph. If he turns the ram-air parachute into the wind and the winds are 10 mph, the airspeed remains the same but the ground speed reduces by 10 mph. If the ram-air parachute faces into 20 mph winds, the ground speed will be O mph (Figure 8-11).

Canopy Control

The overall objective of MFF parachuting is to land personnel and equipment intact to accomplish the assigned mission. The free-fall parachutist must know and employ the principles of canopy control as they relate to the use of the ram-air parachute.

Wind action, direction of canopy flight, and manipulation of the control toggles primarily control the movement of the ram-air parachute.

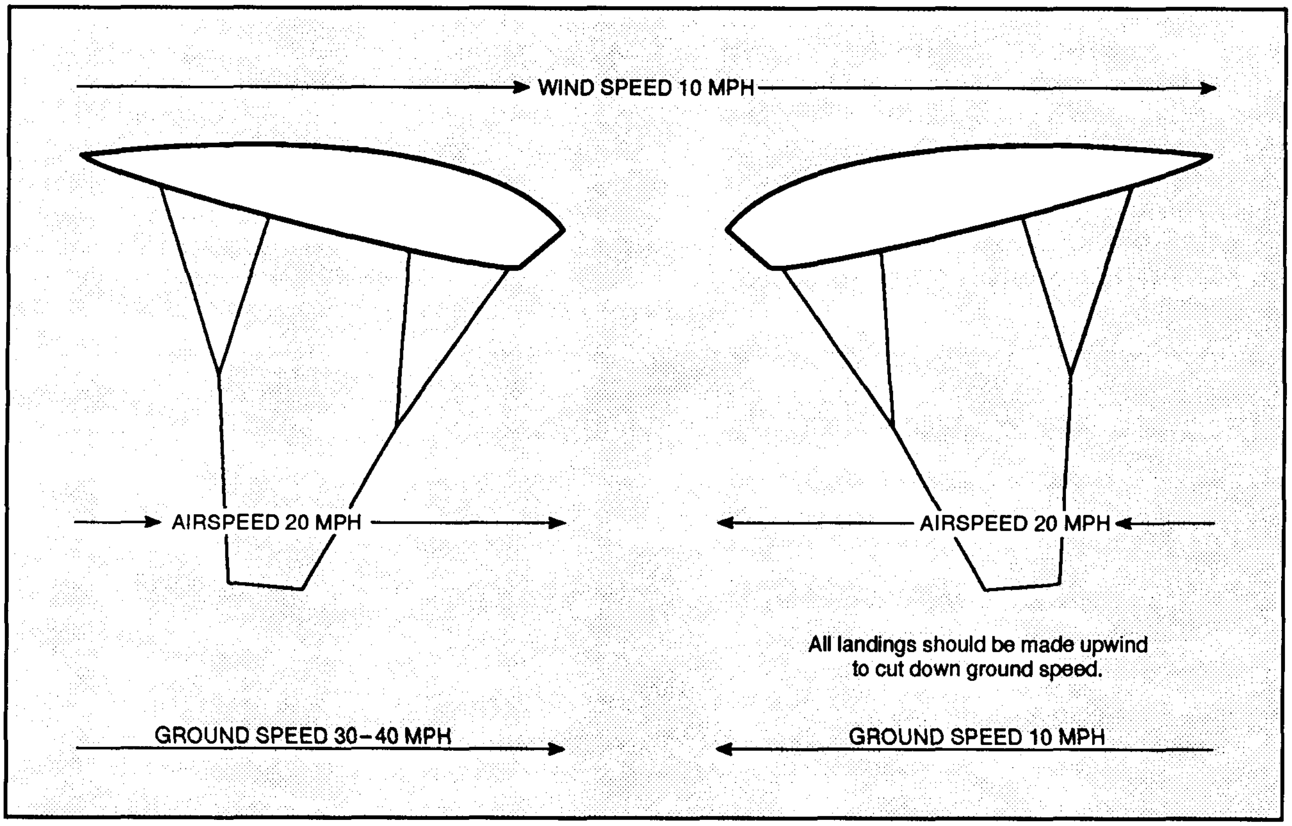


Figure 8-11. Controlling ground speed.

Upon canopy deployment the parachutist grabs the control toggles and performs a controllability check of the parachute. The purpose of this check is to ensure he has control of the canopy using no more than 50 percent toggle travel.

The parachutist must first know wind direction and approximate speed since the direction of his canopy's flight, as determined by his toggle manipulation, is in relation to wind action. The canopy's shape, design, span, and chord generate the ram-air parachute's 20- to 30-mph glide. The flow of air over and under the canopy's wing shape provides the lift and forward flight of the parachute. By specific manipulation of the toggles, the parachutist may distort the trailing edge and cause the canopy to turn, to vary forward speed, and to increase the rate of descent.

Canopy control involves the coordination of wind direction and speed, canopy fright and penetration, and the parachutist's own selective manipulation and distortion of the canopy. Maneuvering the parachute requires more than simply turning the canopy. A properly executed parachute maneuver requires correct canopy manipulation to combine the wind's force and the canopy's flight to move the parachute in a given direction. The parachutist may have to hold into the wind, run with the wind, or crab to the left or right while holding or running. Figure 8-12 contains a condensed guide to good canopy control.

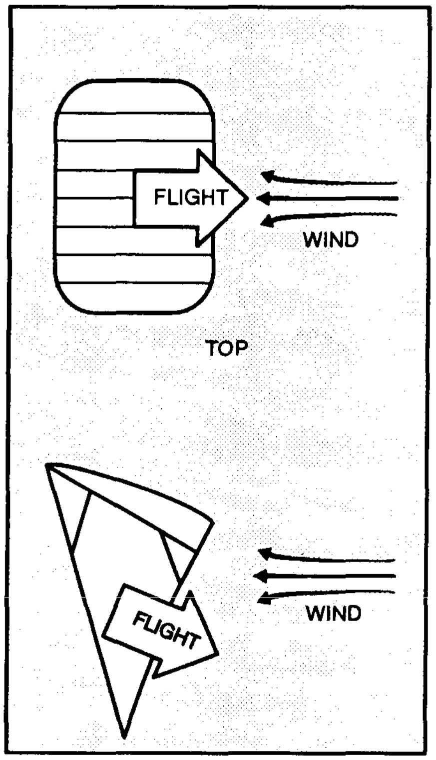
Holding Maneuver. Pointing the canopy into the wind, or "holding," aims the canopy flight directly into the wind (Figure 8-13). This maneuver increases lift has the same effect as reduced wind speed, and slows the canopy's forward movement. The parachutist manipulates the toggles to maintain the position. To crab to either direction while holding, he turns the canopy slightly in the direction in which he wants to move. Turning the canopy too far may cause it to become windcocked and move with the wind. As the parachutist's canopy begins to move in the desired direction, he manipulates the toggles to keep it in position until he completes the maneuver.

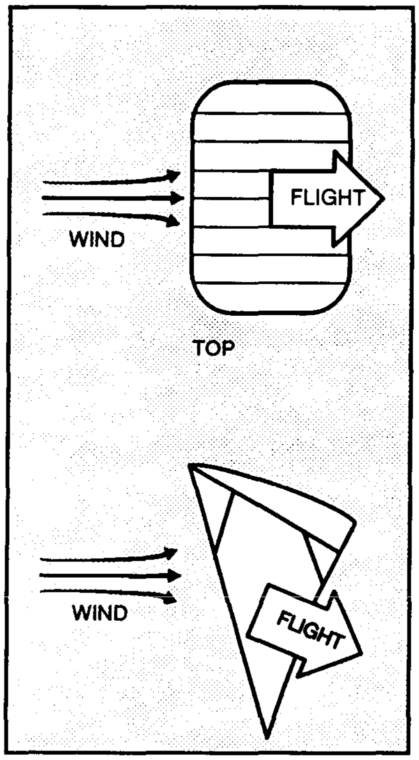
Running Maneuver. If the parachutist points the canopy with the wind, the combined glide speed and the wind speed produce an increased canopy movement speed called "running" (Figure 8-14). He manipulates the toggles to maintain the canopy in position. To crab while running, he turns the canopy slightly in the desired direction and maintains the position until he completes the maneuver.

Crabbing Maneuver The parachutist performs a "crabbing" movement by pointing the canopy at any given angle to the wind direction (Figure 8-15). The force of the wind from one direction and the flight of the canopy at an angle to it moves the canopy at an angle to the direction of flight. The direction of flight varies with the wind speed and the angle at which the parachutist points the canopy. A canopy pointed at a downwind angle makes a sharper angle than one pointed upwind.

- ☐ Check canopy and ground position after opening.
- ☐ Keep a sharp lookout for other parachutists.
- ☐ Check your altitude and your first ground reference point.
- ☐ Pick out intermediate ground references between you and the target.
- ☐ Determine wind direction (on the ground and at altitude).
- ☐ Check the holding pattern and penetration of your canopy.
- ☐ Use the upwind toggle to turn your canopy.
- ☐ Locate the wind line and determine the direction in which you want to move.
- ☐ Always maneuver toward the wind line.
- ☐ Check your progress at halfway and three-quarter-way points and make necessary adjustments.
- ☐ Turn into the wind at a minimum altitude of 500 feet.
- ☐ Control your canopy all the way to the ground.
- ☐ Always land facing into the wind.

Figure 8-12. Sample canopy control and movement accuracy checklist.





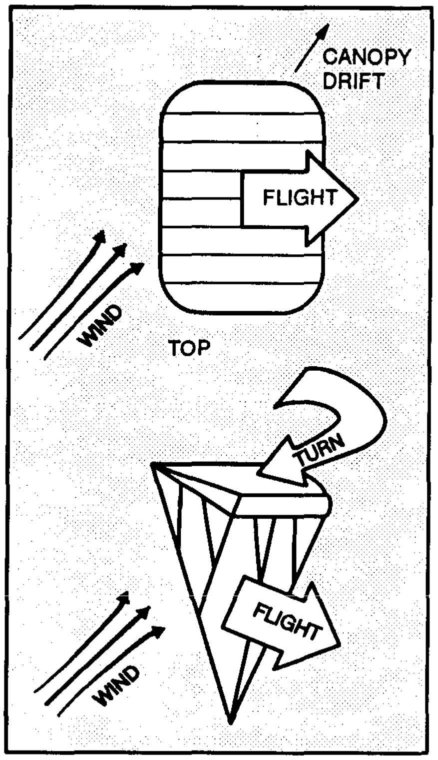


Figure 8-13. Holding maneuver.

Figure 8-14. Running maneuver.

Figure 8-15. Crabbing maneuver.

The effective canopy range and the wind line determine the course (direction of movement) the parachutist follows in maneuvering toward the target area. The effective canopy range is the maximum distance from which the parachutist can maneuver the canopy into the target area from a given altitude. It is greater at high altitudes and decreases proportionately at lower altitudes, forming a cone- or funnel-shaped area (Figure 8-16). Changes in wind direction and conditions may cause this range to shift in any direction.

A wind line 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.

The parachutist checks his movement in relation to the ground. Winds at altitude maybe from different directions than those at the desired impact point.

The parachutist picks a ground reference point on the wind line, halfway between the opening point and the target area. This point is the first checkpoint that he can reach in half the opening altitude with correct canopy manipulation. The second checkpoint is a reference point halfway between the first checkpoint and the target area that he should reach in half the remaining altitude.

The parachutist always tries to maintain the "upwind advantage." This advantage is a margin in his canopy range where he will not be blown behind his target area from which he cannot recover and land with his group.

The ram-air parachute is a highly maneuverable canopy capable of 360-degree turns in 3 to 5 seconds under normal conditions. Its maneuverability comes from the parachutist's use of its capabilities to vary forward speed, rate of descent, turn, and crosswind movement.

Under normal conditions, the parachutist varies his forward speed and rate of descent by using the canopy's toggles. Immediately upon canopy deployment he clears the toggles from the deployment brakes setting and performs a controllability check. His toggle position at the stall point will be at a different position as wind speed increases and when carrying heavy equipment loads.

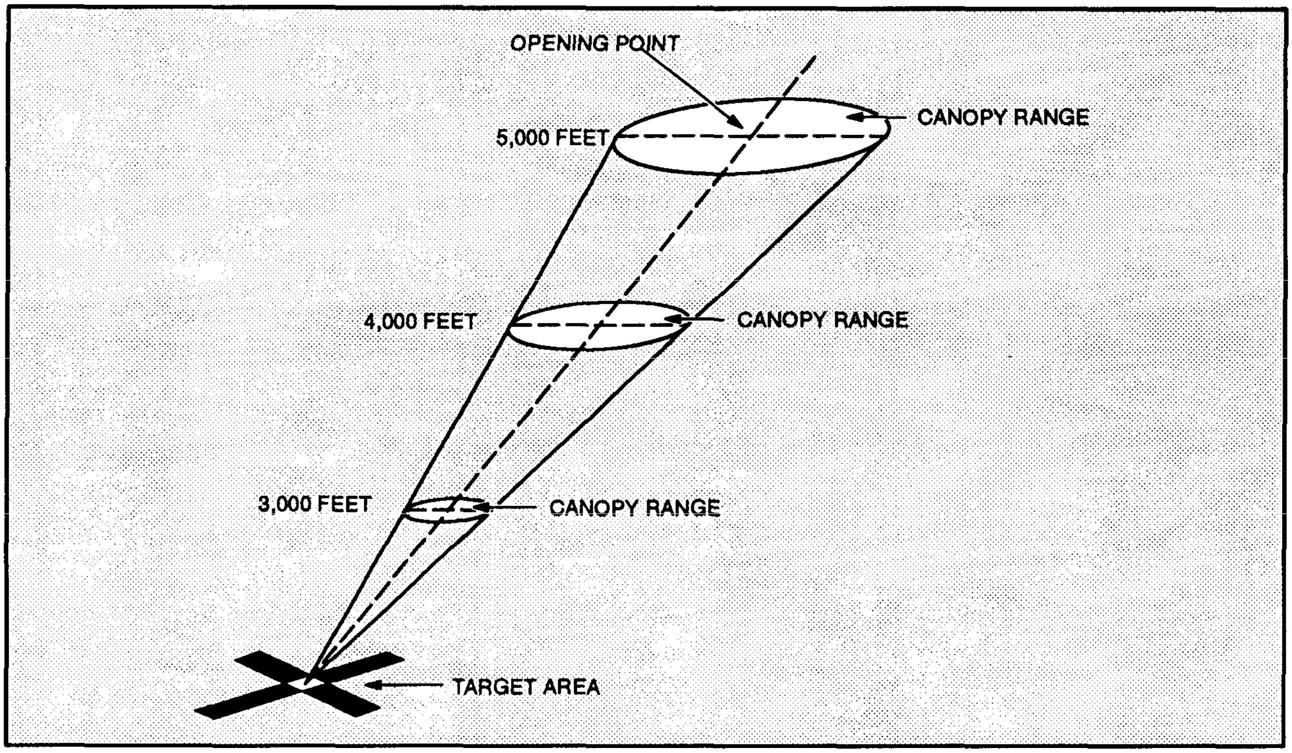


Figure 8-16. Effective canopy range.

WARNING

Before attempting any maneuvers or turns, the parachutist must be alert to prevent collisions with other parachutists. This maneuver is especially critical below 500 feet AGL.

Fu// Flight (No Brakes). The maximum canopy flight and penetration for maneuvering is obtained using full flight. The toggles are in the up position behind the rear risers (Figure 8-17).

Half Brakes. The parachutist grasps the toggles and pulls them down to about shoulder or chest level for the halfbrakes position (Figure 8-18). The canopy speed will decrease to about a 9- to 12-mph flight, and the rate of descent will increase.

Fu// Brakes. The parachutist pulls the toggles to about waist level for full brakes (Figure 8-19). The canopy stops moving forward and the rate of descent increases. In the full brakes position, the canopy is actually on the verge of a stall.

Stall. A stall occurs when the parachutist pulls the toggles below the full brakes position (Figure 8-20). The angle of attack of the parachute's nose and wing change produce a very great amount of lift for a short time. As the parachute loses forward airspeed and because the parachutist pulled the tail down lower than the nose, the canopy will attempt to fly backward and the rate of descent will increase to a hazardous degree. To regain forward airspeed and flight, the parachutist slowly raises the toggles to the half brakes position to raise the tail.

WARNING

The parachutist does not move the toggles quickly from the stall to the full flight position, as the canopy will surge forward with an increased rate of descent. The parachutist must avoid stalling the ram-air parachute below 500 feet AGL.

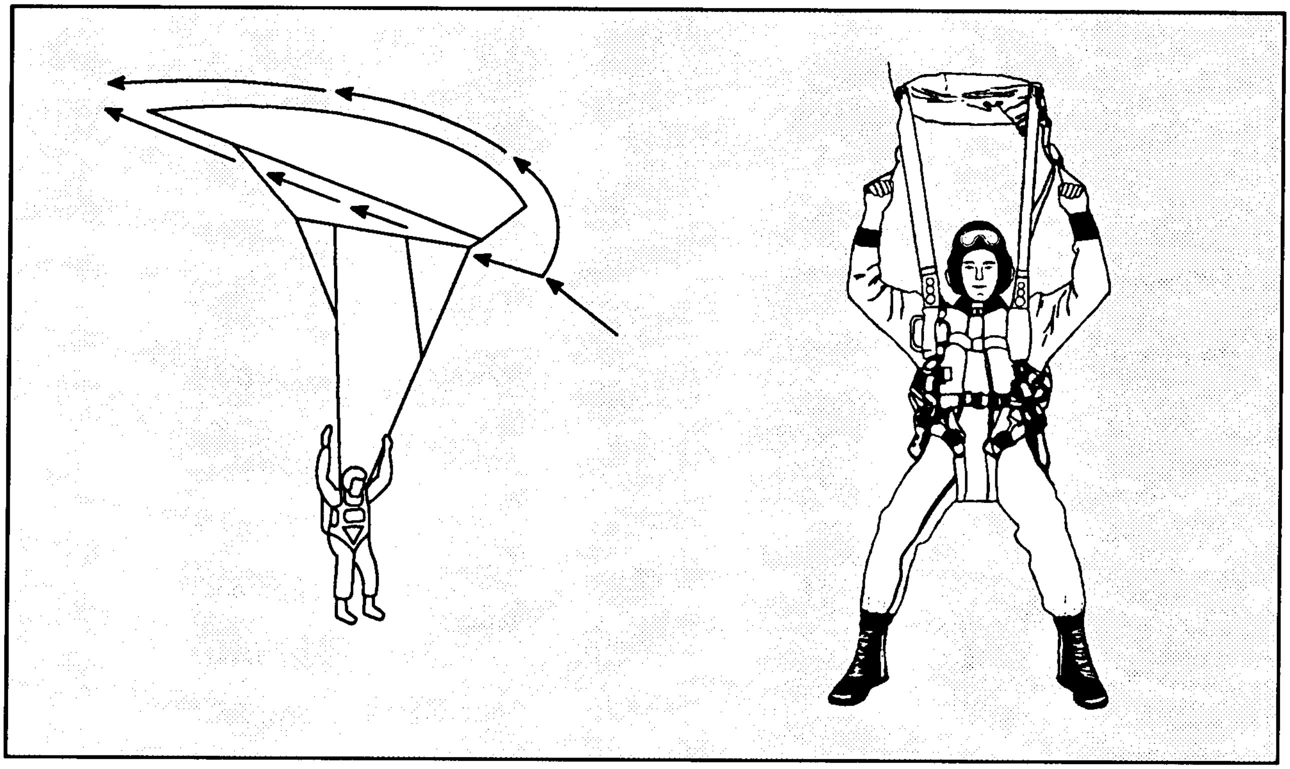


Figure 8-17. Full flight.

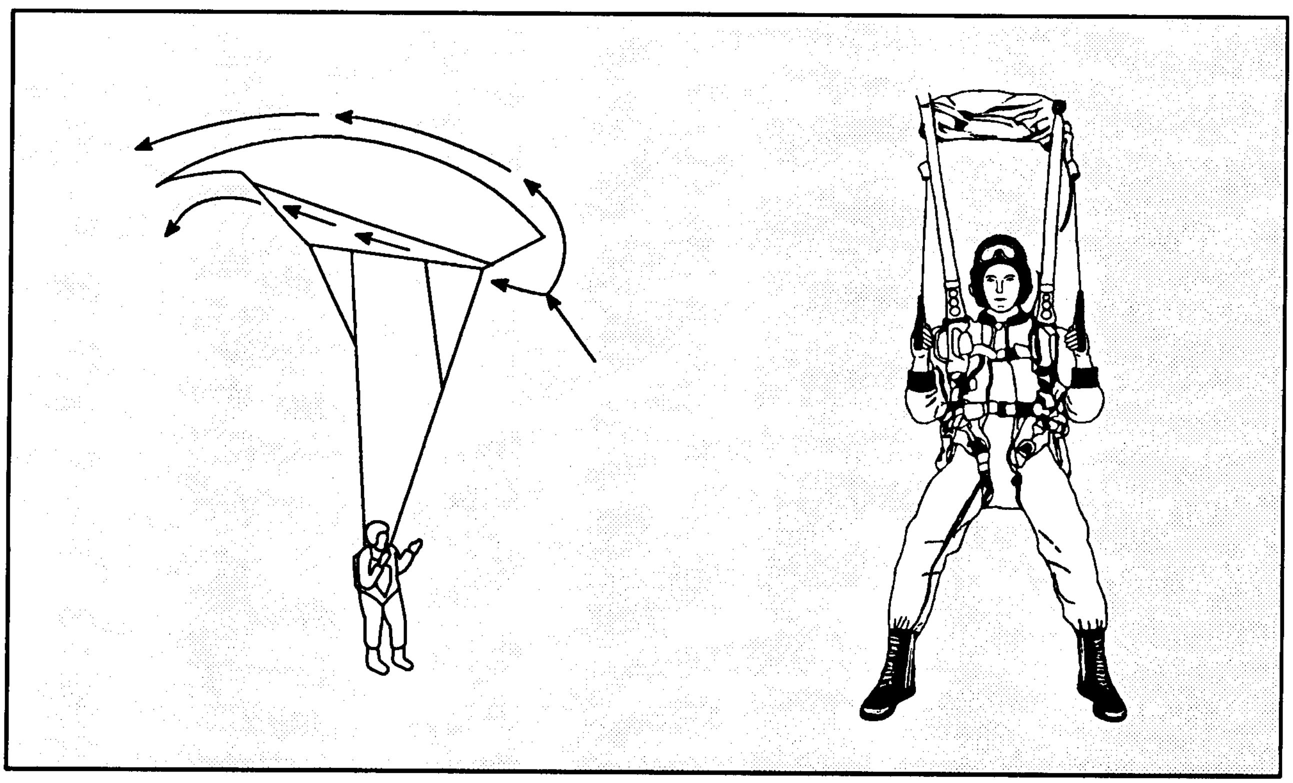


Figure 8-18. Half brakes.

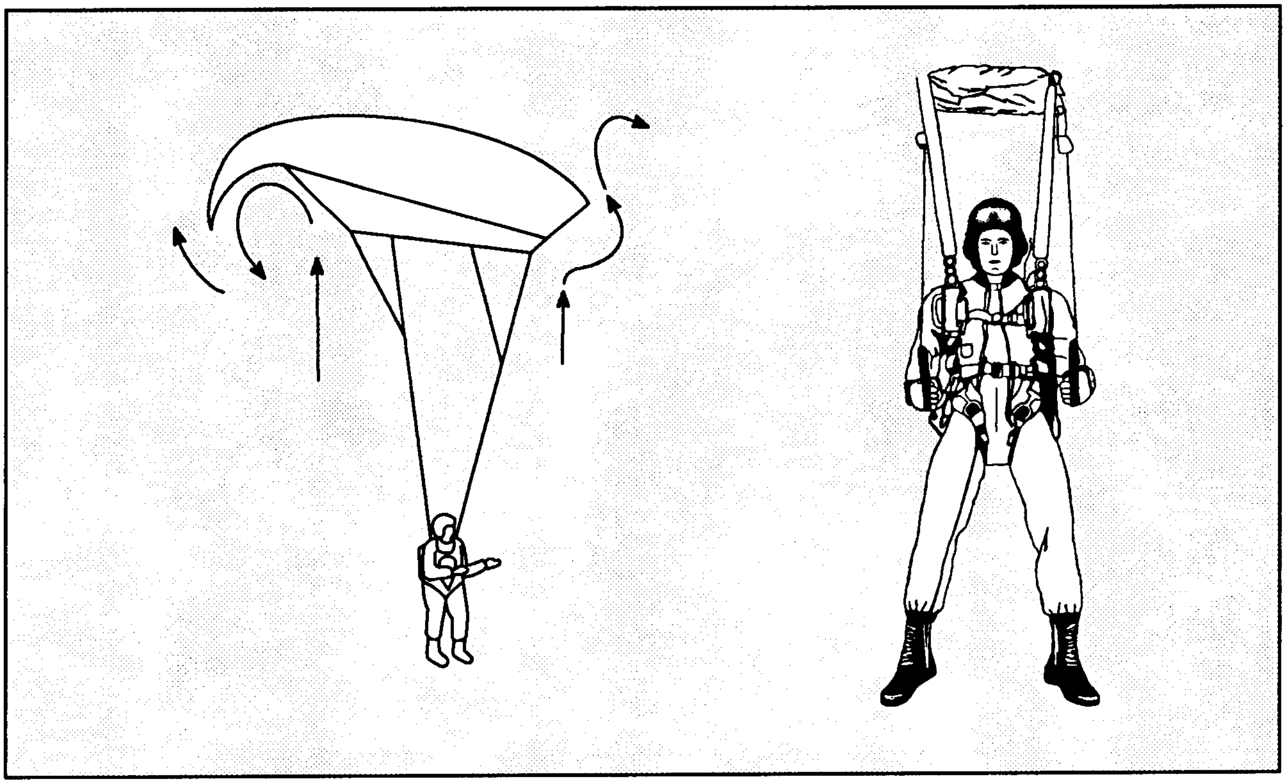


Figure 8-19. Full brakes.

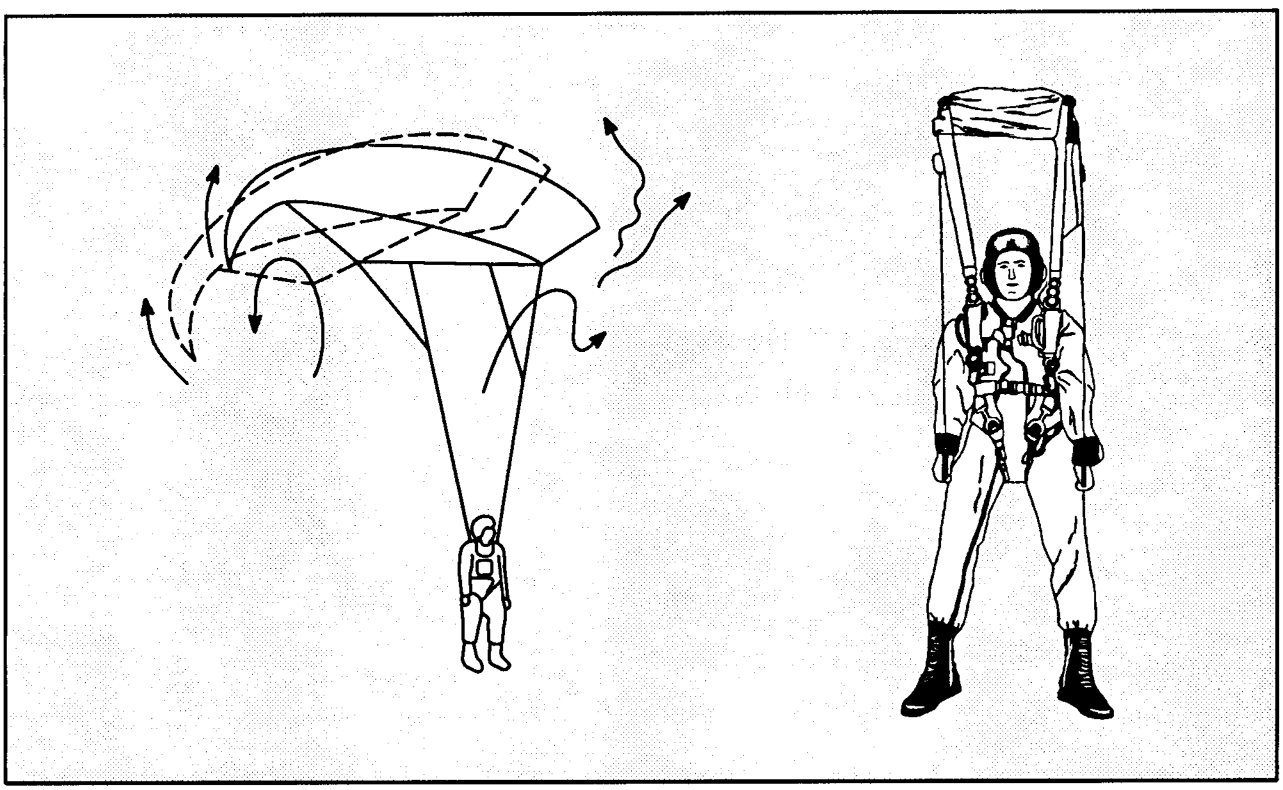


Figure 8-20. Stall.

The parachutist can make turns from the full flight, halfbrakes, and full brakes positions. Turns from full flight are very responsive, but due to the high forward speed, the turns will cover a wide arc. The parachutist makes these turns by depressing either toggle, leaving the other one at the guide ring. In this type of turn, the parachute will bank and actually dive, causing the parachute to lose altitude quickly. The farther the parachutist depresses the toggle, the steeper the bank angle.

Spiral turns are basically turns from full flight but maintained for more than 360 degrees of rotation. The parachute will begin diving in a spiral. The first turn will be fairly slow, with shallow bank angles, but the turn speed and bank angle will increase rapidly while the parachutist maintains the spiral. The parachutist should use trim tabs located on the front risers to lose altitude, if required.

WARNING

Spiral turns are NOT recommended. They will cause excessively fast diving speed with a rapid loss of canopy control. If the parachutist makes a spiral turn, he should be aware of other parachutists and wind direction. He must NEVER make a spiral turn below 500 feet AGL.

Turns from the half brakes position result in almost flat turns. These turns are desirable when flying the target approach legs.

Turns from full brakes are extremely fast, and heading changes are quick and flat. To prevent the canopy from stalling, the parachutist makes these turns by raising the opposite toggle.

The parachutist makes flared landings into the wind. He starts them at an altitude of 10 to 15 feet, with room ahead for the actual touchdown. At *200* feet, he eases both toggles to the full flight position, allowing airspeed to build. At about 10 feet above the ground (depending on wind conditions), he slowly pulls both toggles downward, timing the movement to coincide with the full brakes position at touchdown. The flared landing, when properly executed, practically eliminates forward and vertical speed for a short period. If the parachutist slows down the ram-air parachute prior to the flare point, depressing the toggles will result in a “sink.”

WARNING

On a misjudged flare attempt, if the parachute enters a stall, the parachutist initiates recovery procedures by slowly raising the toggles about 6 inches. He must be prepared to perform a parachute landing fall (PLF).

NOTE: In turbulent wind conditions, the parachutist maintains about 25 percent to half brakes to help keep the ram-air parachute inflated and stable.

NOTE: The parachutist can safely land the ram-air parachute in the half brakes position. This procedure is especially useful during night or limited visibility operations when he cannot see the ground or if recovering from a stall. He must be prepared to perform a PLF upon ground contact.

The ram-air parachute landing approaches similar to standard aircraft practice consisting of a downwind leg, a base leg, and a final approach upwind into the target (Figure 8-21). The parachutist uses his altimeter to assist his visual altitude determination.

Downwind Leg. The parachutist flies the downwind leg along the wind line, passing the target area at an altitude between 1,500 and 1,000 feet (depending on winds), about 300 feet to the side of the target. He continues the downwind leg about 300 to 400 feet downwind of the target (again, depending on winds),

Base Leg. When 300 to 400 feet past the target, the parachutist begins a gentle 90-degree turn to fly the base (crosswind) leg across the wind line. He usually flies this leg at 30 to 60 percent brakes, depending on the wind conditions. He may either shorten or extend the base leg to reach the turning altitude. Under low wind conditions, he flies the base leg to a turning point about 500 feet directly downwind of the target and at an altitude of 500 feet.

Final Approach. Under light wind conditions (0 to 5 knots) and 500 feet directly downwind of the target, the parachutist makes a braked turn to turn toward the target. He completes the final turn at approximately 500 feet and no lower than 200 feet. On the final approach, braking techniques control descent and flight. The parachutist performs any major control corrections immediately while there is enough altitude and distance to the target. He lowers his equipment at 200 feet.

WARNING

The parachutist avoids the turbulent air directly behind and above a ram-air parachute by flying offset to a parachute to his front or a minimum of 25 meters to the rear and above. He does not make sharp or hook turns on the final approach or attempt a 360-degree turn.

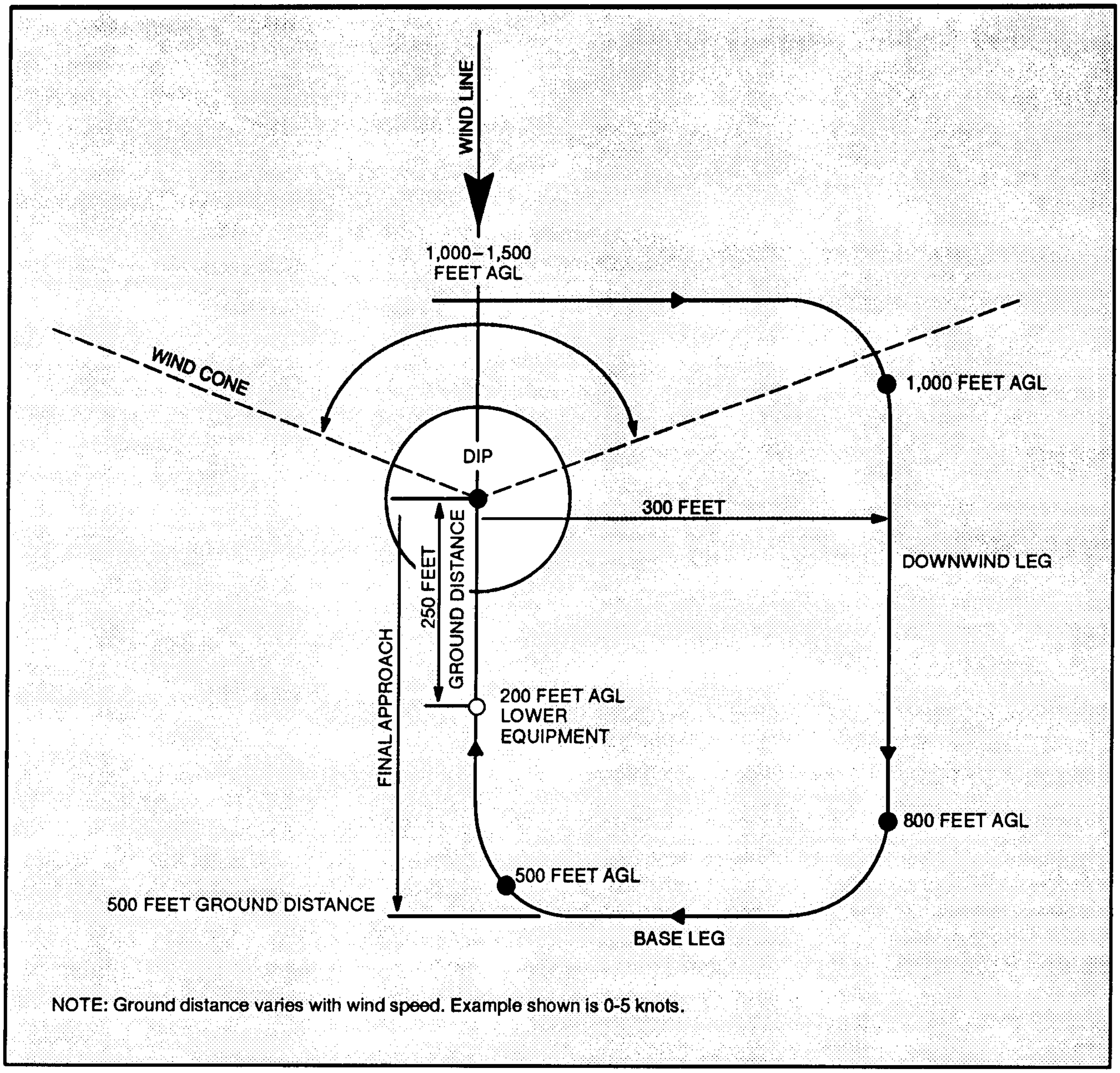


Figure 8-21. Landing approaches.

> **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 on impact.

> **WARNING**
>
> The parachutist maintains a sharp lookout for fellow parachutists at 500 feet and below to avoid canopy collisions and entanglements. The lower parachutist has the right-of-way.

Turbulence

Turbulence is the result of an air mass (wind) flowing over obstructions on the earth's surface. Common obstructions are irregular terrain (bluffs, hills, mountains), man-made features (buildings, elevated roadways, overpasses), or natural ones such as tree lines. A disturbance of the normal horizontal wind flow causes turbulence. As the air mass moves around and over the obstruction, it transforms into a complicated pattern of eddies and other irregular air movements. Turbulence generally affects the flight of the parachute at the most critical time for the parachutist, the last 200 feet of canopy flight.

In general, with ground wind speeds less than 10 knots, both the windward and leeward sides of an obstruction cause small eddies 10 to 50 feet in depth. When wind speeds are between 10 and 20 knots, obstructions can cause currents that are several hundred feet in depth. Additionally, there will still be eddies on the windward and leeward side near the obstruction. At wind speeds greater than 20 knots, currents formed on the leeward side are carried considerable distances beyond the object that created them. Only minor eddies and currents form over smooth water surfaces. Turbulence over choppy swells is worse closer to the surface of the water due to the wind flow over a constantly changing surface configuration. Over mountains, even light winds (moving air masses) pushed up mountainsides or redirected down valleys can form major eddies and air currents that have violent, abrupt characteristics. Additionally, in HAHO operations in mountains or around hilly terrain, unstable air masses form currents that continue to grow in size and complexity. The resultant turbulence can extend up to thousands of feet AGL.

An example of turbulence is the vortex created by aircraft taking off or landing. The turbulence created by these aircraft can invert smaller aircraft landing too closely behind them. bother example is the turbulence behind another parachutist's canopy, The parachutist who finds himself behind this canopy will feel the turbulence it creates. Turbulence can exist around any cloud mass. Individual clouds probably will not create turbulence. Clouds that mark the leading edge of an air mass probably will contain strong downdrafts. Cloud decks capping mountain ridges will contain very strong downdrafts and abrupt turbulence. Those type cloud formations will contain rapid pressure differentials. Altimeter readings should be suspect because the parachutist could be 1,000 feet lower than the indicated altitude on the altimeter.

The parachutist should avoid at all costs clouds that contain thunderhead activity due to the violent turbulence associated with those formations.

Land and Sea Breezes

The thermal differences of air masses associated with the interface along shorelines cause land and sea breezes. In the daytime, coastal land masses warm up faster than water. The air above the land rises, causing a lower air density than over the water. The air flows from the water over the land to replace the lower air density there. This phenomena creates an "onshore" breeze known as a "sea breeze." It is most evident on clear, summer days in lower latitudes. The same phenomena occurs in reverse in the evening due to the more rapid cooling of the landmass. The reversed process creates a "land breeze." The air flow over obstacles in the vicinity of shoreline DZs creates turbulence, when farther away from the coast, turbulence might not exist.

Valley and Mountain Breezes

Winds generally flow upslope on warm days in mountainous terrain. They flow downslope in the evening as the air masses cool. During the day, the winds create "valley breezes;" at night, the reverse process creates "mountain breezes." These breezes, coupled with the air flow over obstacles, can cause strong and unpredictable turbulence.

CHAPTER 9

HIGH ALTITUDE HIGH OPENING OFFSET PARACHUTING

High altitude high opening offset delivery techniques offer the commander a unique method for infiltrating HAHO-trained operational elements. The RAPS gives the commander tactical capability to infiltrate these elements by parachute without requiring the aircraft to overfly the intended DZ. These elements can be released at an offset release point and cover long distances under canopy. The RAPS' reserve parachute's flight characteristics are identical to the main parachute's, increasing the chance of a successful infiltration should a cutaway from the main parachute take place because of a malfunction.

NOTE: For parachute systems that have a smaller reserve canopy than the main canopy, the mission commander planning the operation must plan for contingencies that address the reduced glide capability should a cutaway from the main parachute take place.

Techniques and Requirements

The parachutist uses a combination of delayed free-fall and HAHO techniques if making exits at an altitude above 25,000 feet MSL. He can also deploy his parachute at intermediate altitudes to minimize the chance of parachute damage or injury to himself upon canopy deployment while using the glide advantage of the RAPS.

WARNING

The RAPS' maximum deployment altitude is 25,000 feet MSL.

The maximum altitude for routine training should be 17,500 feet MSL. Conducting training at this altitude eliminates the need for oxygen prebreathing and minimizes the chance of parachute damage and injury to the parachutist due to opening forces. The parachutist is also less likely to encounter physiological problems and cold weather injuries.

HAHO offset parachuting requires extensive airspace clearance. Additionally, this training must take place in areas having alternate DZs should the parachutist (or element) not be able to reach the primary DZ.

Accurate weather data is essential. Wind directions and speeds are critical for route planning, Air temperatures are important for preparing against exposure injuries.

WARNING

Icing conditions may occur at high altitude or during adverse weather conditions. Ice formation on the parachute canopy adversely affects its flight characteristics by increasing the rate of descent and decreasing its responsiveness.

Special Equipment

Special precautions must be taken to prevent exposure injuries to the parachutist at high altitude. The Extended Cold Weather Clothing System (ECWCS) provides the necessary thermal protection. It consists of Gore-Tex fabric outerwear and other insulated clothing items. Gloves are necessary to protect the hands. The gloves, however, must not interfere with the manual activation of the main parachute or the performance of emergency procedures.

The parachutist can use toggle extensions. They permit the parachutist to keep his hands at waist level during extended flights. They also allow for improved blood circulation to the hands and arms and lessen fatigue. Other techniques are to leave the brakes stowed and simply steer the parachute using risers to make needed corrections.

Each parachutist needs a compass to determine direction should he separate from the group or during limited visibility, such as when passing through cloud layers. A marine-type, oil-dampened compass that pressure changes or cold weather does not affect is recommended. The compass must show direction regardless of its mounted attitude on the parachutist. The parachutist takes care when mounting the compass to avoid erroneous readings that interference from radios or other electronic navigation aids might cause. He declinates his compasses while wearing all his accompanying equipment. This action will account for all magnetic variances that accompanying metal objects cause.

The parachutist mounts the electronic navigation or guidance devices so that they do not interfere with the manual activation of the main parachute or the performance of emergency procedures. The use of such devices may also increase the likelihood of detection during infiltration.

The parachutist can use radios for air-to-air or air-to-ground communications. He mounts the radio so that it also does not interfere with the manual activation of the main parachute or the performance of emergency procedures. The use of radios may increase the likelihood of detection during infiltration.

Free-Fall Delays

As an aircraft increases, altitude, the aircraft's true airspeed (TAS) must increase to maintain a constant indicated airspeed (IAS) due to decreased air density. True airspeed is the actual speed of the aircraft through the air mass. When TAS exceeds terminal velocity, the parachutist must allow for longer delays in order to decelerate to a safe speed for parachute deployment (Figure 9-1).

WARNING

Failure to take the minimum recommended delay can result in serious injury to the parachutist and parachute damage.

EXIT ALTITUDE (IN FEET)	DELAY (IN SECONDS)
10,000 to 12,500	5 to 7
12,500 to 20,000	7 to 9
20,000 to 25,000	6 to 10
Above 25,000	Free-fall below 25,000 feet

Figure 9-1. Recommended free-fall delays.

Parachute Jump Phases

The HAHO offset parachute jump has four phases. These phases include exit, delay, and deployment assembly under canopy, flight in formation, and final approach and landing.

Exit, Delay, and Deployment

On the command "go," the group leader exits the aircraft. The remainder of the element exits the aircraft at 1-second intervals using the same exit technique as the group leader. Each parachutist free-falls for the required delay.

A parachutist experiencing a malfunction must immediately start emergency procedures to minimize loss of altitude.

Upon deployment, the group leader checks with the element for malfunctions, then assumes the initial flight heading.

In the event a member of the element is beneath the group, the element must execute the rehearsed tactical plan (lose altitude to reform the group or follow the low parachutist).

Assembly Under Canopy

The opening altitude should be a minimum of 1,000 feet above any cloud layer to allow enough altitude for the element to assemble under canopy. Each parachutist flies his canopy to his rehearsed position within the formation. Each parachutist assumes the group leader's heading.

Flight In Formation

The "wedge" and the "trail" formations are the easiest to control and to maintain in flight (Figure 9-2). The group leader has the primary responsibility for navigation. He jumps with the navigation aids.

Element members in the formation maintain relative airspeed and position with the group leader. They do this maneuver by trimming their canopies using the trim tabs on the front risers and by braking.

Under limited visibility conditions, such as when passing through a cloud layer, each parachutist goes to half brakes and maintains the compass heading until he regains visual contact with the formation. Each parachutist must maintain altitude awareness.

Final Approach and Landing

The group leader initiates the landing pattern at about 1,000 feet AGL in the landing area.

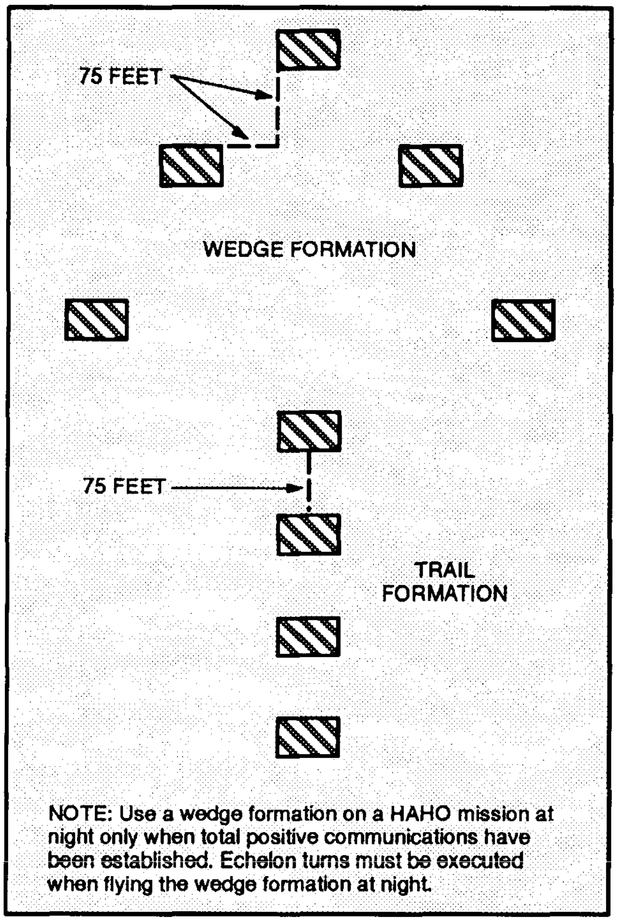


Figure 9-2. Assembly flight formations.

Each parachutist removes any trim tab settings to prevent injury on landing from the increased forward speed.

The landings are staggered to avoid the turbulence directly above and to the rear of the other ram-air canopies. Each parachutist prepares to do a PLF should visibility prevent him from seeing the ground.

CHAPTER 10

RAM-AIR PARACHUTE EMERGENCY PROCEDURES

Military free-fall airborne operations are inherently dangerous. Emergencies may occur before or during takeoff, during flight, while in free-fall, or during canopy descent. Safety considerations require that each parachutist be able to recognize an emergency situation and react accordingly.

Refresher Training

The conditioned response executed as the correct procedure for a particular emergency situation is a highly perishable skill. Refresher training should include performance oriented training with special emphasis on emergency procedures and the actions required to successfully respond to any situation. This training must be conducted prior to each MFF airborne operation. The duration of the training should be commensurate with the length of time between airborne operations and, at the very least, until each parachutist is confident in his emergency procedure skills.

Established Procedures

The procedures established by this publication in response to emergency situations have proven to be the most successful in both the MFF training and tactical environments. Any departure from these procedures may interfere with the parachutist's conditioned response. This action can lead to a delay at a critical time with the potential of causing injury or death. This publication strongly recommends that all parachutists follow these established procedures. Figures 10-1 through 10-12 depict the emergency procedures that may be used with the RAPS during emergency situations.

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

Figure 10-1. Emergency preparations before takeoff.

- Release the brakes.
- Look left, turn left 90 degrees.
- Look right, turn right 90 degrees.
- Determine the stall point.

NOTE: If the canopy requires more than 50 percent opposite toggle to counter a turn, the canopy is uncontrollable. If the canopy stalls prior to 50 percent brake setting, it is uncontrollable.

NOTE: If the canopy is uncontrollable, perform cutaway procedures. Cutaway procedures are the same no matter what type of malfunction occurs.

Figure 10-2. Controllability check.

- Use the rear risers to avoid other parachutists as required. Turn to the right to avoid collision.
- Release the brakes and gain control of the canopy.
- Check the canopy.
- Resolve post-opening malfunctions as required.
- If controllability of the canopy is questionable, perform a controllability check (see Figure 10-2).
- If a malfunction cannot be resolved, and if the canopy is uncontrollable, the decision to cut away must be made by 2,000 feet AGL.
- Orient yourself to the drop zone.
- Locate the other parachutists and achieve separation.
- Activate the strobe light or canopy lighting system as required.
- Maintain altitude awareness.

NOTE: Procedures should be done immediately after the parachute deploys.

Figure 10-3. Post-opening procedures.

JUMPMASTER RESPONSIBILITY	PARACHUTIST RESPONSIBILITY
• Shout "pilot chute" and try to contain the pilot chute and canopy in the aircraft. • In UH-1 or UH-60, close opposite door. • Unhook the reserve static line from the riser. • Cut away main canopy and remove from container and secure. • Secure parachutist with seat belt and continue with operation (jumpmaster's discretion). • If extracted, another parachutist will exit and deploy his canopy and follow and land with the extracted parachutist.	• Shout "pilot chute" and try to contain the pilot chute and canopy in the aircraft. • Shout "pilot chute" and try to contain the pilot chute and canopy in the aircraft. • If possible, move away from the open exits to a safe area forward in the aircraft. • If the canopy or pilot chute is pulled outside the aircraft, exit immediately.

WARNING

If you are standing in the vicinity of an open door or ramp and you experience a premature deployment, try to contain it; if any portion of the parachute goes out of the aircraft, exit immediately to minimize or avoid serious injury.

Figure 10-4. Procedures for inadvertent pilot chute deployment inside the aircraft.

SITUATION	SIGNAL	ACTION IN AIR FORCE AIRCRAFT	ACTION IN ARMY AIRCRAFT
Crash Landing During Takeoff	• Continuous ringing of alarm bell or verbal warning by aircrew	• Remain seated until aircraft stops, then exit	• Follow aircrew instructions • Pull legs inside aircraft • Remain in position • Cover head with arms • Clear the aircraft as soon as it stops and move well away from it • Jumpmaster ensures all personnel are away from the wreckage
During Flight	• Six short rings of alarm bell or verbal warning by aircrew	• If time and altitude permit, jump • If not, secure seat belt • Brace for impact NOTE: Coordinate opening aircraft exits with the aircrew.	
Emergency Bailout Below 1,000 Feet AGL	• Six short rings of alarm bell or verbal warning by aircrew	• Take aircraft seats and fasten seat belts • Prepare for crash landing	• Take aircraft seats and fasten seat belts • Prepare for crash landing
1,000 to 2,000 Feet AGL	• Three short rings of alarm bell or verbal warning by aircrew	• Exit at the jumpmaster's command • Deploy the reserve parachute immediately • Attempt to land with the other jumpers	• Exit at the jumpmaster's command • Deploy the reserve parachute immediately • Attempt to land with the other jumpers
Above 2,000 Feet AGL		• Exit at the jumpmaster's command • Deploy the main parachute after a maximum 5-second delay • Attempt to land with the other jumpers	• Exit at the jumpmaster's command • Deploy the main parachute after a maximum 5-second delay • Attempt to land with the other jumpers
Ditching Over Water With Insufficient Drop Altitude	• Verbal warning by aircrew	• Use available padding • Remain seated • Secure seat belt	• Pull legs inside aircraft • Remain in position • Cover head with arms
Order to Lighten Load	• Verbal warning by aircrew	• Designated parachutist may assist jumpmaster or loadmaster in jettisoning cargo	• As directed by pilot
Fire in Flight	• Verbal warning by aircrew	• Remove parachutists from vicinity of fire • Extinguish the fire	• As directed by pilot

Figure 10-5. In-flight emergency procedures.

EMERGENCY	PROCEDURE
Collision on exit	• Maintain your arch, gently push off the parachutist, regain your stability, check your altimeter, check the rip cords, and continue the MFF as planned.
Instability in free-fall	
Spinning	• Arch, check your hands and feet, counter, and maintain altitude awareness.
Tumbling	• Arch, keep your head up, check your hands and feet, and maintain altitude awareness.
Entering a cloud or loss of visibility.	• Stop all movement and return to a stable, relaxed arch. Maintain altitude reference. Pull at prescribed altitude even if you are still in the cloud.
Accidental opening	
Main parachute	• Do a penetration check and continue to fly the canopy for a landing on the intended DZ.
Reserve parachute (Check the risers; also, no trailing pilot chute.)	• Cut away main canopy, do a penetration check, and continue to fly the canopy for a landing on the intended DZ.
Main and reserve parachutes deploy	• Activate the cutaway handle, do a penetration check, and continue to fly the canopy for a landing on the intended DZ.
Main deploys and reserve opens partially but does not fully inflate	• Slow the main parachute to prevent reserve deployment. Try to pull in the reserve deployment bag. Hold it between your legs. Be ready to cut away the main parachute.
Maneuvers in free-fall	
Collision avoidance	• Use body turns and gliding technique to avoid other parachutists, and always look in the direction of the turn before you begin the turn. Never continue to free-fall over another parachutist's back.
Lost goggles	• Maintain your arch. Reach up with both hands, keeping your elbows high, and find and replace the goggles. Maintain altitude awareness. NOTE: If goggles will not remain in place or they separate from you, squint your eyes to see.

Figure 10-6. Emergencies in free-fall.

- Observe other parachutists in free-fall.
- Activate main parachute with other parachutists at the prescribed activation altitude.
- If unable to observe other parachutists, maintain visual reference on drop zone markings and free-fall until ARR activates main parachute.

NOTE: This procedure is the same for both day and night operations.

WARNING

Activation of the main or reserve parachute above the prescribed opening altitude may cause serious injury or death to other parachutists in free-fall.

Figure 10-7. Altimeter failure or loss procedures.

MALFUNCTION	PROCEDURE
Pilot Chute Over the Nose of Canopy	• Perform the post-opening procedures. • Execute a controllability check.
Dual Main and Reserve Deployment	• If both the main and reserve parachutes deploy completely, cut away the main parachute. • If only the reserve pilot chute and bridle are deployed, attempt to contain them. • If the reserve parachute deploys and will not fully inflate, slow the main parachute and be prepared to perform a cutaway should the reserve parachute fully inflate.
Horseshoe	• Perform cutaway procedures immediately.
Bag Lock	• Pull down twice on the rear risers. • If the main parachute does not deploy, perform cutaway procedures.
Closed End Cells/ Hung Slider	• Bring both toggles to the full brake position for 3-4 seconds and slowly let up the toggles to the 50 percent brake position (this procedure may be performed a maximum of two times). • If unsuccessful, continue with the post-opening procedures (controllability check).
Premature Brake Release	• Immediately release the opposite brake. • Perform the post-opening procedures.
Broken Control Lines	• Release the brakes and steer with the remaining control line. • Continue the post-opening procedures. • Determine the stall point at a safe altitude using the rear risers. • Use the rear risers for landing. NOTE: The rear risers may also be used for control; however, overuse may fatigue the arms.
Broken Lines	• Perform the post-opening procedures.
Line Twists	• Reach up and separate the risers and use a kicking motion to untwist the suspension lines. NOTE: Do not release brakes until line twists are cleared.
Rips and/or Tears	• Perform the post-opening procedures.
Tension Knots	• Perform the post-opening procedures.
Floating Rip Cord	• Locate the rip cord housing with the right hand. • Locate the rip cord cable that should protrude from the housing. • Pull the cable. • If unsuccessful, perform cutaway procedures. **WARNING** **This entire action should be completed in no more than 2 seconds.**
Hard Pull	• If the pull is unsuccessful, come across with the left hand in a punching motion and push the right hand and rip cord out. • If still unsuccessful, perform cutaway procedures.

Figure 10-8. Malfunction procedures.

MALFUNCTION	PROCEDURE
Pack Closure	• Check over your shoulder again. • If main parachute does not deploy, perform cutaway procedures.
Pilot Chute Hesitation	• Check over your shoulder again. • If main parachute does not deploy, perform cutaway procedures.

Figure 10-8. Malfunction procedures (continued).

MALFUNCTION	CUTAWAY PROCEDURE
Total malfunction NOTE: A total malfunction occurs when the canopy remains in the container assembly after the ripcord has been pulled.	• Throw away the main rip cord. • Look at and grab the cutaway handle. • Look at and grab the reserve rip cord. • Arch.
Partial malfunction NOTE: A partial malfunction occurs when the container assembly opens but the canopy does not fully or properly deploy.	• Pull the cutaway handle. • Pull the reserve rip cord. • Check to ensure the reserve pilot chute has deployed. • Perform the post-opening procedures.

Figure 10-9. Cutaway procedures.

PARACHUTE COLLISION AVOIDANCE

- Lower parachutist has the right-of-way.
- All parachutists maintain a safe vertical and horizontal separation.
- Look right, clear, turn right.

COLLISION IMMINENT

- Steer to avoid; look right, clear, turn right.
- If unable to avoid collision, spread arms and legs in an attempt to bounce off the canopy or lines.

NOTE: A 200-foot vertical and 75-foot horizontal separation is recommended for normal operations.

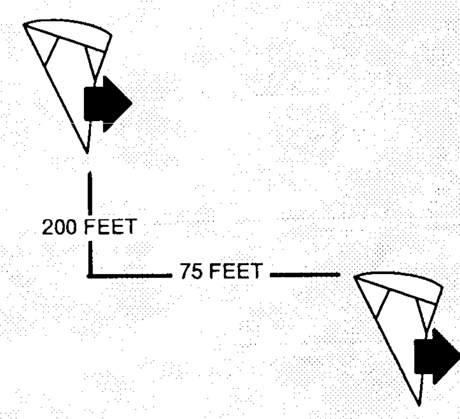
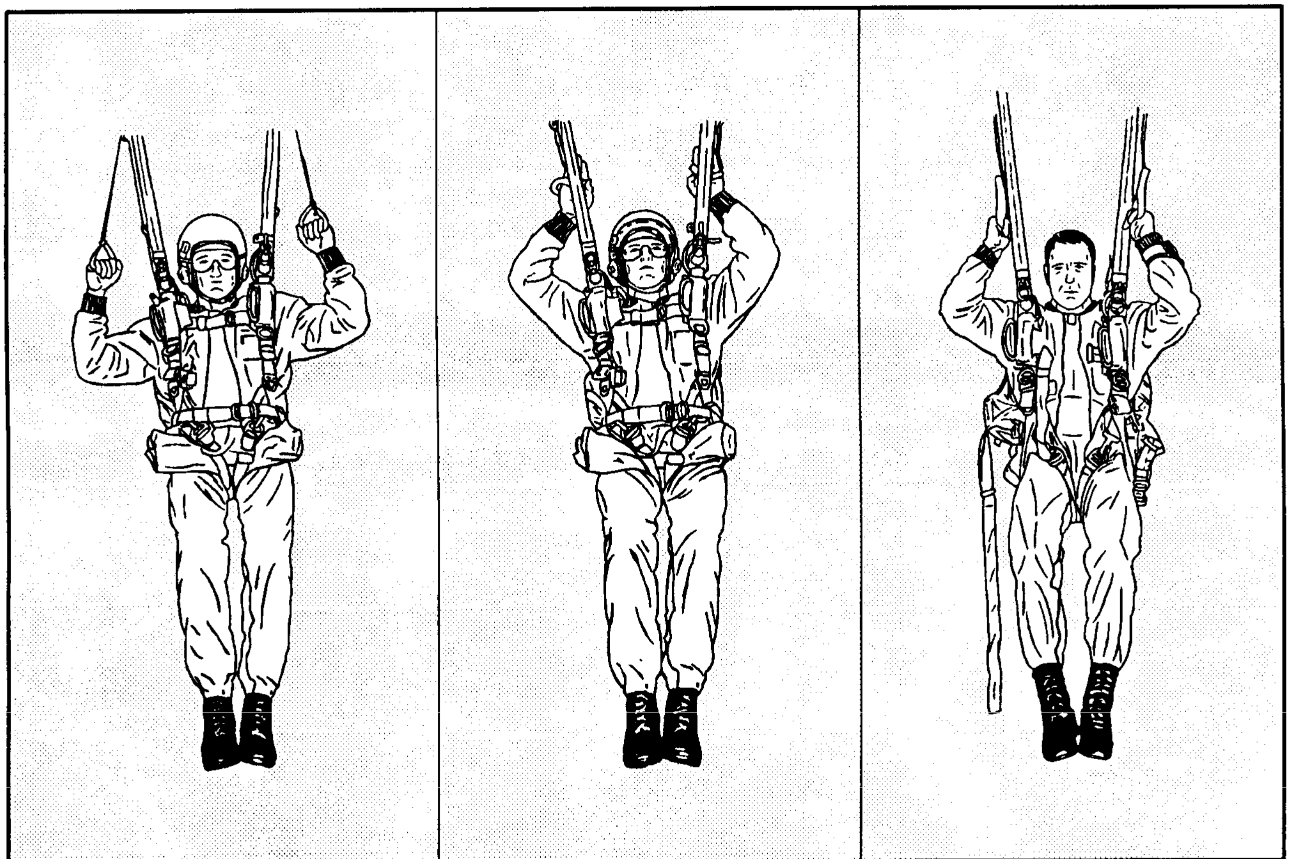


Figure 10-10. Recommended parachute separation.

SITUATION	HIGHER PARACHUTIST	LOWER PARACHUTIST
Lower parachutist is entangled with higher parachutist, and higher parachutist has a good canopy. Above 2,000 feet AGL	• Attempt to clear off the lower canopy.	• If canopy cannot be cleared, check the altitude. • Above 2,000 feet AGL, perform cutaway procedures.
	NOTE: If lower canopy is cleared, it should reinflate in 150 to 200 feet.	
1,000 to 2,000 feet AGL	• Make every effort to control lower canopy. • Be prepared to do a PLF.	• Perform cutaway procedures. **OR** • Jettison equipment. • Land with higher parachutist. • Be prepared to do a PLF.
Below 1,000 feet AGL	• Make every effort to maintain control of lower canopy. • Be prepared to do a PLF.	• Jettison equipment. • Land with higher parachutist. • Be prepared to do a PLF.
	NOTE: The higher parachutist should fly the final approach and land with half brakes.	
Both parachutists are entangled, and neither has a good canopy. At any altitude	• Get clear of entangled lines and cut away (altitude permitting).	• Cutaway after the higher parachutist (altitude permitting).
	WARNING **The higher parachutist may be fatally engulfed in the canopies if the lower parachutist performs a cutaway first.**	
	• If still unsuccessful, both should deploy reserve parachutes in an attempt to slow the descent. • If only one reserve parachute deploys, the parachutist with the good reserve must bring the other parachutist to the ground. • If both reserves deploy, cut away from entanglement. NOTE: Communication between the parachutists and altitude awareness are critical in successful disengagements.	

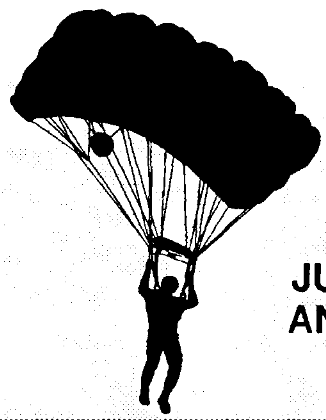
Figure 10-11. Canopy entanglement procedures.



TREES	WIRES	WATER
• Do not lower equipment; jettison if it was lowered. • Turn canopy into wind. • Brake as needed (50 percent braking position) to achieve vertical descent through the trees. • Prepare for a PLF. • Use forearms to protect face while passing through trees. • If suspended, signal for assistance. NOTE: Keep toggles in hands and continue to control canopy until in contact with the ground. NOTE: Goggles and oxygen mask provide additional face and eye protection.	• Throw away rip cord. • Turn off oxygen. • Slow canopy down. • Avoid wires at all costs, even if a downwind landing is required. • Streamline body while passing through the wires. • If entangled, remain motionless until power is disconnected. • Prepare to do a PLF after passing through the wires. • If the parachute is entangled in the wires and contact with the ground is made, cut away from the main chute immediately and move away. NOTE: If time and altitude permit, unhook the reserve static line and jettison equipment.	• Jettison oxygen mask and equipment. • Unhook reserve static line. • Unfasten chest strap and waist strap. • Inflate flotation device if available. • Turn canopy into the wind. • Use brakes to slow airspeed. • After entering water, release leg straps (as feet contact the water) and swim free of the harness. • If being dragged in the water, cut away the main canopy. • If trapped under the canopy, follow a seam to the edge. • Signal for assistance using emergency devices. NOTE: On entering water, be prepared for a normal landing or a PLF.

NOTE: Emergency landings are performed when an off-drop zone landing is unintentional. Tree and water landings may be performed intentionally for operational purposes.

Figure 10-12. Emergency landing procedures.



CHAPTER 11

JUMPMASTER RESPONSIBILITIES AND CURRENCY QUALIFICATIONS

This chapter establishes the procedures and techniques that jumpmasters use in MFFpara-chute operations. It delineates duties and responsibilities, regardless of unit, location, and mission. Units may have to supplement this guidance with SOPs to perform certain missions. See FM 57-220 for further discussion on the jumpmaster's responsibilities during airborne operations.

Responsibilities

The airborne commander appoints a jumpmaster for each aircraft. This individual is delegated command authority over, and is responsible for, all airborne personnel and equipment in the aircraft. Assistant jumpmasters and designated safety personnel help him. He assigns them tasks. The jumpmaster can delegate authority but cannot delegate responsibility. Figure 11-1 lists his responsibilities.

Qualifications

For appointment by the airborne commander as either a jumpmaster or assistant jumpmaster for an airborne operation, the individual must be a graduate of the MFF Jumpmaster Course. (See note below.) He must have performed jumpmaster duties within the previous 6 months or attended MFF jumpmaster refresher training. An assistant jumpmaster must have performed assistant jumpmaster duties at least twice before being designated as a jumpmaster.

NOTE: The Commandant, United States Army John F. Kennedy Special Warfare Center and School, is the proponent for the conduct of MFF courses of instruction. Only graduates of a USAJFKSWCS recognized MFF jumpmaster course may perform duties as an MFF jumpmaster. The only recognized Navy MFF jumpmasters are those who hold a Navy MFF jumpmaster graduation certificate dated before 16 June 1989 and those who graduated from the USAJFKSWCS MFF Jumpmaster Course. The Chief of Naval Operations (CNO) has directed that Navy personnel will follow this manual and undergo training at USAJFKSWCS. The only recognized Air Force MFF jumpmasters are those who have graduated from the USAJFKSWCS MFF Jumpmaster Course and those previously qualified Air Force free-fall jumpmasters who have undergone an MFF jumpmaster upgrade certification using USAJFKSWCS criteria.

Cardinal Rules

General rules stress that the jumpmaster must—

- **Never** sacrifice safety for any reason.
- Rehearse jumpmaster procedures on the ground.
- Arm his ARR before opening the jump door(s) or the ramp.
- Face the open jump door when in flight.

- Maintain a firm handhold on the aircraft when working in or close to an open jump door or ramp.
- **Never** allow anyone in or near an open jump door or ramp who is not wearing a helmet and safety harness or parachute. The helmet requirement may be waived for intentional water jumps.

Currency and Requalification Requirements

An MFF jumpmaster must be USAJFKSWCS trained or have formally undergone transitional training in a proponent-recognized school environment from the MC-3 system to the RAPS. He must have performed primary or assistant jumpmaster duties within the last 6 months where parachutists actually exited the aircraft while using a jumpmaster-directed release.

Previously qualified MFF jumpmasters who do not meet proficiency and currency requirements will meet the following requalification requirements:

- Undergo MFF parachutist refresher training outlined in Appendix C.
- Receive jumpmaster personnel inspection training for the primary MFF parachute system used in his parent unit.
- Receive refresher training in wind drift (HARP) calculation for MFF mission profiles.
- Receive oxygen equipment refresher training.
- Perform assistant jumpmaster duties for one MFF jump.
- Execute under canopy navigation techniques specific to the navigation aids unique to the parent unit.

An MFF jumpmaster who meets the currency criteria on this page will conduct the requalification and refresher training.

NOTE: Whenever possible, use a jumpmaster-directed release to enhance MFF jumpmaster skills.

AT THE UNIT AREA

- ☐ Receives the operations officer briefing.
- ☐ Receives weather decision or mission abort criteria from airborne troop commander.
- ☐ Checks the manifest (DA Form 1306).
- ☐ Organizes the planeload.
- ☐ Appoints assistant(s) and/or safety personnel.
- ☐ Briefs the personnel.
- ☐ Inspects the personnel and equipment.
- ☐ Conducts prejump training.

AT THE DEPARTURE AIRFIELD

- ☐ Coordinates with the departure airfield commander.
- ☐ Makes weather decision.
- ☐ Issues the parachutes.
- ☐ Inspects the personnel (see Appendix E).
- ☐ Inspects the equipment.
- ☐ Inspects the aircraft (see Appendix F).
- ☐ Attends the jumpmaster and aircrew briefing (see Appendix G).
- ☐ Gives the planeside briefing, as appropriate.
- ☐ Announces the station time to the personnel.

IN FLIGHT

- ☐ Remains ground oriented.
- ☐ Constantly checks the personnel.
- ☐ Enforces the flight rules and regulations.
- ☐ Issues time warnings.
- ☐ Oversees the preparation, placement, and dropping of free-fall bundles.
- ☐ Gives the heading corrections to the flight crew (when using jumpmaster release).
- ☐ Performs outside safety checks of the aircraft and DZ prior to the personnel jump.
- ☐ Issues the jump commands.

ON THE DROP ZONE

- ☐ Accounts for the personnel and equipment.
- ☐ Oversees the care and evacuation of injured personnel.
- ☐ Turns in air items.
- ☐ Reports to the DZSO (peacetime).

Figure 11-1. Sample jumpmaster responsibilities checklist.

CHAPTER 12

MILITARY FREE-FALL DROP ZONE OPERATIONS

The airborne and airlift commanders make joint recommendations concerning drop altitudes and DZs. The airborne force commander recommends the final selection of DZs. He bases his recommendations on the suitability and size of the DZs, their geographic relationship to the initial objectives, and the natural or man-made obstacles and the rough surfaces that could cause an unacceptable number of injuries or excessive equipment damage. After considering the airborne force commander's preference, the routes to the DZs, the terrain obstructions, the ease of DZ identification, and enemy defenses, the mission commander recommends approach headings and selects initial and timing points. The MAC/Air Force Special Operations Command (AFSOC) mission commander ensures the delivery of the troops, equipment, and supplies to the selected DZs at the times established in the air movement plan.

Categories

USA and USAF DZs consist of terrain or water masses that have been approved jointly by the USA and USAF for the conduct of joint airborne operations involving personnel and equipment delivered from USAF troop carrier aircraft. A USA DZ consists of terrain or water masses that have been approved by the Army for the conduct of airborne operations involving personnel and equipment delivered from aircraft other than USAF troop carrier aircraft.

Selection Criteria

The ground unit commander selects the general area of the DZ where it will best support the ground tactical plan. The joint force commander (JFC) gives guidance on DZ size in operation plans (OPLANs) and operation orders (OPORDs).

Size

There is no minimum size for MFF DZs (STANAG 3570 and MAC Regulation 55-60). During training, the experience level of the parachutists must be considered when selecting DZs. An area 50 meters by 100 meters (for example, a football field) is the recommended minimum size DZ for training.

Other Considerations

In a peacetime environment, before dropping personnel and equipment from an aircraft, DZs must be surveyed and marked. Control personnel must also be located on the DZ before and during the drop, Joint inspection by USA and USAF personnel is required annually for USAF troop carrier aircraft drops. Obstacles on the DZ and in the immediate surrounding area must be recorded for use in the jumpmaster personnel briefing.

The maneuverability of the RAPS allows for greater flexibility in the selection of DZs; however, DZs are selected only after a detailed analysis of the following:

- Mission.
- Proximity to the objective area.
- Enemy threat and air defense capability.
- Adequate approach and departure routes.
- Method of insertion (HALO or HAHO).
- Elevation and drop altitude.
- Physical characteristics of available DZs and surrounding areas.
- Relative number of obstacles in the area.

Number of parachutists to infiltrate.

Personnel Qualifications and Responsibilities

drop zone safety officer (DZSO) must be an officer, warrant officer, or noncommissioned officer (NCO). The commander ensures the DZSO is familiar with MFF operations IAW this manual and is a qualified and current static-line jumpmaster. The jumpmaster briefs the DZSO on the DZ markings, communications, and operating procedures that will be used.

DZSO (Officer or NCO)

The DZSO has overall operational responsibility for the DZ. He conducts a ground or aerial recon of the DZ before the drop to ensure there are no safety hazards. Other responsibilities include-

- Establishing personal liaison with the USAF drop zone control officer (DZCO) and the combat control team (CCT) and discussing drop procedures (USAF troop carrier aircraft).
- Clearing the DZ of unauthorized personnel and vehicles.
- Briefing and posting road guards (if required).
- Ensuring medical personnel are in position.
- Opening the DZ to provide adequate lead time.
- If using a CCT, collocating with the CCT about 10 minutes before the drop time and remaining with them until the completion of the jump (USAF troop carrier aircraft).
- Maintaining constant check of ground winds. Peacetime ground wind training limits will not exceed 18 knots. There are no winds aloft restrictions. Winds aloft, either in flee-fall or under canopy, are computed in the wind drift (D=KAV) calculation.
- After the pilot notifies the DZSO that the aircraft is 2 minutes from drop time, reporting back to the pilot the ground winds and a clear or negative drop. The aircraft pilot reports to the DZSO the number of parachutists that exited the aircraft.
- Relaying strike report to the aircraft pilot (Army aircraft or USAF troop carrier aircraft).
- During night drops, ensuring that all lights on or next to the DZ (except for DZ markings) are turned off 5 minutes prior to drop time and remain off during the jump.
- Directing recovery crew to assist parachutists and to retrieve equipment in trees.
- Assisting in medical evacuation of injured personnel from the DZ.
- Immediately after the completion of the jump, requesting the CCT to ask the pilot (USAF troop carrier aircraft) or asking the pilot (Army aircraft) if any personnel or equipment did not drop and then relaying this information to the airborne commander on the DZ.
- If a malfunction occurred, preventing the handling of the equipment until parachute malfunction personnel have examined the equipment. If a malfunction officer or an NCO is not physically located on the DZ, the DZSO secures the equipment and allows no one to examine it until he can turn over the equipment to an appropriate parachute maintenance facility.
- Recording the necessary information for the parachute operation report.
- Closing the DZ.

USAF DZCO

The USAF DZCO represents the airlift commander. He supervises all USAF personnel on the DZ. He also observes drop operations. Other responsibilities include—

- Evaluating all factors that might adversely affect safety.
- If conditions make drop operations unsafe, directing the CCT to relay that information to the appropriate USAF commander as soon as possible and to display the established NO DROP signal on the DZ.
- Directing the use of CCT equipment.
- Canceling drops when requested to do so by the Army DZSO.
- Keeping the Army DZSO advised on ground wind speed on the DZ.
- Preparing the necessary log and reports for submission to the airfift 'control 'element (ALCE) or the appropriate USAF commander.

CCT

The CCT marks the DZS with proper navigational and identification aids. He establishes ground-to-air communications at DZS as well as communications with designated control agencies. Other responsibilities include—

- Providing USA DZSO with surface weather and low-level (up to 1,500 feet) wind-aloft observations.
- Exercising air traffic control over aircraft in the vicinity of specific DZ (as directed).

Drop Zone Markings

MFF infiltrations usually take place on blind DZS due to the general ineffectiveness of visual markings when viewed from high altitudes (HALO) and extended distances (HAHO). DZ identification is normally by location in relation to major terrain features.

Drop zone markings are sometimes used when the tactical situation permits and it is desirable to indicate wind direction to the descending parachutists (Figure 12-1). FMs 31-24 and 57-38 and MAC Regulation 55-60 outline marking techniques.

Release Points and DZ Detection

Location in relation to major terrain features identifies the HARP. Appendix B contains methods of computing the HARP. The HARP may be marked, if known, when the tactical situation permits. In heavily vegetated, mountainous, or urban terrain and during conditions of restricted visibility, DZs and HARPs may be difficult to detect. Electronic beacons or radar transponders and appropriate tracking devices help aircraft personnel and parachutists in locating DZs or HARPs. Expedient methods such as balloons and pyrotechnics may also assist aircraft personnel and parachutists in locating DZs or HARPs. In situations where secrecy is important, aircraft and parachutists equipped with automatic direction finding (ADF) equipment may conduct drops using only the radio homing beacon. Parachutists may also use the NAVSTAR Global Positioning System with portable terminals.

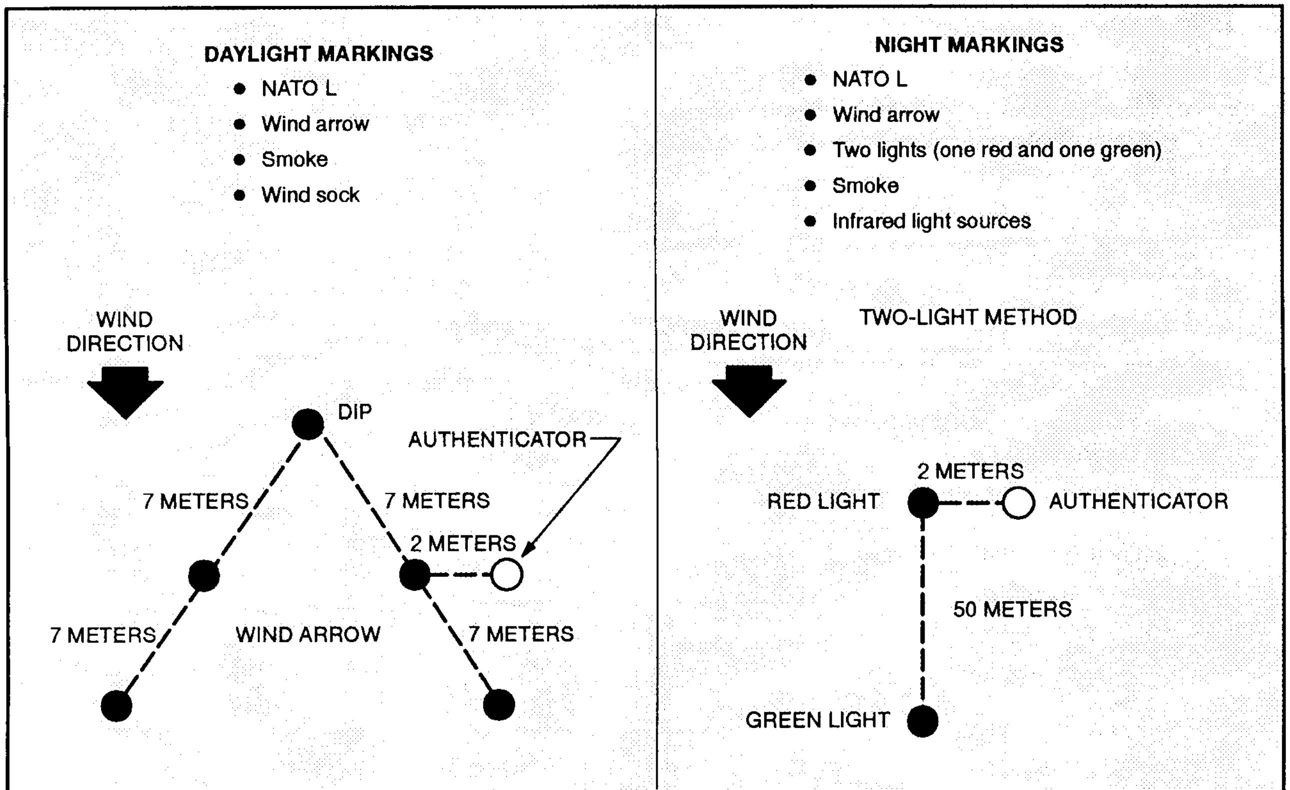
HAHO Aircraft or Team Identification

In air-to-ground identification, the aircraft or team (HAHO) identifies itself to the reception committee by arriving in the objective area within the specified time limit. It also identifies itself by approaching at the designated drop altitude and track (aircraft).

In ground-h-air identification, the reception committee identifies itself to the aircraft or team by displaying the correct marking pattern within the specified time limit and using the proper authentication code signal.

Authentication System

There is no standard authentication system for unconventional warfare (UW) reception operations. During mission planning, the commanders concerned agree on the authentication system they will use, Signal operation instructions (S0I) prescribe the authentication procedures.



NOTES:
1. When using an authenticator, you can place it at any marker station.
2. Avoid using white lights, if possible, to minimize confusion with buildings, street lights, vehicles, and other light sources.
3. Use any combination or pattern for ground markings. The key is to coordinate them with the ground party to ensure all parachutists understand them and to show wind direction.

Figure 12-1. Military free-fall drop zone markings.

Authentication may take the form of a coded light source, panel signal, radio contact, homing beacon, or combinations thereof. Authentication may be employed individually or in conjunction with the marking pattern. When using a homing beacon or radar transponder for authentication, the commanders concerned will jointly agree upon positioning and turn-on and turn-off times during mission planning.

CHAPTER 13

THE AUTOMATIC RIP CORD RELEASE

The ARR is a safety device designed to activate the main parachute of the RAPS should the parachutist fail to do so. The ARR functions at a predetermined altitude AGL by sensing changes in barometric pressure. The jumpmaster calculates the proper millibar setting and inspects the ARR for the proper setting. The current ARR is the FF-2 Hite Finder (see Appendix A and TM 10-1670-264-13&P). The supporting rigger section issues the ARR properly attached to the RAPS.

WARNING

The ARR is a mechanical safety device. It is considered only as a secondary means of main parachute activation. Its use is mandatory for all MFF operations, except for intentional water jumps.

Activation Setting and Operation

The ARR is set to activate at 500 feet or more below the briefed main parachute manual activation altitude. However, it is not under any circumstances set to activate below 2,500 feet AGL. The ARR senses the altitude 1,000 feet above the MSL activation altitude. The ARR fires 6 seconds after the timer's activation, withdrawing the rip cord pin from the main parachute closing loop. The process cannot be stopped once the timer is activated.

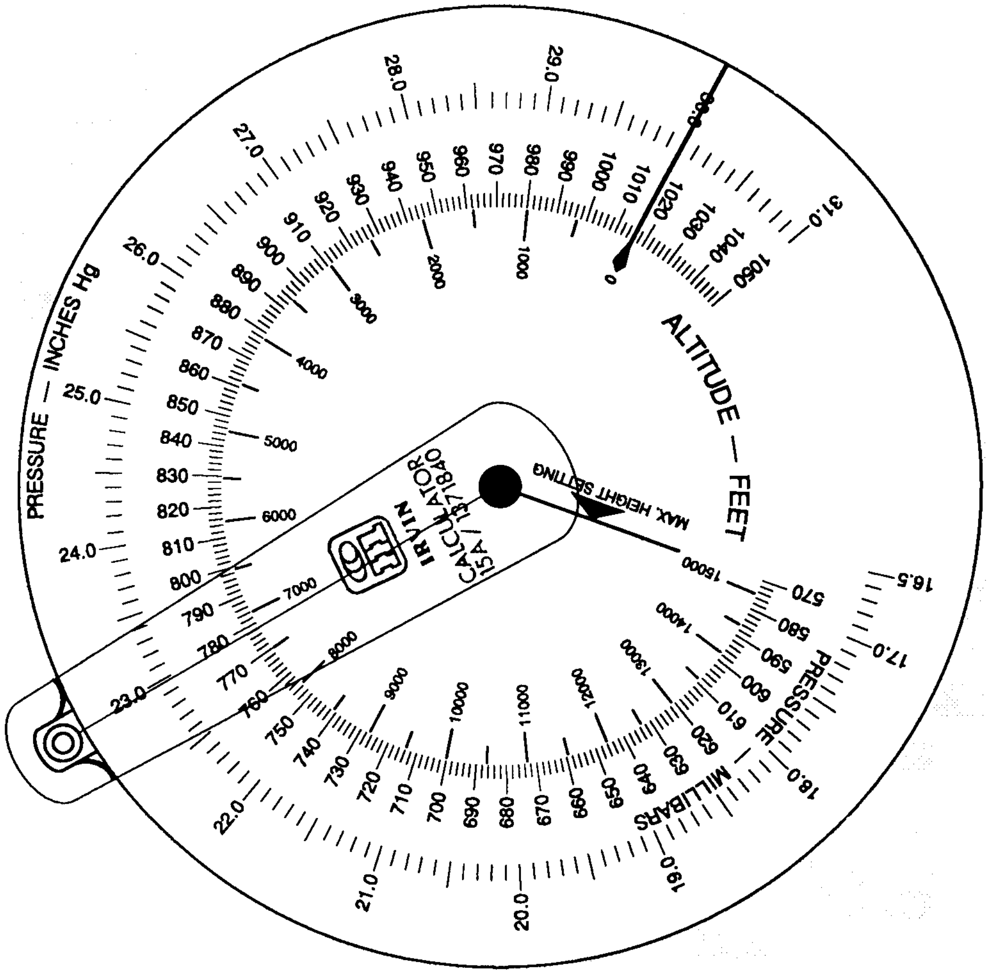
Millibar Setting Calculation

The jumpmaster obtains the forecasted aircraft "altimeter setting" for the DZ. If flying a mission with limited weather information, the aircrew can provide the altimeter setting en route to the drop area. The altimeter (pressure) setting will be given in inches of mercury (Hg). The jumpmaster obtains the setting to the nearest one-hundredth of an inch.

Using the Irvin FF-2 Calculator (Figure 13-1), the jumpmaster determines the ARR millibar setting by first placing the black line over the altimeter setting on the outer scale (example 30.00). Next, the jumpmaster adds the given ARR activation altitude (example 2,500 feet AGL), to the given DZ elevation expressed in feet (example 4,700 feet) to determine the MSL activation altitude (example 7,200 feet). He then places the red line over the MSL activation altitude (example 7,200 feet) on the inner scale of the calculator and reads the millibar under the red line on the center scale (example 778 millibars).

Arming and Disarming

On the jumpmaster's command, the parachutist removes the arming pin to arm the ARR. The safe arming altitude for the ARR is 2,500 feet above the MSL activation altitude. If the aircraft must descend below the safe arming altitude, the parachutist reinserts the arming pin to disarm the ARR. He must disarm the ARR not lower than 2,500 feet above the MSL activation altitude to prevent an inadvertent firing.



EXAMPLE

Altimeter setting = 30.0

ADD:

ARR activation altitude = 2,500 feet AGL

DZ altitude =+4,700 feet MSL

7,200 feet MSL = millibar setting of 778

Figure 13-1. Calculating the ARR millibar setting using the Irvin FF-2 Calculator.

CHAPTER 14

LIMITED VISIBILITY OPERATIONS

MFF infiltrations during periods of limited visibility (adverse weather or darkness) have a higher chance of success than strictly daylight operations. Limited visibility infiltrations offer surpnse and increased security due to reduced enemy observation capability. Limited visibility operations require a high degree of skill and individual discipline. A well-rehearsed tactical plan executed by personnel proficient in MFF skills is critical to success.

Adverse Weather

Foggy, overcast, or mostly cloudy conditions effectively prevent observation from the ground, However, adverse weather conditions present special problems for the MFF parachutist. High winds and precipitation can degrade canopy performance and make control difficult. Entering clouds may cause disorientation and lead to detachment separation under canopy, free-fall collisions, or canopy entanglements. The loss of depth perception due to ground fog, smoke, or haze may prevent the parachutist from executing a proper landing.

In free-fall, the parachutist stops all maneuvering upon entering a cloud. He activates the main parachute at the designated altitude, even if he has not passed through the cloud layer. In clouds under canopy, he flies the canopy at the half brake position to give himself the greatest range of canopy response.

Night Operations

Night MFF parachuting offers the same advantages as parachuting during adverse weather, especially during the first quarter, new moon, and last quarter moon phases. Night free-fall parachuting is the most psychologically demanding of parachute operations. Extensive training must take place at night. During this t-raining, the parachutist develops confidence in the equipment and his own abilities,.

Commanders must weigh the tactical situation when placing lighting devices on the parachutist and on the parachute canopy for safety and control during free-fall and canopy flight. At a minimum, use lighting devices for altimeters and other instruments.

The use of oxygen dramatically improves night vision, Wearing the oxygen mask until the landing is a recommended procedure. The commander may consider using oxygen for all night free-fall operations, even if the jumping altitude does not require it.

The jumpmaster can use night vision devices to help him while spotting from the aircraft. The parachutist can also use them during canopy flight as an aid to navigation and formation flying. He must have extensive experience flying and landing with night vision goggles to overcome the loss of depth perception. An additional factor to consider is that the night vision goggles will seriously impair his night vision after using them for extended periods.

WARNING

Night vision goggles should not be worn during free-fall, because they restrict the parachutist's ability to locate the rip cord handle and the cutaway handle.

The lack of depth perception at night may prevent the parachustist from executing a proper landing. The parachutist flies the parachute at the half brake position and performs a PLF on contact with the ground. Various night lighting techniques exist to identify parachutists, group leaders, or subunit elements while under canopy. Some techniques involve attaching the devices in the aircraft and some must be activated and placed on the canopy before packing the parachute. Some of these techniques are rheostatic electroluminescent riser lights; chemical lights (chemlites) on the parachutist's body and on the risers, and/or the bridle line attachment point (activated and packed before the chemlite's life span expires); and other electrical systems placed in pockets on the canopy's top skin.

APPENDIX A

MC-3 MILITARY FREE-FALL SYSTEM

Although the MC-3 MFF system is still available in the procurement system, user units should make the transition to the RAPS to ensure joint interoperbility and a lower injury rate in airborne operations. This appendix covers this system. Some Reserve and National Guard elements still use it.

Main Parachute Assembly

The main parachute assembly consists of an MC-3 canopy assembly with a personnel parachute canopy sleeve assembly and 40-inch spiral vane pilot parachute, an MC-3 backpack assembly a manual rip cord assembly, a harness assembly, and an FF-2 automatic rip cord release assembly. The following paragraphs describe these components.

Canopy Assembly

The MC-3 canopy assembly (Figure A-1) is a 24-foot MFF back-type parachute that deploys manually or automatically. 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 controls the volume and direction of airflow through the turn slots, allowing variation in the direction, forward speed, and rate of descent of the canopy.

The canopy skirt's (the lower lateral band) design is such 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 attached to each side of the canopy skirt and extending below the skirt contribute to the overall spread and stability of the MC-3 canopy. The canopy, when deployed, takes on an elliptical shape, developing a built-in thrust, or forward speed, of 13 mph. The MC-3 canopy assembly is packed inside a personnel parachute canopy sleeve and is deployed by a pilot parachute.

Backpack Assembly

The MC-3 backpack assembly container is semi-permanently attached to the harness assembly with horizontal and diagonal back strap retainers (Figure A-2). The four locking pins on the manual rip cord pass through four locking cones on the backpack to close the pack. Four pack opening bands routed behind the backpack and attached to eyelets on the side flaps of the backpack provide the tension.

Manual Rip Cord Assembly

When the parachutist has fallen to the predesignated deployment altitude, he removes the manual rip cord handle from the rip cord pocket and extends his arm. This action pulls the rip cord cable through the cable housing and removes the locking pins from the cones in the backpack. With the locking pins removed, the pack opening bands pull the backpack assembly's side flaps 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 (Figure A-3).

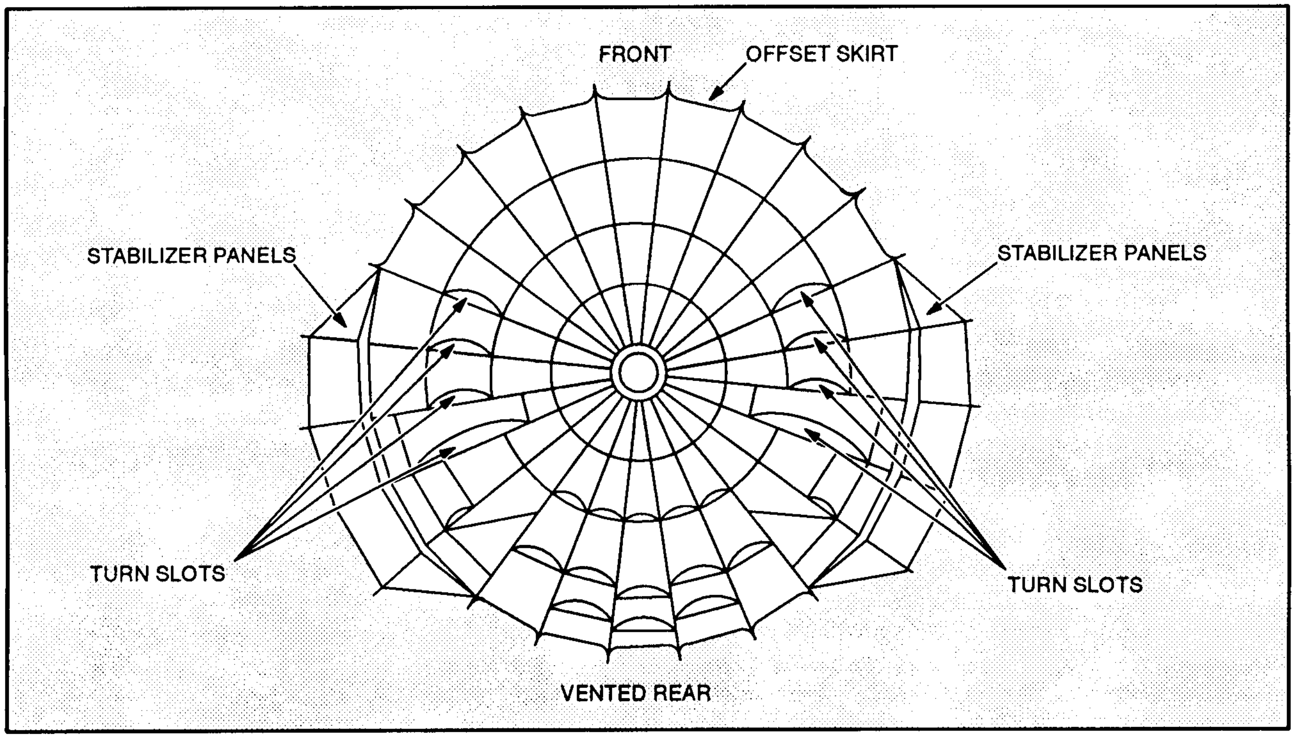


Figure A-1. MC-3 canopy assembly.

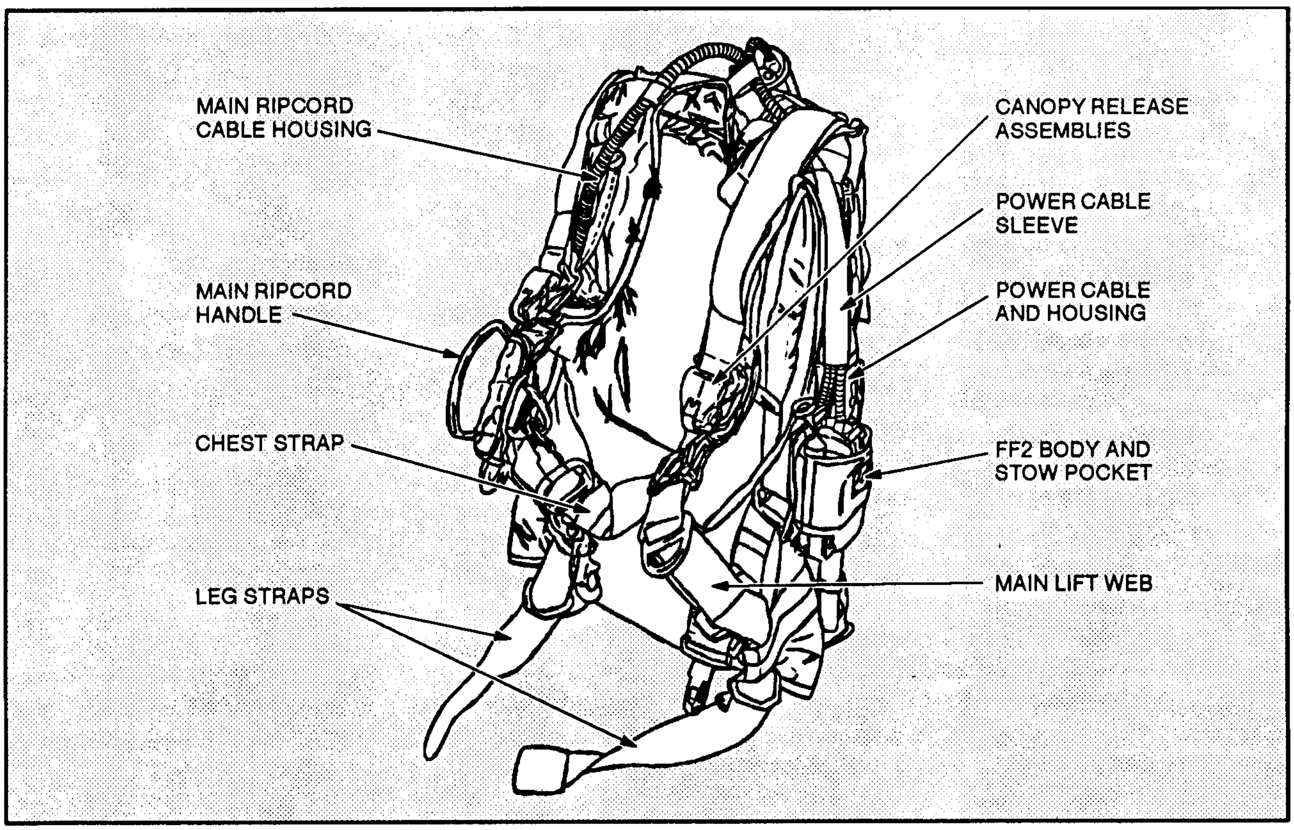


Figure A-2. MC-3 backpack assembly.

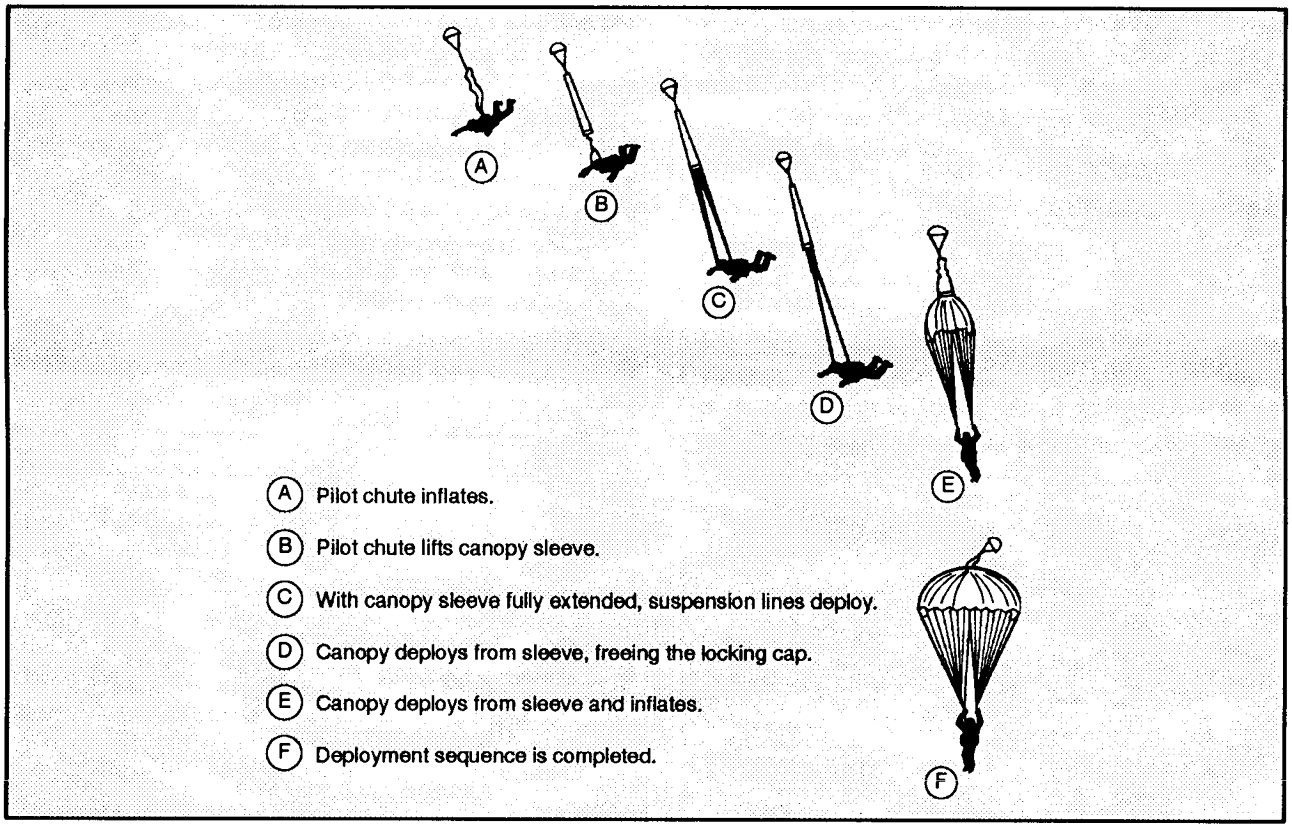


Figure A-3. Deployment sequence.

A sleeve retainer line attached to the sleeve bridle loop and the pilot parachute bridle passes through the sleeve and connects, on the other end, to the canopy bridle loop to prevent losing the sleeve. The entire deployment sequence, from locking pin removal to canopy inflation, normally occurs within two and a half seconds.

Harness Assembly

The troop back and chest personnel parachute harness assembly is mounted on a short-girth vest for easy donning and includes 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. The parachutist adjusts the harness to fit snugly, but it should not restrict body movement. He adjusts the harness as follows:

- He dons the harness, checks for body size, and removes the harness.
- He adjusts the two main lift webs to body size and ensures the lift webs are even.
- He dons the harness and fastens the chest and leg straps.
- He adjusts the chest and leg straps, ensuring he can arch his back properly.
- He folds the excess webbing and secures 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 rip cord handle pocket is affixed to the right main lift web, with the end of the rip cord cable housing tacked above it. Two "D" rings, integral parts of both main lift webs, are located below the chest strap and serve as the reserve parachute's suspension points. The two equipment rings, integral parts of the saddle portion of the main lift webbing, are used to attach the equipment lowering line. The FF-2 ARR attaches to the left diagonal backstrap of the harness.

FF-2 Automatic Rip Cord Release Assembly

The FF-2 ARR assembly (Figure A-4), commonly called the Hite Finder, is designed to automatically open a free-fall personnel parachute at a safe altitude should the parachutist fail to pull the manual rip cord. The ARRs response depends upon presetting the instrument for the barometric pressure at the desired activation altitude, computed in millibars, above the intended DZ. The ARR is in an alloy case, at the bottom of which is a cylindrical housing that contains the main spring, a plunger, and a barrel cap. On one side of the ARRs case is a millibar dial knob used to set the activation altitude. On the opposite side is an access hole, covered by a threaded plug, used to reset the time-delay mechanism. The arming pin assembly used to manually activate the ARRs time-delay mechanism is located on the top. Also located and fitted on top of the release case is the power cable and housing assembly that pulls the parachute rip cord pins in the instrument's operational sequence.

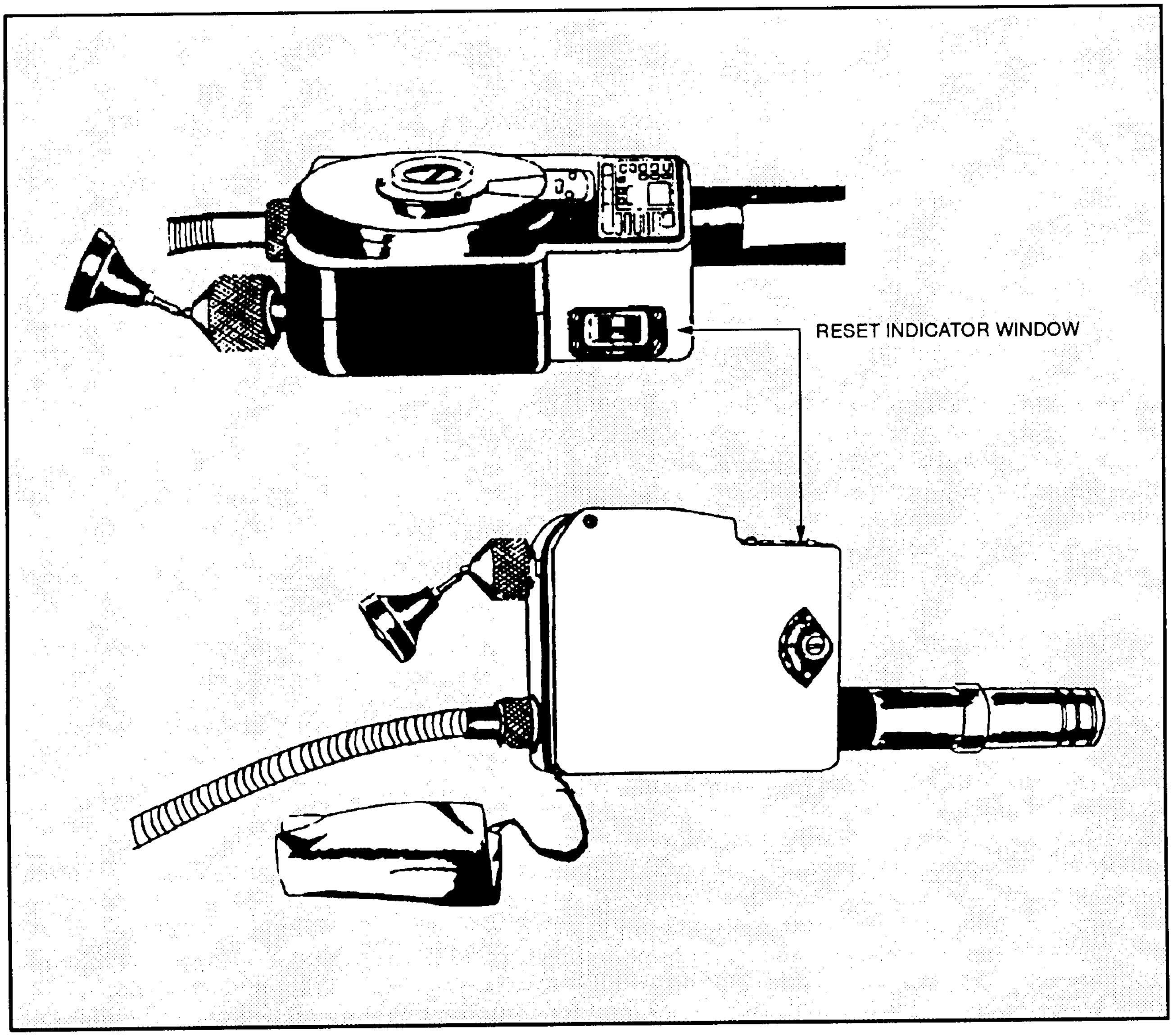


Figure A-4. FF-2 ARR assembly.

WARNING

Before and after the installation of an FF-2 automatic rip cord release assembly on a free-fall back parachute assembly, the parachutist checks the reset indicator to ensure that a partial rundown of the timing mechanism has not occurred due to any inadvertent momentary withdrawal of the arming pin.

The parachutist can check the reset operation using the "RESET INDICATOR" window (Figure A-4) located immediately below the ARR case's rounded face. He visually checks the window and observes the location of the two white marks. If the ARR's time-delay mechanism has been reset, the two marks will be aligned. If the lower, movable mark is offset more than one-half the width of the indicator, the time-delay mechanism may not have been reset properly. The parachutist replaces an ARR that has not been reset with another that has been reset, or he has the support rigger reset the time-delay mechanism as required.

In most cases the FF-2 ARR has been installed when the parachute is issued. The FF-2 ARR fits into a stowage pocket specifically designed to contain it. Should the parachutist have to install the release, he follows the procedures in Figure A-5.

WARNING

Due to the exposed mounting location of the FF-2 ARR, take extreme care when handling, storing, and transporting an MC-3 back steerable parachute.

Should the parachutist have to remove the FF-2 ARR from the parachute, he slips the rip cord locking pin out of the hook without unscrewing the knurled locking nut. He never unscrews the knurled locking nut from an uncocked release. He reverses the other steps in Figure A-5, unlocking the cable housing from its plate and slipping the power cable and housing through the loop and sleeve.

Reserve Parachute Assembly

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

The reserve parachute attaching strap has a triangular link on 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, the parachutist has to install the attaching strap, he-

- Positions the back parachute with the harness facing up.
- Raises the pack back cushion and opens the horizontal backstrap retainers.
- Centers the attaching strap over the pack between the horizontal backstrap retainers.
- Passes each triangular link end of the attaching strap through the fourth pack opening band slot located at each side of the backpack assembly.
- Passes the loose end of each horizontal backstrap retainer down through the adjacent loop formed in the attaching strap and reattaches each retainer in the original location.
- Resecures the pack cushion to the pack.

The reserve parachute connector strap has a quick-ejector s-nap on each end, It is installed on a packed chest reserve personnel parachute bypassing 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 triangular links on the attaching strap to encircle the parachutist's waist snugly.

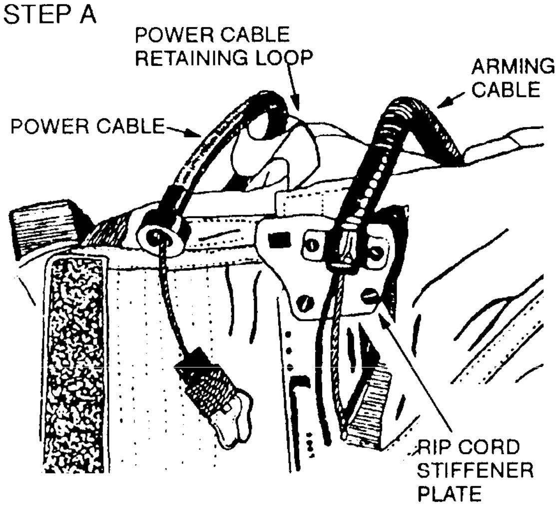
Slip the FF-2 into the stowage pocket attached to the parachute harness, making sure that the adjustment crew, millibar window, and reset indicator can be seen through the openings provided. Stow the individual release log record inside the pocket between the release casing and the side of the pocket with the attaching webs (the side next to the parachute).

Extend the cylindrical housing 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) fastenersmate.

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. Refer to Figure A-2.

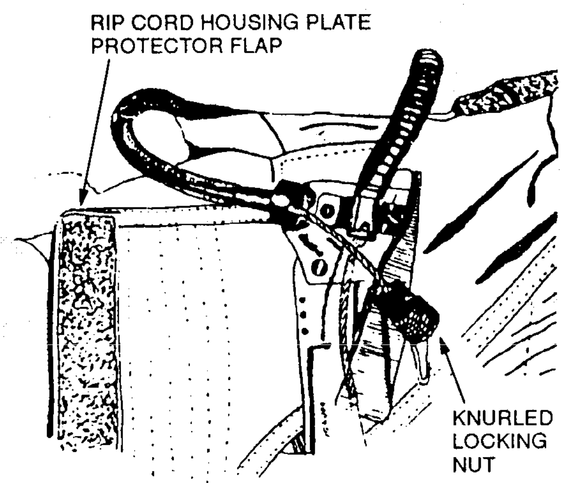
Follow Steps A through D and then close and secure the rip cord housing plate protector flap and the rip cord protector flap.

STEP A



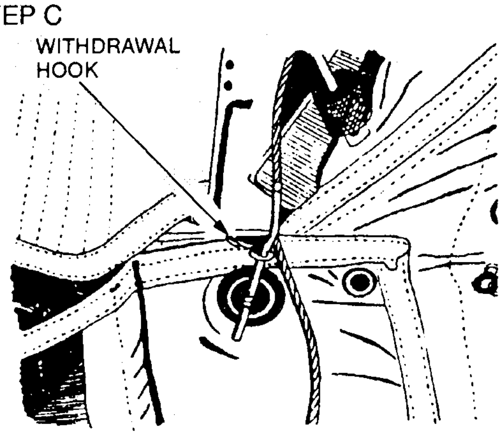
Pass the upper end of the arming cable and housing through the power cable retaining loop at the upper end of the pack, and route it toward the rip cord stiffener plate.

STEP B



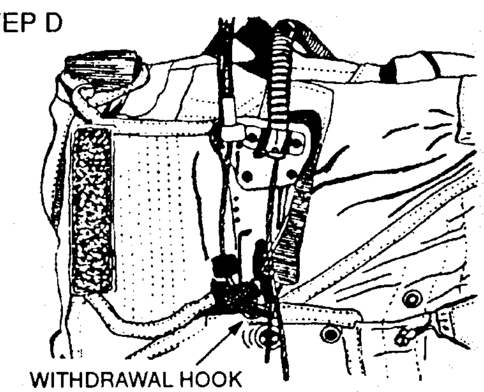
Rotate the power cable housing end 90 degrees clockwise to lock the key in the slot and secure the housing to the plate.

STEP C



Unscrew the knurled locking nut on the upper end of the power cable and remove the withdrawal hook from the slotted retainers.

STEP D



Install the withdrawal hook on the first rip cord locking pin above the first locking cone with the closed, rounded end of the hook under the rip cord cable and against the upper end of the pin. Ensure 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.

Figure A-5. Installing the FF-2 ARR.

The parachutist positions the reserve parachute at the center of his body so that the air will flow evenly over the upper and lower portions of his body. He secures it firmly with the reserve restraint strap (located at the bottom of the main backpack) to prevent shifting during free-fall.

Altimeter

The altimeter (Figure A-6), 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 their purpose is the same--to indicate altitude above the ground.

The nonsensitive-type altimeter used for free-fall is marked in increments of 250 feet, numbered every 1,000 feet, O being zero feet and the 10,000-foot indicator representing 10,000 feet. It has only one needle that moves across its face. A small red light with a protective cover lights the dial for night operations. Its ON / OFF light switch is located on the side of the metal mounting bracket.

The nonsensitive altimeter is a reliable piece of equipment that should not be handled roughly. If accidentally dropped or after a hard landing, run it through the test chamber again. Before placing it in service, put it through a test chamber IAW TM 10-1670-264-13&P.

Although the altimeter usually is installed on the reserve parachute when the reserve is issued, the parachutist may sometimes have to install it himself. He unsnaps and opens the rip cord protector flap on the packed reserve to expose the pack-opening spring bands. He unhooks each of the pack-opening spring bands from the top. He passes the loose end of each band through the appropriate accommodating slots in the base of the altimeter bracket. He centers the altimeter bracket on top of the reserve parachute pack and rehooks the bands in the original hooking location.

Helmet Assembly

The MC-3 flying helmet is used for free-fall. It should have a bayonet fastener receptacle on each side of the helmet to attach the oxygen mask. The jumpmaster's hehnet has earphones and a boom microphone for communication with the aircrew. Helmets and masks for personnel other than jumpmasters should not have communications equipment.

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.

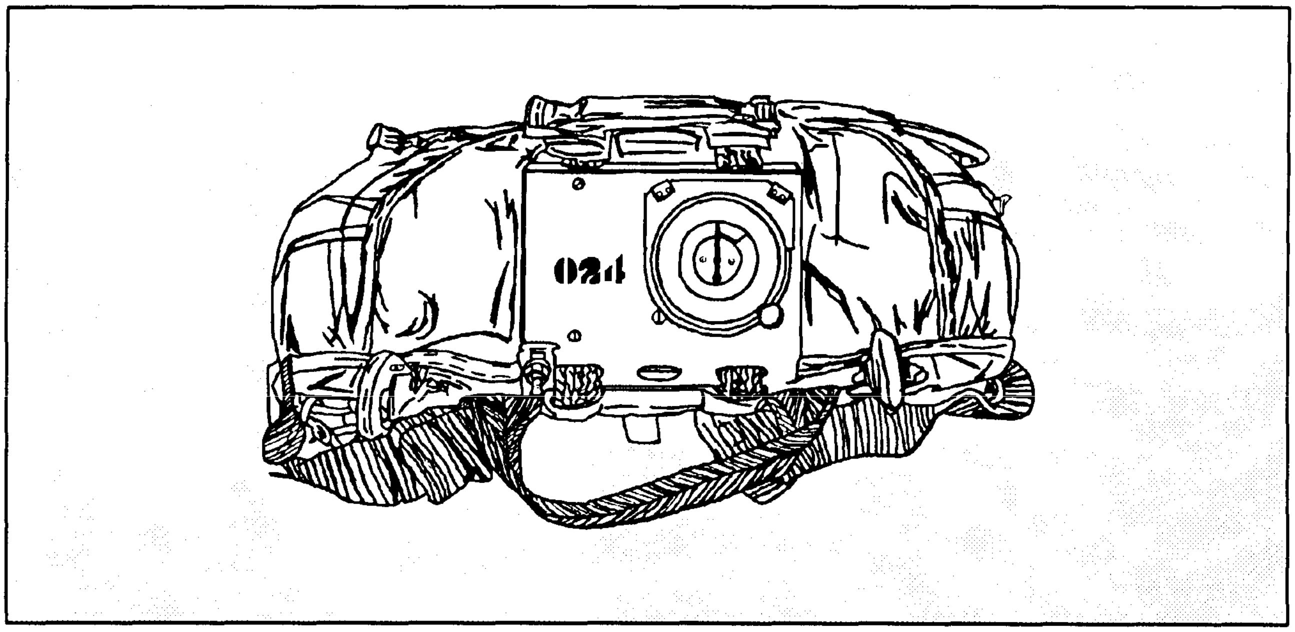


Figure A-6. Altimeter.

Personnel Oxygen System Assembly

The personnel oxygen system consists of an MBU-3/P oxygen mask and an oxygen bottle assembly with a CRU 60/P oxygen connector. The MBU-3/P is a pressure-type mask that 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 jumpmaster's oxygen mask incorporates a microphone for communication with the aircrew.

Oxygen bottle assembly (Figure A-7) (or bailout bottle assembly) consists of two oxygen cylinders secured together with a double-bottle clamp and a manifold assembly. The manifold assembly 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 1,800 and 2,200 psi. These cylinders will provide a parachutist oxygen for about 15 minutes. Once activated, the bottles can be turned off if necessary.

The pressure gauge located at the center of the manifold assembly shows 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 (1,800 and 2,500), other pressure indication points may be approximated; for example, when the indicator on the gauge cuts the second "L" of "FULL", the pressure is about 2,000 psi.

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

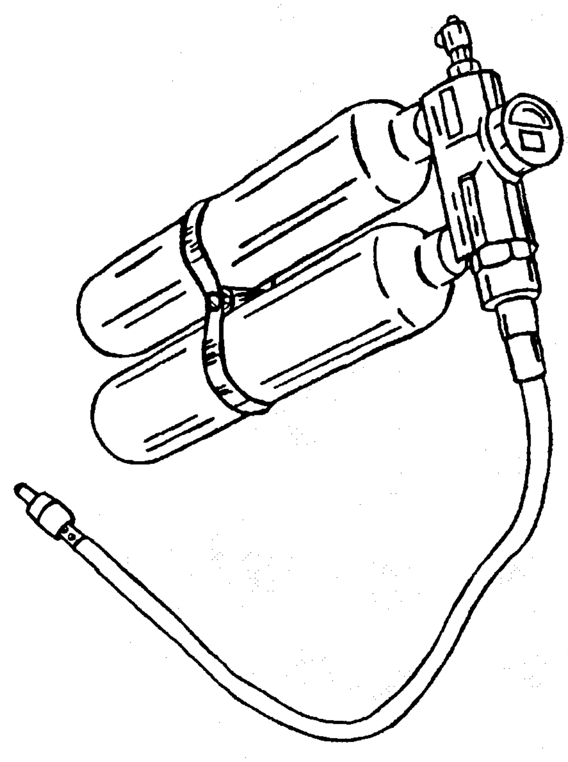


Figure A-7. Oxygen bottle assembly.

WARNING

To prevent moisture and contaminants from entering the system, the parachutist ensures the ON/OFF switch on a double-bottle oxygen assembly is 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 that attaches the hose to the CRU 60/P oxygen connector mounted on the parachute main lift web. The parachutist clamps the other end of the hose to the manifold outlet.

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

Whenever issued a bailout bottle, the parachutist ensures that the—

- Bayonet connector is spring loaded.
- Rubber hose is free of cuts or deterioration.
- ON/OFF control is operational and in the OFF position.
- Gauge reads between 1,800 and 2,200 psi.

WARNING

Any deficiency is cause for replacement of the bottle.

Double-bottle oxygen cylinders are installed in a pocket attached to the chest reserve parachute packtray (Figure A-8). Normally they are already installed when the reserve parachute is issued. Should the parachutist have to do it himself, he first checks that the pressure gauge indicates between 1,800 and 2,200 psi. If the pressure is below 1,800 psi, he replaces the cylinders. If the cylinder assembly shows a pressure over 2,200 psi, he activates the cylinder and "bleeds" the pressure down to 2,2oo psi.

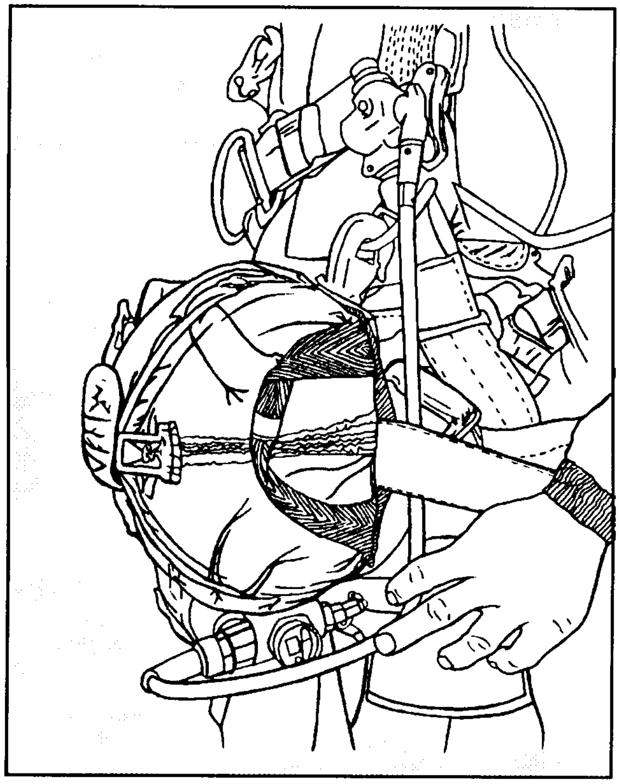


Figure A-8. Double-bottle oxygen cylinder installed.

The parachutist inserts the lower end of the oxygen cylinder assembly into the pocket and passes the long end of the closing flap over the manifold, with the pressure gauge extending through the slot in the flap. He passes the lower side closing flap up over the side of the cylinder. He secures the end closing flap with the hook and pile (Velcro) fastener. He brings the other side closing flap tightly up over the cylinders and secures the three flaps together with the flap hook and pile fastener.

Emergency Procedures

Emergencies may occur at opening altitude when there is a complete malfunction of the parachute, a partial malfunction, or a minor deployment problem. Each of these emergencies and the emergency procedures used to correct the conditions are described in detail in the following paragraphs.

Complete Malfunction

A complete malfunction occurs when the canopy remains in the packtray after pulling the rip cord. If the parachutist has a complete malfunction, he does not waste valuable time trying to cut away the main canopy before activating the reserve. He looks down at the reserve rip cord handle and pulls it with the right hand immediately. He does not waste time trying to assume a specific body position. He checks his canopy. If his main canopy should come out of the pack as a result of the opening shock of the reserve, he grasps the main canopy's risers and pulls the main canopy in as rapidly as possible, gathering it in his arms or between his legs. He prepares to land. He grasps the reserve's suspension lines with both hands and pulls himself upright, as in doing a pull-up, to assume a better landing position. He lands, executing a PLF.

Partial Malfunction

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 procedures to correct 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 entanglement. A stabilizer hang-up occurs when a set of stabilizer panels do not fully deploy and results in rapid spinning and an increased rate of descent. In either case or if the parachutist has a major deployment problem, he must decide whether or not to execute a cutaway if he is in a rapid spin he cannot correct or if his rate of descent is more than it would be with a T-10 reserve.

After the parachutist checks his canopy and attempts, if feasible, to clear his malfunction, he checks his altimeter. He must decide to cut away or not to cut away no lower than 1,800 feet AGL.

Beeause the MC-3 is a sensitive and precision-type canopy, and because a serious malfunction creates a high degree of spinning and an increased rate of descent, the parachutist must cutaway above 2,000 feet AGL before activating the reserve parachute to avoid the chance of serious injury or death.

Minor Deployment Problems

If the parachutist has minor deployment problems, he does not activate his reserve parachute. He takes the corrective action described in each of the following situations.

Sleeve and/or Pilot Chute Through Modification, Control Line, or Turn Slot. Should the sleeve and/or pilot chute slip through a turn slot or loop around a control line, the parachutist compensates 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 the control lines be broken or inoperable, the parachutist steers with the opposite control line and by pulling the rear riser on the same side as the broken line. This action will have essentially the same effect as pulling the control line, but will not be as positive.

Frontal Closure. Occasionally the front of the canopy skirt will tuck under the rear during deployment. Although this condition should clear itself in a second or two, the parachutist pulls down on one or both control knobs and the font will open.

Pilot Chute Hesitation. If the parachutist is in a nearly flat and stable body position, the airflow around him may be so uniform as to create a partial vacuum that prevents the pilot chute's inflation. If he pulls his rip cord and feels his pack open but does not experience opening shock within 2 seconds, he looks over his shoulder to see if he has a pilot chute hesitation. Generally, just turning to look will break the vacuum and remedy the hesitation. The parachutist also considers any other irregularity and initiates proper emergency procedures immediately.

Entanglement

A midair entanglement invoking high-performance canopies requires immediate action. First, the parachutist checks his altitude. If he is above 2,000 feet AGL, he tries to free himself from the other canopy. He may find, upon freeing himself, that his main canopy has lost some or all of its lift, and he may feel as if he is baek in free-fall. His canopy may require several hundred feet to reinflate. If it does not reinflate, he initiates the proper partial malfunction procedures immediately. If he is unable to free himself from the other canopy and is above 2,000 feet, one parachutist must execute a cutaway. The parachutist whose canopy is giving the least support or is higher should execute a cutaway. Both parachutists make a decision and agree on their decision immediately. If still entangled and below 1,600 feet both parachutists must make an immediate joint decision as to which one will hand deploy his reserve by the controlled method of reserve deployment.

Cutaway Procedures

Figure A-9 shows cutaway procedures. The parachutist begins the cutaway no lower than 2,000 feet AGL. He does not waste valuable time with repetitious efforts to clear a malfunction. To initiate the cutaway, the parachutist—

- Throws away his main rip cord. If he cannot pull it through the cable housing, he tucks the handle securely behind his right main lift web to avoid the chance of the reserve or pilot chutes becoming entangled with the loose handle.
- Places his legs and feet together and opens both safety covers of the canopy release assemblies simultaneously with both hands (Figure A-9, Step A).
- Locks his thumbs in the lanyard cable releases (Figure A-9, Step B).
- Keeping his eyes on the reserve rip cord handle, pulls vigorously forward and downward on the cable releases (Figure A-9, Step C).
- Does not try to restabilize in free-fall. He protects the open canopy release assemblies by placing his left arm across the releases and immediately pulls the reserve rip cord vigorously with his right hand and throws it away.
- Checks his canopy and canopy drift.
- Prepares to land. He pulls himself upright by the suspension lines for a better landing attitude and lands, executing a good PLF.

WARNING

The parachutist does not try to deploy a reserve under a partial malfunction of the MC-3 without first trying a cutaway, unless he is below 2,000 feet AGL.

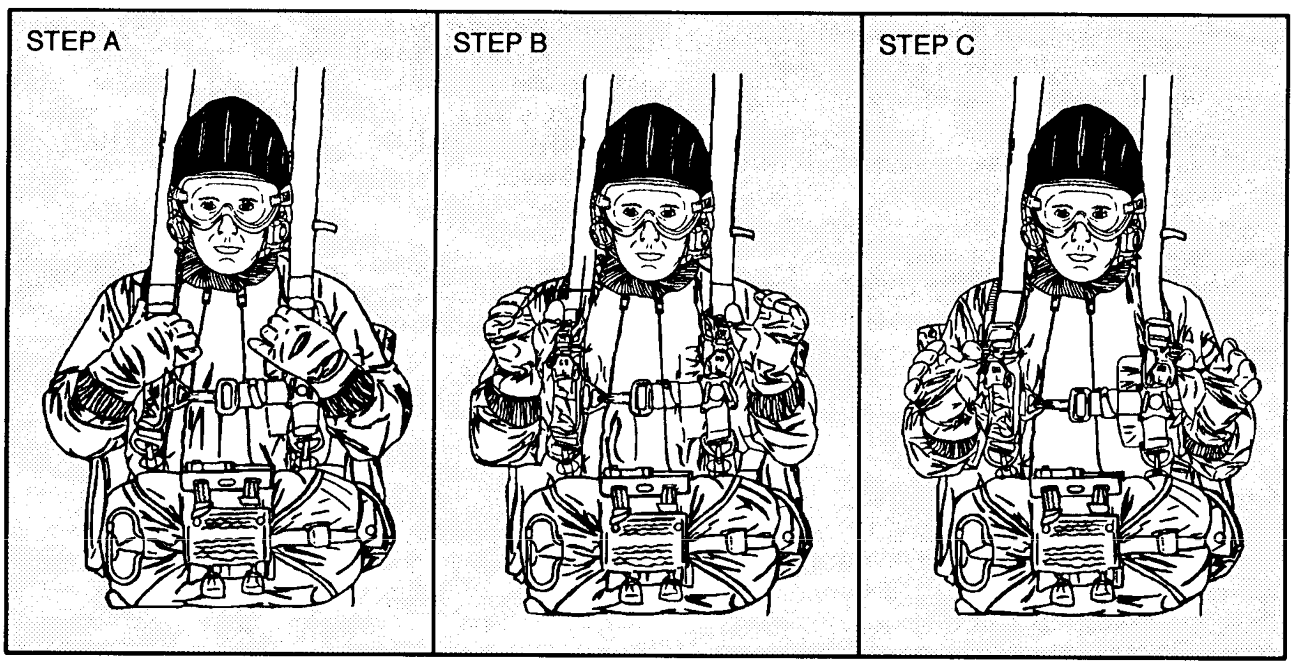


Figure A-9. Cutaway procedures.

Controlled Method of Reserve Deployment

The parachutist deals with a malfunction resulting in a high rate of descent without spins, or one encountered below 2,000 feet, using the controlled method of reserve deployment (Figure A-10). To perform these procedures, he—

- Places his left hand over the rip cord protector flap.
- Pulls the reserve rip cord and discards it.
- Assists the opening of the pack flaps and gains control of the reserve parachute.
- Lifts the entire reserve canopy overhead at full arm's length and throws it down and directly away from his body as vigorously as possible.
- If the main and reserve parachutes entangle, tries to inflate the reserve by pulling on the reserve suspension lines.

Parachute Recovery

There are two accepted methods of recovering the MC-3 parachute assembly. The preferred method requires the use of an aviator's kit bag; however, the parachutist may use the alternate method when a kit bag is not available. In either case, he attaches his rip cord handle to his harness chest strap before he removes the harness. This action prevents the loss of the rip cord handle. He removes the harness and, before allowing it to touch the ground, reinserts the arming pin into the FF-2 ARR to preclude misplacing the pin and introducing dirt or debris into the release.

Preferred Recovery Method

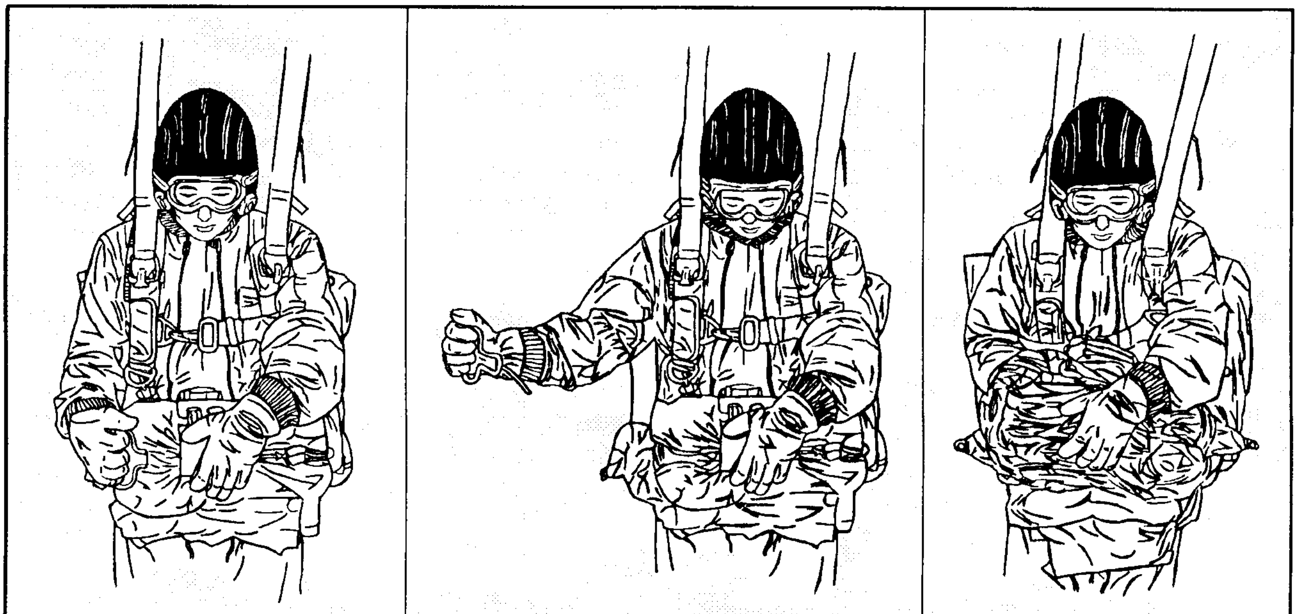
To recover the MC-3 parachute assembly using the preferred method, the parachutist stretches the entire assembly, from the pilot chute to and including the pack and harness, out on the ground. He moves to the pilot chute end of the canopy sleeve and pulls the sleeve retainer line through the sleeve until the bridle loop is even with the top of the sleeve. He fastens the bridle loop to a handy object or has someone hold it while he pulls 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, he pulls the sleeve down to the point where no canopy material is exposed. He moves back to the bridle and drapes the pilot chute over his shoulder. He places his thumb through the bridle loop and makes S-folds with the canopy and suspension lines until he arrives at the risers. He places the folded canopy and suspension lines into the kit bag and the pilot chute on the ground next to the bag. He removes the FF-2 ARR from the harness, if required to do so. He places 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 ARR. He places the pilot parachute into the kit bag and snaps the kit bag's fasteners. He does not use the slide fastener (zipper), since the teeth can damage any protruding fabric.

Alternate Recovery Method

To recover the MC-3 parachute using the alternate method, the parachutist follows the same steps as for the preferred method through drawing the sleeve over the canopy. Then he drapes the pilot parachute and the sleeved canopy over his shoulder and coils the suspension lines into one of his hands, making about a 2-foot coil. He folds the risers intn the open packtray and places the coiled suspension lines on top of them. He makes S-folds about the same length as the packtray with the sleeved canopy. He places these S-folds into the packtray and allows the pilot parachute to extend beyond the top of the tray. He closes the side closing flaps over the entire contents and secures the flaps in place with the pack opening bands.

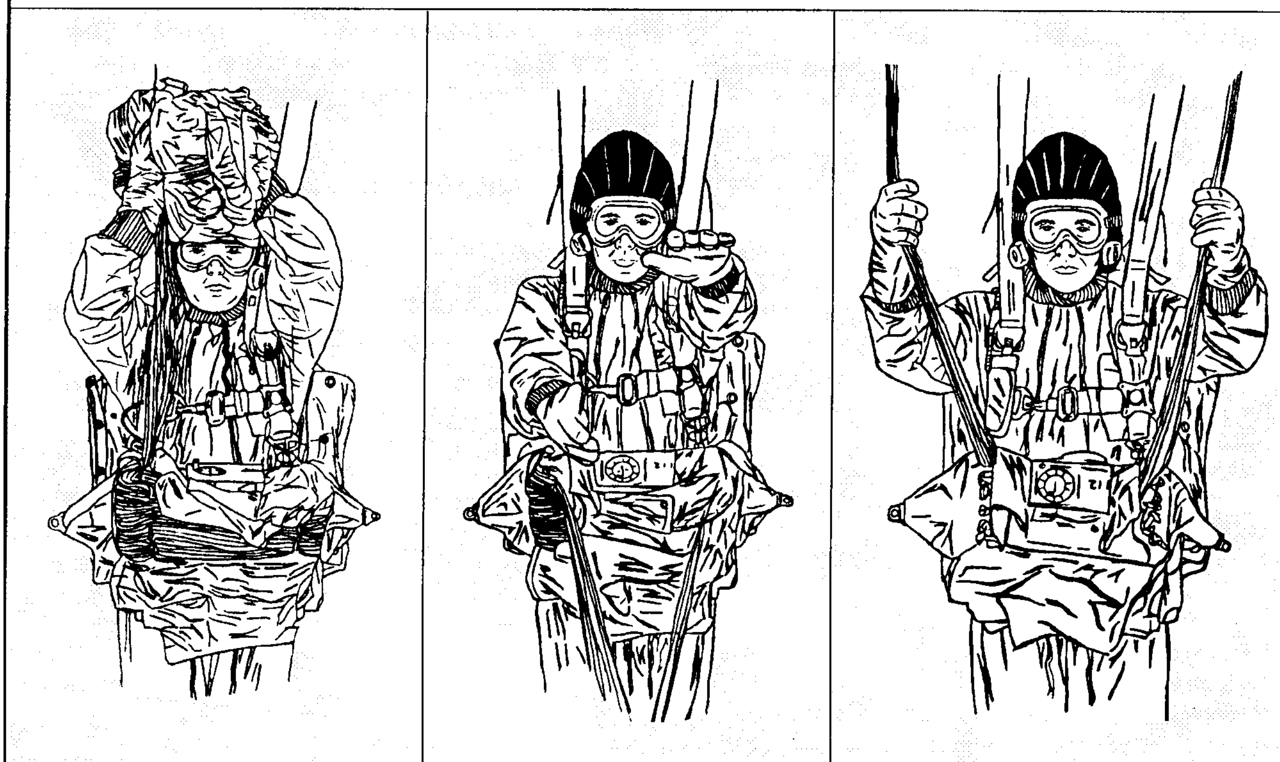
Jumpmaster Personnel Inspection (MC-3)

Prior to each jump, the jumpmaster conducts a systematic inspection of each parachutist to ensure that all equipment is properly worn and attached. The jumpmaster uses the steps described in the following paragraphs when performing the personnel inspection for the MC-3 parachute.



Place your left hand over the rip cord protector flap. Pull the reserve rip cord 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 parachute entangle, attempt to inflate the reserve by pulling on the reserve suspension lines.

Figure A-10. Controlled method of reserve deployment.

With the parachutist facing him, the jumpmaster places both hands on each side of the parachutist's helmet. He then checks the—

- Retainer strap on the goggles to ensure its serviceability and attachment to the sides or rear of the helmet.
- Lens to ensure that it is the clear type and has no cracks or severe scratches to obscure the vision.
- Helmet's adjustable chin strap for serviceability and that its snaps are fictional.
- Oxygen mask's attachment to the helmet and ensures that it releases properly, allowing for rapid removal should there be an oxygen malfunction.
- Oxygen mask for proper fit and cleanliness. He ensures both inhalation valves point down and the exhalation valve is attached properly. He checks the oxygen hose's secure attachment to the oxygen mask with a clamp. He traces the hose to ensure it is not misrouted, it has no cracks, and the mask connector is properly inserted and seated in the connection block assembly mounting plate.
- Mounting plate's attachment to the left main lift web. He ensures the male connecting portion for the bailout bottle assembly hose is on the parachutist's left side. He ensures there is an O-ring on the male connecting portion of the oxygen mask-to-regulator comector. He checks the MC-1 oxygen cylinder assembly's bayonet connector for proper seating, ensuring it is in the "locked" position.

The jumpmaster moves to the risers. He places both hands, palms up, as close to the packtray as possible. He grasps the risers with his thumbs on top of the risers. Applying pressure upward and moving one hand at a time toward the canopy release assembly, he checks for twisted or misrouted risers. He ensures the fitting of the male-to-female portion of the canopy release assembly is secure.

With his right hand on the last item inspected, the jumpmaster places his left hand on the parachutist's right canopy release assembly. He grasps the canopy release cover and checks for spring tension. With his left hand on the canopy release cover, he inspects the left canopy release cover using the same procedures. He grasps the entire right canopy release assembly with his left hand, rotates it one-quarter turn outward, and visually inspects the seating of the male and female portions of the assembly. He repeats the same procedures with the parachutist's left canopy release assembly.

The jumpmaster grasps the rip cord handle with his left hand. He places his right hand firmly around the rip cord handle pocket and applies pressure to ensure its proper seating. He checks the tacking and routing of the rip cord cable housing with his left hand.

The jumpmaster inspects the chest strap's routing and attachment. He places his left hand on the short chest strap V-ring attached to the right main lift web. With his right hand, he traces the chest strap from the attaching point on the left main lift web to the quick-ejector snap fastener. He ensures the strap is attached to the V-ring of the short chest strap. He applies pressure on the release lever of the quick-ejector snap fastener to ensure it is locked.

The jumpmaster moves to the reserve parachute assembly and places his hands on each end of the reserve, palms facing toward the center of the reserve. Starting on the parachutist's right side, he ensures the right carrying handle is secure and a safety wire attached. Looking to the right he uses his right hand to check the left carrying handle to ensure it is secure.

Next thejumpmaster grasps the reserve assembly with both hands and raises it upward and away from the parachutist to relieve tension from the snap fastener guard. He places the index fingers of each hand on the outer edge of the snap fastener guard. He visually inspects to make sure the snap fasteners are attached to the harness assembly D-rings. He checks the snap fastener guards for spring tension.

With his left hand, he traces the reserve tie-down strap on the parachutist-k right side to ensure it is properly secured to the backpack retainer strap. With his right hand, he checks the left side reserve retainer strap for proper routing and secure attachment.

He moves his left hand (fingers closed and pahn facing toward the reserve) to the front of the reserve parachute. He inserts his fingers with a downward motion between the packtray and rip cord handle to ensure the pack opening band is not over the rip cord handle. He inserts the index finger of his left hand into the rip cord handle pocket to ensure no foreign material is present and the rip cord swage ball is intact. He inserts both index fingers under the rip cord protector flap and applies pressure away horn the container to release the snap fasteners.

Starting on the parachutist's right side of the rip cord cable, he visually and with his left hand ensures the right end flap's grommet is on top of the pack-releasing cone. He checks the first and second pins in sequence to ensure they are not bent, are filly seated, and the holes of the pack-releasing cones are free of foreign matter. He checks the left end flap's grommet to ensure it is on top of the pack-releasing cone. He secures the flap back in the closed position. He checks the proper routing and attachment of the pack opening bands. He grasps the pull tab of the right end pack opening band with his left hand and applies pressure to the pull tab to ensure it is attached. He grasps the lefl pull tab with his right hand and checks it in the same manner. He moves both hands to the bottom pull tabs and checks them one at a time.

The pack opening bands on the bottom of the reserve packtray secure the oxygen cylinder bag. The jumpmaster checks the proper routing of the pack opening bands. He opens the bag flap with his right hand and checks the oxygen cylinder gauge for an 1,800 to 2,200 psi reading. He traces and inspects the hose from its connection on the bailout bottle assembly to its attachment on the connection. He moves both hands to the top of the reserve and ensures the routing of both tip pack opening bands secure the altimeter mount. He pulls on the tabs to ensure they are secure.

Next, the jumpmaster checks the altimeter for proper setting, adjustment operation, and attachment to the altimeter mount.

The jumpmaster raises the reserve and instructs the parachutist to “hold the reserve and squat.”

The jumpmaster places both hands on the leg straps as far back toward the saddle as possible. With his fingers facing down, he traces the leg straps back toward the V-ring. He ensures there are no twists or misrouting and that the quick-ejector snap fastener is properly locked. He always ensures the kit bag is under both leg straps and that one leg strap, either left or right, passes through at least one of its carrying handles.

The jumpmaster moves to the parachutist’s left side and starts at the top. He ensures that the weapon, if carried, is slung over the parachutist% left shoulder, muzzle down and pistol grip to the rear. He ensures the weapon rides as low as possible with its butt as close to shoulder level as possible. He ensures the sling is routed over the left shoulder and under the left main lift web. He checks the chest strap’s routing through the sling. The reserve restraint strap should go over the sling and upper handguard and be secured to the backstrap V-ring.

The jumpmaster moves to the ARR. He ensures the arming pin is properly inserted into the body of the ARR. He visually inspects the reset indicator to check for proper alignment of the white reset indicators. He checks for the correct millibar setting through the access hole on the side of the pocket. He traces the power cable housing to the mounting plate and ensures its proper attachment. He inspects the power cable and withdrawal hook for proper routing and attachment to the top locking pin.

The jumpmaster then moves to the rear of the parachutist where he checks the goggles’ retainer strap on the helmet for proper attachment.

The jumpmaster places both hands, fingers up, under the risers as close to the canopy release assembly as possible. He traces their routing, one riser at a time, back toward the packtray assembly, to ensure proper mounting and that they do not contain twists. He inspects the rip cord housing cable to ensure it is properly secured to the rip cord housing clamp. He raises the rip cord protector flap and inspects the rip cord cable for hys and ensures there are no bent pins. Starting from the top pin, he physically checks the routing and the pins, then closes and snaps the rip cord protector flap. He inspects the pack opening bands on each side, one at a time, to ensure they are secured to the packtray.

Next, the jumpmaster checks the left side packtray slide fastener to ensure that it is secured. He inspects the right packtray slide fastener in the same manner. He instructs the parachutist to lean forward so that he can check the saddle for twists.

After completing the JMPI, the jumpmaster has the parachutists don any equipment with which they will jump. He inspects the equipment container starting from the front of the parachutist

The jumpmaster sees the equipment lowering line between the parachutist's legs. He checks its attachment to the equipment container harness. He checks the container harness leg straps for routing through the keepers and ensures they are not twisted. He continues checking the routing up to the quick-release adjustable buckle attached to the harness D-ring. He ensures a safety wire is inserted in the snap hook on the right side.

Then the jumpmaster moves to the right side of the parachutist and checks the attachment of the quick-release snap fastener on the lowering line to the equipment ring on the right side of the main lift web. He moves to the rear of the parachutist and checks the proper stowing and routing of the lowering line on the equipment container. He ensures all loose straps are properly stowed.

APPENDIX B

HIGH ALTITUDE RELEASE POINT CALCULATION

The effects of variable wind directions and speed must be accounted for when determining the high altitude release point (HARP) for each MFF mission. Accurate wind data is essential to calculate the HARP precisely. Commanders are cautioned against planning pinpoint landings on targets when wind data is questionable due to the source, timeliness of repoting, or other dynamic meteorological conditions (for example, thunderstorms or changing fronts). Wind will affect the parachutist during free-fall and canopy performance after deployment.

Obtaining Wind Data

A variety of sources such as military airfields, civilian airports or weather services, artillery meteorological sections, or pilot teams in the operational areas can provide wind data. Aircrew personnel can also determine wind data during flight as the aircraft passes through different flight levels. (It is not advisable to use this technique for actual infiltrations, as the data obtained en route to the objective area may not reflect conditions at the objective area.)

Recording Wind Data

The jumpmaster records the reported wind data according to altitude in feet, direction in degrees, and speed (velocity) in knots. He records the wind data for every 2,000 feet of altitude during free-fall and every 1,000 feet of altitude under canopy.

Calculating and Plotting the HARP

The jumpmaster calculates and plots the HARPs location in reverse sequence for a HALO mission (Figure B-1). First, he calculates the distance and direction from the desired impact point (DIP) to the parachute opening point. Second, he calculates the distance and direction from the parachute opening point to the preliminary release point. Third, he calculates the distance and direction from the preliminary release point (to compensate for forward throw) to the HARP.

Calculation of the HARP during HAHO operations may or may not require calculation of free-fall drift, depending upon the length of free-fall required. For HAHO missions requiring less than 2,000 feet of free-fall, the jumpmaster disregards free-fall drift.

When plotting the HARP on a map, the jumpmaster converts the wind direction from True North to a grid azimuth using the declination diagram.

Using the Wind Drift Formula and Constants

The jumpmaster uses the wind drift formula D= KAV.

D = distance in meters.

K = constant (drift in meters per 1,000-foot loss of altitude in a l-knot wind).

A = altitude in thousands of feet.

V = average wind speed (velocity).

The jumpmaster also uses the following wind drift constants (K factors):

K = 3 (parachutist in free-fall).

K =25 (MC-3 parachute system and RAPS **[HALO]).**

K = 48 (RAPS [HAHO]).

NOTE: The jumpmaster calculating the HAHO wind drift uses the constant of the least performing canopy; for example, the U.S. Navy MT1-X-S uses the S-type reserve that has a K factor of 60. Therefore, if a parachutist has to activate his reserve parachute, he will still be able to glide to the DZ.

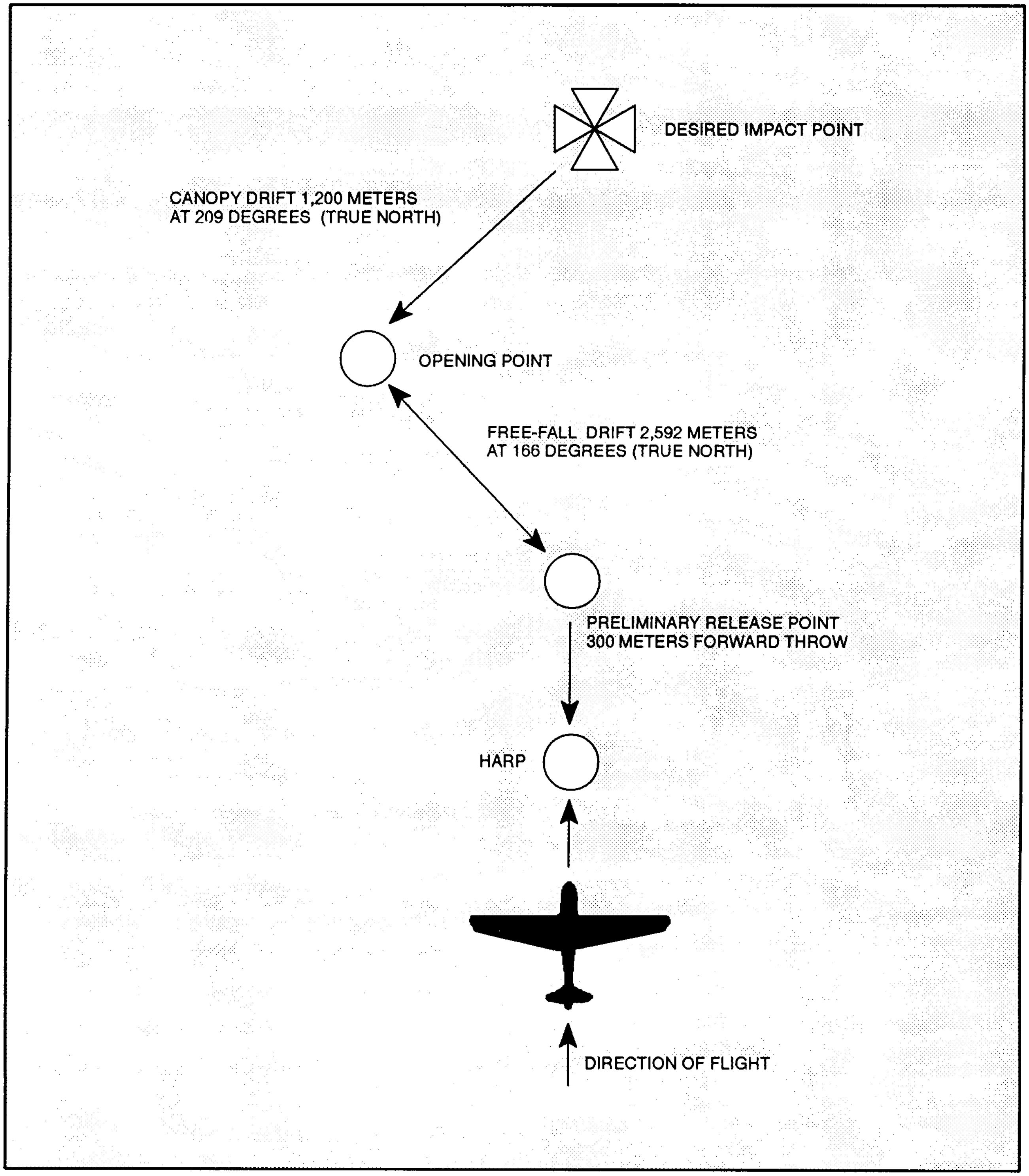


Figure B-1. Calculating and plotting the HARP for a HALO mission.

Calculating HALO Free-Fall Drift and Direction

To determine the parachutist's drift in free-fall, the jumpmaster calculates the average wind speed (velocity) and average wind direction from the exit to the opening altitude. Opening altitude (4,000 feet in this example) is not in-eluded since that is where the free-fall stops. The wind data from 4,000 feet to 1,000 feet is calculated using the canopy drift constant.

EXAMPLE: Altitude	Velocity	Direction
20,000	85	160
18,000	75	160
16,000	75	165
14,000	65	165
12,000	50	155
10,000	45	150
8,000	20	185
6,000	20	190
	435 knots	1330 degrees

The jumpmaster determines the averages by-

1. Determining the total free-fall distance from the exit (20,000) to the opening (4,000). A = 20,000-4,000 = 16,000, or A = 16.
2. Dividing the sum of the wind velocities (435) by the number of velocities (8). V = 435+8= 54.375, or V = 54 (rounded to nearest whole number) knots average wind speed (velocity).
3. Dividing the sum of the wind directions (1330) by the number of directions (8). Direction = 1330 ÷ 8 = 166.25, or Direction = 166 degrees (round to nearest whole number) average wind direction.
4. Substituting the numerical values for the letters of the D = KAV formula.

   D = (3) (16) (54)

   D = 2,592 meters at 166 degrees (True North).

NOTE If using wind directions from 315 degrees to *045* degrees to calculate the average wind direction, erroneous averages may result. To compensate, the jumpmaster adds 360 degrees to directions of 001 to 045 degrees.

EXAMPLE: Direction	Direction
345	345
350	350
345	345
010	010(+360) = 370
015	015(+360) = 370
350	*350*
1415 degrees	2135 degrees

Direction = 1415+6=235.83 or D = 236 degrees (incorrect)

Direction = 2135+6= 355.83 or D =356 degrees (correct)

Calculating Canopy Drift

To determine the parachutist's drift under canopy, the jumprnaster calculates the average wind speed (velocity) and direction from 1,000 feet to the opening altitude.

EXAMPLE: Altitude Velocity Direction

Altitude	Velocity	Direction
4,000	15	190
3,000	14	220
2,000	11	205
1,000	9	220
	49	835

(Disregard Surface Winds)

The jumpmaster determines the averages by—

1. Dividing the sum of the velocities (49) by the number of velocities (4). V = 49 ÷ 4 = 12.25, or V = 12 (rounded to nearest whole number) average wind speed (velocity).
2. Dividing the sum of the wind directions (835) by the number of direction (4). Direction = 835 ÷ 4 = 208.75 degrees, or 209 degrees (rounded to the nearest whole number) average wind direction.
3. Substituting the numerical values for the letters of the D = KAV formula.

   D = (25) (4) (12)

   D = 1,200 meters at 209 degrees (True North).

Calculating Forward Throw

Compensation must be made for the distance a parachutist's body initially travels into the direction of flight due to forward speed (velocity). The average forward throw, at normal high-performance aircraft exit speeds, is 300 meters.

Calculating Doglegs

Wind direction changes of 90 degrees or more are known as doglegs. Doglegs require separate calculations from the altitude where the wind direction changes.

Calculating the HAHO HARP

To calculate the HAHO HARP, the jumpmaster uses the modified D = KAV formula, as the intention is to maximize the linear distance traveled using the RAPS' gliding capability.

The jumpmaster uses the following HAHO gliding distance-formula:

$$D = \frac{(A - SF)(V + 20.8)}{K}$$

D = gliding distance in nautical miles (nm).

A = altitude in thousands of feet.

SF= safety factor in thousands of feet.

V = average wind speed (velocity) in knots.

20.8 = canopy speed constant.

K = 48 (canopy drift constant).

The jumpmaster calculates the safety factor. It provides a buffer area after exit to permit the parachutists to assemble under canopy and to establish the landing pattern over the DZ. For example, the element commander desires 1,000 feet for canopy assembly after exit and 2,000 feet to establish the landing pattern. The safety factor is 3,000 feet. Therefore, SF= 3.

The jumpmaster calculates the total gliding distance in nautical miles. To convert nautical miles to kilometers (km), multiply by 1.85.

When an element exits the aircraft in stick formation, the jumpmaster compensates for dispersion between the parachutists. He obtains this figure by dividing the total number of parachutists by 2 and then multiplying the result obtained by 50 meters. He plots the calculated distance back into the aircraft's line of flight. This procedure places the middle of the stick on the desired opening point.

The jumpmaster plots 300 meters back into the aircraft's line of flight to compensate for forward throw.

The following are examples of HAHO HARP calculations:

Calculating the HAHO HARP

EXAMPLE 1: HAHO HARP CALCULATION.

Situation. The exit altitude is 14,000 feet. Twelve parachutists exit the aircraft in stick formation. The element commander desires 1,000 feet for canopy assembly and a 1,000-foot arrival altitude over the DZ. Wind speed and direction at altitude are—

Altitude	Velocity	Direction
14,000	25	090
12,000	22	*080*
10,000	21	*090*
9,000	21	*090*
8,000	20	*085*
7,000	18	*080*
6,000	18	*080*
5,000	17	*085*
4,000	16	080
3,000	12	075
2,000	12	080
1,000	08	080
	210 knots	995 degrees

Jumpmaster Calculations.

The jumpmaste—

1. Determines the average wind speed. V = 210 ÷ 12 = 17.50, or V = 18 (rounded to nearest whole number) average wind speed.
2. Determines the average wind direction, D = 995 ÷ 12 = 82.91, or D = 83 (rounded to nearest whole number) degrees (True North) average wind direction.
3. Determines the safety factor is 2 (minimum).
4. Substitutes the numerical values for the letters of the formula.

   D = {12 -2) (20.8+ 18)+ 48,

   D = (10) (38.8÷ 48.

   D = 388.0 ÷ 48.

   D = 8.0 nm at 83 degrees (True North).
5. Determines the gliding distance. 8.0 nm X 1.85 = 14.80 km.
6. Determines dispersion = (12 ÷2)X 50 = 300 meters.
7. Determines forward throw. 300 meters.
8. Converts the average wind direction to a grid azimuth and plots it on the map to determine the opening point.
9. Plots the dispersion factor to determine the preliminary release point and compensates for forward throw to determine the HARP.
10. Determines the grid azimuth from the opening point to the DIP. Converts the grid azimuth to a magnetic azimuth. The magnetic azimuth is the compass heading followed to the DZ.

Calculating the HAHO HARP

EXAMPLE 2: HAHO HARP CALCULATION WITH A DOGLEG.

Situation. The exit altitude is 15,000 feet, Twelve parachutists exit the aircraft in stick formation. The element commander desires 1,000 feet for canopy assembly and a 2,000-foot arrival altitude over the DZ. A change of wind direction creates a dogleg at 9,000 feet AGL. Wind speed and direction at altitude are-

Altitude	Velocity	Direction
14,000	33	210
12,000	30	210
10,000	29	180
	92 knots	600 degrees
9,000	26	075
8,000	24	080
7,000	22	085
6,000	20	090
5,000	18	090
4,000	14	085
3,000	12	090
2,000	10	085
1,000	8	080
	154 knots	760 degrees

Jumpmaster Calculation (Below the Dogleg from 9,000 to 1,000 feet).

The jumpmaster calculates the gliding distance and direction from the DIP to the dogleg at 9,000 feet. He—

1. Determines that the average wind speed (velocity) from 1,000 feet to 9,000 feet is 17.11 or V = 17 (rounded to the nearest whole number) knots average wind speed.
2. Determines that the average wind direction from 1,000 feet to 9,000 feet is 84.44 or 84 (rounded to the nearest whole number) degrees (True North).
3. Determines that the safety factor is 3. He must remember that in a formula for a HAHO dogleg, the safety factor is 2 on the base leg and 1 on the dogleg to equal a total safety factor of 3.
4. Establishes that altitude = 9,000 feet or A=9.
5. Substitutes the numerical value for the letters of the formula.

   D =(9 -2) (20,8 + 17)÷ 48.

   D = (7) (37.8)÷ 48.

   D=264.6÷ 48=5.5 nm Xl.85=10.lkm gliding distance at 84 degrees (True North).

Calculating the HAHO HARP

Jumpmaster Calculation (Above the Dogleg from 10,000 to 14,000 feet).

The jumpmaster calculates the gliding distance and direction from 10,000 feet to the exit altitude. He—

1. Determines that the average wind speed (velocity) from 10,000 feet to 15,000 feet is 30.66 or 31 (rounded to the nearest whole number) knots.
2. Determines that the average wind direction from 10,000 feet to 15,000 feet is 200 degrees (True North).
3. Determines that the safety factor is 1.
4. Establishes that altitude = 5,000 feet or A=5.
5. Substitutes the numerical vaIue for the letters of the formula.

   D =(5 -1) (20.8+ 31) ÷ 48.

   D = (4) (51.8) ÷ 48.

   D = 207.2 ÷ 48 = 4.3 nm X 1.85 = 7,9 km gliding distance at 200 degrees (True North).

The jumpmaster converts the True North azimuths to grid azimuths. Plots the glide path from the DIP to the dogleg. Plots the glide path from the dogleg to the opening point Calculates the dispersion for 12 parachutists (300 meters). Plots the preliminary release point from the opening point. Compensates for forward throw and plots the HARP,

The jumpmaster determines the grid azimuth from the opening point to the DIP. Converts the grid azimuth to a magnetic azimuth. The magnetic azimuth is the compass heading followed to the DZ. By holding a single compass heading, the parachutist will maintain direction and follow a ctig path from the opening point to the DZ, rather than a path with distinct turns.

NOTE: The safety factor above the dogleg and below the dogleg when combined, mathematically incorporates the desired effect over the complete group.

APPENDIX C

RECOMMENDED MILITARY FREE-FALL PROFICIENCY AND REFRESHER TRAINING PROGRAM

MFF parachuting skills are highly perishable. MFF personnel maintain these skills through regularly scheduled training periods to develop the necessary degree of proficiency. Otherwise, mission capability and parachutist safety will suffer.

Proficiency

Commanders conduct oxygen training jumps below 18,000 feet MSL to eliminate the need for prebreathing. They conduct proficiency jumps as a part of other training operations, such as field training exercise or Army Training and Evaluation Programs (ARTEPs), to take advantage of available training assets. They follow a minimum program consisting of eight parachute jumps per quarter (Figure C-l). They do not plan more than four proficiency jumps for any one day. Figure C-2 depicts a suggested 30-day predeployment training program.

JUMP NUMBER	TYPE OF JUMP
1	HALO/administrative–nontactical
2	HALO/combat equipment/oxygen
3	HALO/combat equipment/night
4	HALO/combat equipment/night/oxygen
5	HAHO/administrative–nontactical
6	HAHO/combat equipment/oxygen
7	HAHO/combat equipment/night
8	HAHO/combat equipment/night/oxygen

Figure C-1. Minimum quarterly training guide.

DAY	SUBJECT	SCOPE	CLASSROOM HOURS	PRACTICAL HOURS
1	Familiarization With Free-Fall and HAHO Equipment	Review	1	
	Emergency Procedures	Review of emergency procedures, cutaway procedures, malfunction types, and emergency landings	1	
	Ram-Air Canopy Control and Characteristics	Review	1	
2	Airborne Operations	12,500 H/A-NT poised exit door 12,500 H/A-NT poised exit ramp 12,500 H/A-NT		8
3	Airborne Operations	12,500 H/CE 12,500 H/CE		8
4	Oxygen Review and Procedures	Review	1	1
	Airborne Operations	17,500 H/O 17,500 H/CE/O		8
	Night Operations	Review night airborne operations	1	
5	Airborne Operations	17,500 H/CE/O 12,500 H/A-NT/N		8
6	Commander's Time	Weather day as needed		
7	Commander's Time	Weather day as needed		
8	HAHO	Planning and organizing, formations, communications, canopy control, group leaders, emergency procedures, use of compass	2	
	HAHO Computations	HAHO formula, spotting techniques, control, NAVAIDs, DZ marking day and night, and support equipment	2	4

Figure C-2. Suggested 30-day predeployment training program.

DAY	SUBJECT	SCOPE	CLASSROOM HOURS	PRACTICAL HOURS
9	Airborne Operations HAHO	12,500 S/A-NT 12,500 S/A-NT 12,500 S/CE		8
10	Airborne Operations HAHO	12,500 S/CE 12,500 S/CE/N 12,500 S/CE/N		8
11	Airborne Operations HAHO	12,500 S/CE/O 12,500 S/CE/O 12,500 S/CE/N		8
12	Airborne Operations HAHO	12,500 S/CE/N/O 12,500 S/CE/N/O		8
13	Commander's Time	Weather day as needed		
14	Commander's Time	Weather day as needed		
15	Airborne Operations HAHO	17,500 S/CE/O 17,500 S/CE/O	8	
16	Airborne Operations HAHO	17,500 S/CE/N/O 17,500 S/CE/N/O	8	
17	Airborne Operations HAHO	17,500 S/O/N 12,500 S/CE	8	
18	Airborne Operations HAHO	12,500 S/CE 12,500 S/CE 12,500 H/CE	8	
19	Airborne Operations HAHO	17,500 S/CE/O/N 12,500 S/CE	8	
20	Commander's Time	Weather day as needed		
21	Commander's Time	Weather day as needed		
22	Airborne Operations HAHO	17,500 S/CE/O/N 12,500 S/CE		8
23	Airborne Operations HAHO	12,500 S/CE 12,500 S/CE		8
24	Airborne Operations HAHO	17,500 S/CE/O/N 12,500 S/CE		8

Figure C-2. Suggested 30-day predeployment training program (continued).

DAY	SUBJECT	SCOPE	CLASSROOM HOURS	PRACTICAL HOURS
25	Airborne Operations HAHO	12,500 S/CE 12,500 S/CE 12,500 H/CE		8
26	Airborne Operations HAHO	17,500 S/CE/O/N 12,500 S/CE		8
27	Commander's Time	Weather day as needed		
28	Commander's Time	Weather day as needed		
29	Airborne Operations HAHO	12,500 S/CE 12,500 S/CE		8
30	Airborne Operations HAHO	17,500 S/CE/O/N		8
	Review	Course review of all instruction	2	

LEGEND:

H – HALO
A-NT – Administrative-nontactical
N – Night
O – Oxygen
CE – Combat equipment (including weapon)
S – Standoff (HAHO)

Figure C-2. Suggested 30-day predeployment training program (continued).

NOTE: Commanders, remember that for safety and parachutist confidence, parachutists require a jump refresher before executing night combat equipment jumps after prolonged periods of non jumping. You may not be able to include the eight jumps depicted in Figure C-1 in the quarterly training plan; however, follow the intent of the progression where possible. For example, after a 3-month layoff, an element should make a daylight jump prior to a night combat equipment jump.

NOTE: Units can fulfill oxygen training requirements at altitudes below 18,000 feet MSL. A mission profile that is consistent with prebreathing requirements can be flown without requiring the coordination with or the presence of USAF physiological technicians. Training missions using full oxygen equipment can be flown at altitudes below 13,000 feet MSL. Flights at these altitudes would be consistent with any altitude's oxygen use requirements. These training mission profiles might occur in areas where airspace restrictions are in force or when there are not enough aircrew personnel.

Currency

Currency does not equate to proficiency. Do not consider MFF airborne operations to meet pay requirements as proficiency jumps unless the mission profile follows a tactical insertion profile. MFF jumpmaster currency standards are outlined in Chapter 11.

Minimum MFF HALO currency standards are—

- Current flight physical and an Air Force chamber card.
- An MFF parachute jump with rifle, oxygen mask, and combat equipment within the last 3 months.

Minimum MFF HAHO currency standards are—

- Current flight physical and an Air Force chamber card.
- An MFF parachute jump with rifle, oxygen, and combat equipment, with parachute opening above 10,000 feet AGL within the last 6 months.

Parachute Requalification and Refresher Training

Previously qualified MFF parachutists who, after meeting medical and USAF chamber currency requirements, do not meet the proficiency and currency requirements listed above, will undergo the following training to become requalified:

- Attend emergency procedures class and suspended harness drills.
- Attend combat equipment rigging (combat pack and weapon) class.
- Attend canopy control and grouping under canopy class.
- Perform one daylight jump without combat equipment stressing a stable exit, maintaining heading, and pulling the rip cord at the prescribed pull altitude while maintaining heading (plus or minus 500 feet).
- Perform one daylight jump with rifle and combat equipment, executing a stable exit, making a left and right turn, stopping on heading, and pulling the rip cord at the prescribed pull altitude (plus or minus 500 feet) while maintaining heading and landing within 50 meters of the group leader.
- Perform one night jump with rifle, combat pack (rucksack), and complete oxygen system, executing a manual parachute activation at the prescribed pull altitude (plus or minus 500 feet) and landing within 50 meters of the group leader.

HAHO Requalification and Refresher Training

Previously qualified MFF parachutists who do not meet proficiency and currency requirements will, after becoming current as an MFF parachutist, undergo the training outlined below. The intent of the following recommendations is to build upon the training progression listed in the previous paragraphs. In addition, the intent is to provide safe training and increase parachutist skills, ability, and confidence, culminating in a HAHO night combat equipment oxygen jump.

The parachutist performs one MFF ram-air parachute jump with combat equipment from not higher than 13,000 feet AGL with opening not lower than 10,000 feet AGL. He must land within 100 meters of the group leader.

The parachutist performs one MFF ram-air parachute jump with combat equipment and complete oxygen system with opening not higher than 18,000 nor lower than 16,000 feet AGL. He must land within 100 meters of the group leader.

Training progression continues with a daylight combat equipment jump at altitudes above 18,000 feet MSL, depending upon the availability of USAF physiology technicians. For familiarization purposes, prebreathing can still take place below 18,000 feet MSL.

APPENDIX D

SUGGESTED MILITARY FREE-FALL
SUSTAINED AIRBORNE TRAINING

Sustained airborne training must be conducted within the 24-hour period before station time of any MFF parachute operation. At a minimum, MFF sustained airborne training must consist of the jump master troop briefing, a mock aircraft rehearsal, action procedures in free-fall and canopy flight, emergency procedures, canopy entanglement procedures, and landing procedures. Figures D-1 through D-6 provide outlines of the material to be covered during sustained training.

MANIFEST CALL

Identification Cards
Identification Tags
Uniform
Rigged Equipment and Bundle Inspection
Physiological/Medical Training Currency/Military Dive Status

WARNING
Do NOT fly for a period of 24 hours after diving (AFR 50-27).

INTRODUCE ASSISTANTS AND OXYGEN SAFETY PERSONNEL

Spare Parachute Systems
Spare Altimeters

BRIEF OVERVIEW OF THE TACTICAL PLAN

CRITICAL TIMES

Weather Decision
Load Time
Station Time
Prebreathing Time
Takeoff Time
Time Over Target

MARSHALING PLAN

Location of Sustained Airborne Training
Movement to the Departure Airfield
Aircraft Parking Location
Parachute Issue Location and Time
Jumpmaster Personnel Inspection Location and Time
Joint Mission Briefing Location and Time
Rigging of Oxygen Consoles and Equipment

OPERATIONAL INFORMATION

Type Aircraft
Type Airdrop (HALO or HAHO)
Type Release (Jumpmaster-Directed Release)
Type Exit (Door or Ramp)
Number of Parachutists and Exit Sequence
Automatic Rip Cord Release Millibar Setting
Equipment Bundles
In-Flight Rigging
Aircraft Flight Information
- Flight route and checkpoints
- Duration of flight
- Drop heading, exit altitude, and airspeed
- High altitude release point

Canopy Flight Information
- Wind speed at opening altitude
- Forecasted altitude winds (direction and speed)
- Cloud layers and temperatures aloft
- Opening altitude or HAHO delay
- Heading(s) under canopy and checkpoints
- Other NAVAIDS
- Radio frequencies

Drop Zone Information
- Name and location (primary and alternates)
- Drop zone dimensions
- Drop zone markings (if used)
- Obstacles on or near the drop zone
- Forecasted ground winds (direction and speed)
- Cloud ceiling or other obscurants

Assembly Plan
- Assembly area location
- Assembly aids (if used)
- Disposition of air items
- MEDEVAC procedure

Special Instructions
- Life preservers
- Off the drop zone procedures

Figure D-1. Sample jumpmaster troop briefing.

In-Flight Rigging Procedures

Actions at the Time Warnings

Oxygen Procedures

Aircraft Procedure Signals and Jump Commands

Bundle Ejection and Control

Aircraft Exit Procedure

Automatic Rip Cord Release Arming and Disarming

In-Flight Emergency Procedures

NOTE: The jumpmaster uses field-expedient mock aircraft to conduct the rehearsal. The rehearsal is performance oriented and conducted exactly as the actual mission will occur.

Figure D-2. Mock aircraft rehearsal.

Group Procedures

- In Free-Fall
- Under Canopy

Communications (Air-to-Air, Air-to-Ground, Ground-to-Air)

- Call Signs
- Frequencies
- Time Windows
- Transponder Codes
- Drop Zone Ground Marking Patterns
- Visual Authentication Codes
- Abort Signals

Figure D-3. Action in free-fall and canopy flight.

CUTAWAY PROCEDURES

Total Malfunction

Partial Malfunction

POST-OPENING PROCEDURES

Controllability Check

Penetration and Rate of Descent

PROBLEMS/MALFUNCTIONS IN FREE-FALL

Floating Rip Cord

Hard Pull

Pack Closure

Pilot Chute Hesitation

Horseshoe

Bag Lock

Hung Slider

Riser Separation

Closed End Cells

Premature Brake Release

Broken Control Lines

Broken Lines

Line Twists

Rips and/or Tears

Tension Knots

Pilot Chute Over the Nose of Canopy

Combinations

Dual Main and Reserve Deployments

Altimeter Failure or Loss

Figure D-4. Emergency procedures.

COLLISION AVOIDANCE

ENTANGLEMENT HAS OCCURRED

Lower Parachutist Entangled, Higher Has a Good Canopy

- Above 2,000 feet AGL
- Between 1,000 and 2,000 feet AGL
- Below 1,000 feet AGL

Neither Parachutist Has a Good Canopy

- Cutaway priority
- Reserve deployments

Figure D-5. Canopy entanglement procedures.

LOWERING EQUIPMENT

RAM-AIR PARACHUTE LANDING TECHNIQUE

EMERGENCY LANDINGS

Trees

Wires

Water

LOW WIND LANDING PROCEDURE

HIGH WIND LANDING PROCEDURE

RECOVERY OF EQUIPMENT

ALTERNATE DZ LANDING

Figure D-6. Landing procedures.

APPENDIX E

JUMPMASTER PERSONNEL INSPECTION

Before each MFF parachute operation, the jumpmaster conducts a systematic inspection of each parachutist's parachute and combat equipment for proper wear, fit, and attachment. All equipment being air dropped will receive a JMPI. The JMPI can proceed at the rate of one parachutist every one and a half minutes (depending upon equipment configuration); however, the jumpmaster must never sacrifice safety for speed. Figures E-1 through E-3 contain data on the JMPI sequence.

WARNING

Improper or incomplete jumpmaster personnel inspections may result in death, serious injury, or equipment loss and damage.

OXYGEN

- ☐ Check the mask fit to the parachutist's face by seating both bayonet connectors. If correct, unfasten the fitting on the parachutist's left side so the mask hangs away from the reserve rip cord grip. Inspect the internal components for cleanliness and proper assembly. Inspect the mask body for cracks. Ensure all excess straps are stowed. Inspect the hose from the mask to the AIROX VIII for kinks, holes, and dry rot.
- ☐ Disconnect the hose from the AIROX VIII. Inspect the valve on the end of the hose disconnect for spring tension and ensure the rubber O-ring is present.
- ☐ Lift the cover of the AIROX VIII. Ensure the screen is present and free of debris. Reconnect the hose to the AIROX VIII. Ensure the AIROX VIII is locked into the oxygen block fitting. Inspect the valve on the AIROX VIII for spring tension and ensure the rubber O-ring is present. Ensure the screen inside the valve is present and free of debris. Ensure the hose fitting is tight and the spot paint dot is not broken.
- ☐ Inspect the entire length of the medium pressure oxygen hose. Ensure the hose is routed in accordance with Figure 7-7 and is not kinked. Ensure the elbow fitting is secure.

Figure E-1. Sample recommended inspection sequences for equipment checklist.

OXYGEN

- ☐ Ensure the ON/OFF valve can be locked in the ON position. Return the valve to the OFF position. Ensure the pressure gauge needle is to the right of the number "1" on 1,800.
- ☐ Ensure the waistband extension is routed through the keeper on the bailout system detachable pouch and the hook and pile tabs are secure.

WEAPONS

- ☐ Ensure the sling is routed over the left shoulder, under the main lift web, and to the outside of the chest strap.
- ☐ Ensure the weapon is rotated with the sling to the outside of the buttstock.
- ☐ Ensure the weapon tie-down is attached to the sling and to the weapon tie-down loop on the harness with a bowknot.
- ☐ Ensure the weapon is between the waistband extension and the parachutist.

COMBAT PACK

- ☐ Ensure the modified H-harness or sling and attaching straps are properly assembled.
- ☐ Ensure the attaching straps are routed to the outside of all other equipment and the quick-release snap hooks are attached to the equipment rings.
- ☐ Ensure the lowering line is attached to the combat pack, securely stowed, and the quick-ejector snap is locked onto the right V-ring.
- ☐ Ensure the combat pack shoulder straps are snug around the parachutist's legs.

LIGHTING DEVICES

- ☐ Ensure lighting devices used for night operations are securely attached and do not interfere with the manual activation of the main parachute or the performance of emergency procedures. Ensure backup lighting device (chemlite) is available for use with altimeter should the MA2-30's lighting system fail.

HAHO EQUIPMENT

- ☐ Ensure compasses and radios are securely attached and do not interfere with the manual activation of the main parachute or the performance of emergency procedures.

FLOTATION DEVICES (B-7 Life Preserver or UDT Life Vest)

- ☐ Check that CO_2 cartridges are in place and not expended.
- ☐ Ensure the pull cord is serviceable.
- ☐ Ensure the parachute harness chest strap is under the life preserver unit.
- ☐ Check flotation devices within 1 kilometer of water. Make sure the device does not interfere with the manual activation of the main parachute or the performance of emergency procedures.

Figure E-1. Sample recommended inspection sequences for equipment checklist (continued).

- ☐ Face the parachutist and ensure the harness fits properly and the canopy release assemblies are even and rest in the pockets of the parachutist's shoulders. If necessary, adjust the harness before continuing the inspection.
- ☐ Inspect the helmet for serviceability. Ensure the goggles are clear, not cracked, and do not have scratches that will obscure the parachutist's vision. Ensure the goggle straps are worn under the helmet or are secured to the helmet. Ensure the chin strap is secured.
- ☐ Ensure the right riser is not twisted and the three-ring canopy release is properly assembled. Turn the small and medium rings one-quarter turn to ensure they move freely. Ensure the nylon loop, the cutaway cable housing guide, and the cutaway cable are properly assembled and the cutaway cable excess is stowed in the channel on the riser. The nylon loop must not be twisted or frayed.
- ☐ Ensure the main rip cord handle is properly seated in the stow pocket, the two cable swages are present, the cable is not frayed, and the cable housing is tacked to the protective sleeve. Ensure the cutaway handle is properly mated with the hook and pile tape. Ensure the cutaway cables are routed into the cable housings and the cable housings are tacked.
- ☐ Ensure the chest strap is not twisted and is properly routed through the friction adapter and the excess strap is stowed.
- ☐ Inspect the reserve rip cord handle, swage, stow pocket, and cable housing tacking in the same manner as the main rip cord. Ensure that the reserve ripcord cable is routed free and clear of the reserve static line and cutaway cable housing.
- ☐ Inspect the left riser and three-ring canopy release in the same manner as the right side.
- ☐ Ensure the snap on the reserve static-line quick-release lanyard is snapped and the loop end of the reserve static line is snapped in the brass marine fitting. Ensure the reserve static line is routed free and clear of the cutaway cable housing.
- ☐ Inspect the left main lift web and ensure excess webbing is stowed and is not twisted. Repeat for the right main lift web.
- ☐ Inspect the waistband from the parachutist's right side to the left side and ensure it is properly routed through the friction adapter. If the kit bag is rear mounted, ensure the waistband is routed through both handles.
- ☐ Inspect the right leg strap for twists and ensure the snap hook gate has spring tension and is closed. Repeat for the left leg strap. If the kit bag is worn front mounted, ensure one leg strap is routed through each kit bag handle.
- ☐ Inspect the wrist-mounted altimeter for the proper setting.
- ☐ Open the reserve protective flap. Ensure the reserve rip cord housing is tacked and the reserve static-line ring is around the reserve rip cord cable in front of the fixed guide ring. Ensure the reserve rip cord cable moves freely in the cable housing.
- ☐ Ensure the reserve rip cord cable is routed to the left of the top grommet and the top rip cord pin is at a 45-degree angle to the cable. Ensure both rip cord pins are fully seated.

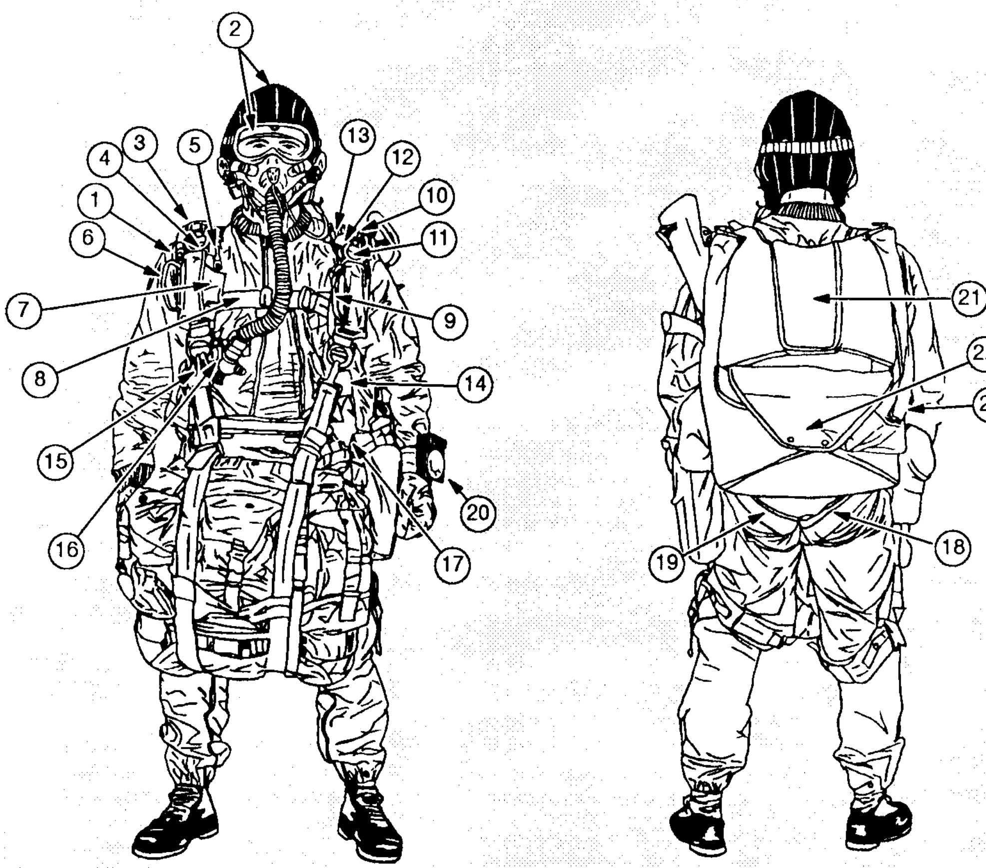
WARNING

Do not push the raised edge of the rip cord pins on top of the grommets. The pins must be fully seated with no slack in the rip cord cable between the top and bottom pins.

- ☐ Ensure the main container flaps are closed in the proper order (bottom, left, right, top). Open the main rip cord protective flap. Ensure the main rip cord pin is fully seated. Ensure the closing loop is coreless type III nylon and is not frayed. Inspect the main rip cord cable for frays and ensure the cable housing is tacked.
- ☐ Inspect the ARR hardware. Ensure the withdrawal hook is routed around the main rip cord pin between the closing loop and the rip cord cable. Ensure the knurled nut is tightened with at least three threads showing. Inspect the ARR power cable for frays and ensure it does not cross the main rip cord cable. Ensure the rubber washer is present and the ARR power cable housing locking key is attached to the stiffener plate.
- ☐ Inspect the ARR power cable housing from the stiffener plate to the ARR stow pocket. Ensure the knurled locking nut is tight. Ensure the arming pin is present and locked with spring tension. Inspect the straps and snaps that secure the ARR in the stow pocket. Ensure the white lines on the ARR reset indicator are aligned. Open the flap of the ARR stow pocket and inspect the millibar setting.

Figure E-2. Sample recommended jumpmaster personnel inspection sequence checklist.

1. Proper harness fit
2. Helmet and goggles
3. Right riser
4. Right 3-ring assembly
5. Right cutaway cable
6. Main rip cord
7. Cutaway handle
8. Chest strap
9. Reserve rip cord
10. Left riser
11. Left 3-ring assembly
12. Left cutaway cable
13. Reserve static line
14. Left main lift web
15. Right main lift web
16. Oxygen block
17. Waistband (runs behind rucksack)
18. Right leg strap
19. Left leg strap
20. Altimeter
21. Reserve pins and static line (under flap)
22. Main pin and withdrawal hook (under flap)
23. ARR (under right arm)



NOTE: Attachment of any equipment constitutes an equipment jumper. The jumpmaster inspects all equipment during the inspection of the jumper's parachute system.

Figure E-3. Jumpmaster personnel inspection (JMPI).

OXYGEN

(23) Proper mask fit

(24) Mask body and valves

(25) Delivery tube

(26) Quick disconnect and O-ring

(27) AIROX VIII valves and O-ring

(28) Delivery hose routing and connections

(29) Oxygen pressure gauge (not shown)

(30) Bailout system pouch

WEAPON

(31) Sling routing

(32) Tie-down

(33) Turned properly

(34) Under waistband

COMBAT PACK

(35) Attachment straps, hardware, and routing

(36) Lowering line routing and attachment

(37) Shoulder straps

NIGHT OPERATIONS

(38) Lightsticks (on right rear riser, right ankle, and altimeter)

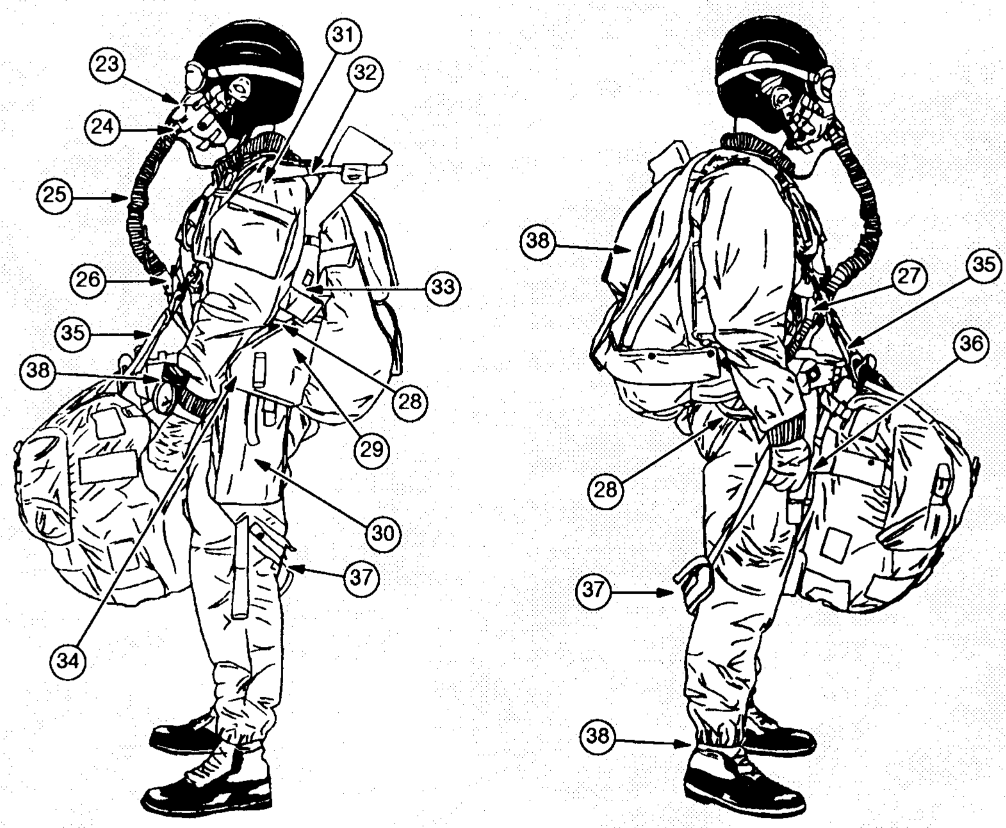
HAHO

Compass (not shown)

Radio (not shown)

OPERATIONS IN VICINITY OF WATER HAZARDS

Flotation devices (B-7 life preserver, UDT life vest) (not shown)



NOTE: Attachment of any equipment constitutes an equipment jumper. The jumpmaster inspects all equipment during the inspection of the jumper's parachute system.

Figure E-3. Jumpmaster personnel inspection (JMPI) (continued).

APPENDIX F

SAMPLE AIRCRAFT INSPECTION CHECKLIST

*Special Forces operational detachments (SFODs) primarily use USAF troop carrier aircrafi when conducting **MFF** operations and proficiency training. The preparation of the aircraft for parachute operations is an aircrew responsibility. The jump master, accompanied by the aircraft loadmaster, inspects the aircraft and coordinates any activities particular to the airborne operation (loading and placement of oxygen consoles for example). At a minimum, the jumpmaster checks the exterior and interior areas of the aircraft directly related to the airborne operation.**FM** 57-230 contains the specific items they will inspect and the peculiarities of certain aircraft Figure F-1 contains a sample aircraft inspection checklist.*

AIRCRAFT EXTERIOR
(Vicinity of the Jump Doors or Ramp)

- ☐ Projections
- ☐ Sharp Edges

AIRCRAFT INTERIOR

- ☐ Seats and Safety Belts
- ☐ Jump Caution Lights
- ☐ Cabin Lighting (if required)
- ☐ Jump Doors
  - Sharp or protruding edges
  - Door latches
  - Jump platforms
  - Air deflectors
- ☐ Floors
  - Clean
  - Excess equipment secured
  - Roller system removed or reversed
- ☐ Oxygen Equipment
  - Secured
  - Operational
  - Jumpmaster and spare console stations
  - Walk-around bottle filler stations operational
- ☐ Safety Equipment
  - Alarm bells
  - Intercom system
  - Fire extinguishers
  - Emergency exits
  - First aid kits
  - Overwater flight equipment
- ☐ Troop Comfort Facilities
  - Airsickness bags
  - Latrine/head

Figure F-1. Sample aircraft inspection checklist.

APPENDIX G

JUMPMASTER BRIEFING CHECKLIST

The jumpmaster briefs the aircrew as a part of his duties at the departure airfield. He uses the checklist at Figure G-1 to brief the aircrew.

- ☐ Free-Fall Operation Concept
- ☐ Aircrew Troop Safety Briefing (Time, Location)
- ☐ Marshaling Plan
- ☐ Drop Zone
  - Designation and Location
  - Desired Impact Point
  - Proposed HARP Location
  - Elevation
  - Major Obstacles
  - Marking/Identification
  - Strike Reports
- ☐ Flight Route/Checkpoint Warnings/Altitudes
- ☐ Drop Heading
- ☐ Racetrack (Turnoff Direction, Turnaround Time)
- ☐ Drop Altitude AGL and MSL
- ☐ Number of Passes
- ☐ Drop Speed
- ☐ Formation or Interval (Multiple Aircraft)
- ☐ Number of Parachutists/Safety/Static Personnel
- ☐ Command of Personnel Remaining on Board the Aircraft
- ☐ Time Warnings; Relayed from Crew to Jumpmaster
- ☐ Jump Caution Lights; When Turned On and Off
- ☐ Confirmation of Load/Station/TOT Times
- ☐ Aircraft Inspection
- ☐ Aircraft Configuration
- ☐ Call Signs and Frequencies
- ☐ Intercom
- ☐ Cabin Lighting
- ☐ Opening/Closing of Troop Doors/Ramp
- ☐ Aircraft Emergencies
  - Load Jettison
  - Fuselage Fire
  - Abandon Aircraft
  - Emergency Bailout
  - Crash Landings
  - Ditching
  - Rapid Depressurization
- ☐ Movement in the Aircraft
- ☐ Smoking Restrictions
- ☐ Airsickness
- ☐ Latrine Facilities
- ☐ Forecasted Weather Conditions
- ☐ In-Flight Rigging
- ☐ Oxygen Procedures
  - Pressurized/Depressurized Flight
  - Prebreathing Requirement
  - Oxygen Emergencies
- ☐ Automatic Rip Cord Release
  - Arming/Disarming Altitude
  - Activation Altitude
- ☐ Free-Fall Bundles
  - Location and Movement
  - Ejection Procedures
- ☐ Visual Jumpmaster Release
  - Spotting Procedure
  - Increments of Correction
  - Hand and Arm Signals
- ☐ Manifest

Figure G-1. Sample jumpmaster briefing checklist.

GLOSSARY

Part I. Acronyms

ADF automatic direction finding
AF Air Force
AFSOC Air Force Special Operations Command
AGL above ground level
ALCE airlift control element
ALICE all-purpose, lightweight, individual, carrying equipment
A-NT administration nontactical
ARR automatic rip cord release
ARSOC Army Special Operations Command
ARTEP Army Training and Evaluation Program
ASI additional skill identifier
AWADS Adverse Weather Aerial Delivery System

CCT combat control team
CD canopy drift
CE combat equipment
chemlite chemical light
CNO Chief of Naval Operations
CO_2 carbon dioxide

DAF departure airfield
DIP desired impact point
DOD Department of Defense
DZ drop zone
DZCO drop zone control officer
DZNCO drop zone noncommissioned officer
DZSO drop zone safety officer

ECWCS Extended Cold Weather Clothing System

FFD he-fall drift
FM field manual

HAHO high altitude high opening
HALO high altitude low opening
HARP high altitude release point
Hg mercury
HPT hook-pile tape

IAS indicated airspeed
IAW in accordance with
IP impact drift

JFC joint force commander
JMD jumpmaster directed release
JMPI jumpmaster personnel inspection

km kilometer
kts knots

LCE load-carrying equipment
LOX liquid oxygen
LPM liter per minute
LPU life preserver unit

MAC Military Airlift Command
MEDEVAC medical evacuation
MFF military free-fall
mg milligram
mm millimeter
MOS military occupational speciality
mph miles per hour
MSL mean sea level

N night

NAVAIDS	navigational aids
NAVAIR	Naval Air
NCO	noncommissioned officer
nm	nautical mile
02	oxygen
OP	opening point
OPLAN	operation plan
OPORD	operation order
PLF	parachute landing fall
PRICE	pressure, regulator, indicator, connections, and emergency equipment
PRP	preliminary release point
psi	pounds per square inch
RAPS	Ram-Air Parachute System
s	standoff
S3	operations officer
SAW	squad automatic weapon
SF	safety factor
SFOD	Special Forces operational detachment
SOI	signal operating instruction
SOP	standing operating procedure
SSI	special skill identifier
STANAG	Standardization Agreement
TA	table of allowance
TAS	true airspeed
TM	technical manual
TO	technical order
TOE	table of organization and equipment
TOT	time over target
TRADOC	Training and Doctrine Command
U.S.	United States
UDT	underwater demolition team
USA	United States Army
USAF	United States Air Force
USAJFKSWCS	United States Army John F. Kennedy Special Warfare Center and School
USSOCOM	United States Special Operations Command
UW	unconventional warfare

Part II. Definitions

***abort* -** The failure to accomplish the mission for any reason. It may occur at any point from initiation of operation to destination.

***above ground level (AGL)* -** The actual distance of the aircraft above the ground, normally expressed in feet.

***Adverse Weather Aerial Delivery System* -** 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.

***arming knob* -** The knob on the FF-2 ARR that activates or deactivates the ARR by its removal or reinsertion.

***automatic rip cord release (ARR)* -** A mechanical device designed to automatically open a parachute at a predesignated altitude.

***automatic rip cord release calculator* -** A circular slide rule type of instrument used by the jumpmaster to calculate the setting on the FF-2 ARR.

***body stabilization* -** A movement made in free-fall to attain and maintain 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.

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

correction **-** The information the jumpmaster gives the pilot in order to assist the pilot in aligning the aircraft over the release point.

crabbing **-** A movement made in free-fall to maneuver the canopy at an angle to the direction of the wind.

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

departure airfield **-** The actual location where parachutists are loaded on the aircraft and from which the aircraft departs for the DZ.

desired impact point (DIP) **-** A desired spot for parachute landings on the DZ.

dog leg **-** A term used to describe calculations when the directional difference in winds is 90 degrees or more at two consecutive altitudes.

drop time **-** The actual time parachutists exit the aircraft.

drop zone (DZ) **-** A terrain feature used as a landing area for parachutists.

drop zone safety officer (DZSO) **-** The officer responsible for the conduct of operations on the DZ.

glide **-** A position used to permit forward movement to prevent collision with other parachutists. Parachutists bring the hands toward the shoulders. They do not break the arch in their back. They extend their 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.

guide ring **-** A ring attached to the rear risers through which the control lines pass.

heading **-** The direction of flight.

holding **-** A term used when the canopy is pointed directly into the wind (as opposed to crabbing or running).

hypoxia **-** A lack of oxygen.

impact point **-** A point on the ground where the parachutist should land.

jump commands **-** The commands 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 military free-fall jumpmaster similar to that of static-line jumpmaster to ensure all safety requirements have been met.

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.

malfunction **-** A discrepancy in the deployment or inflation of the parachute that can create any faulty, irregular, or abnormal condition increasing the parachutist's rate of descent, or a condition in which the canopy is uncontrollable.

millibars **-** A unit of measurement of barometric pressure used when setting the FF-2 ARR.

nonoxygen jump **-** A parachute jump, normally below 10,000 feet, that does not require the use of oxygen equipment.

nonoxygen procedures **-** The signals given by the jumpmaster to control the action of the parachutists 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.

oxygen check - A visual check made by the jumpmaster to see that each parachutist 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 that maybe connected to an oxygen supply, allowing parachutists to operate above nonoxygen altitudes.

oxygen procedures - The procedures used by parachutists and the jumpmaster when they jump using oxygen equipment.

partial malfunction - A situation in which the canopy does not fully deploy.

physiological training - The 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 ARR to the pins, securing the parachute opening.

prebreathing time - The 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.

release point - The point on the ground over which the parachutist exits the aircraft.

reset indicator - A window on the FF-2 ARR through which the release time-delay mechanism is checked.

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

running - A technique used for 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 ARR is set to activate.

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

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.

time warnings - The warnings given by the jumpmaster, in minutes, to alert the parachutist to the time remaining before exiting the aircraft.

toggles - The nylon loops attached to lines that control the forward speed of the canopy and left and right maneuvering, mounted on the front side of the front risers.

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

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 that 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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