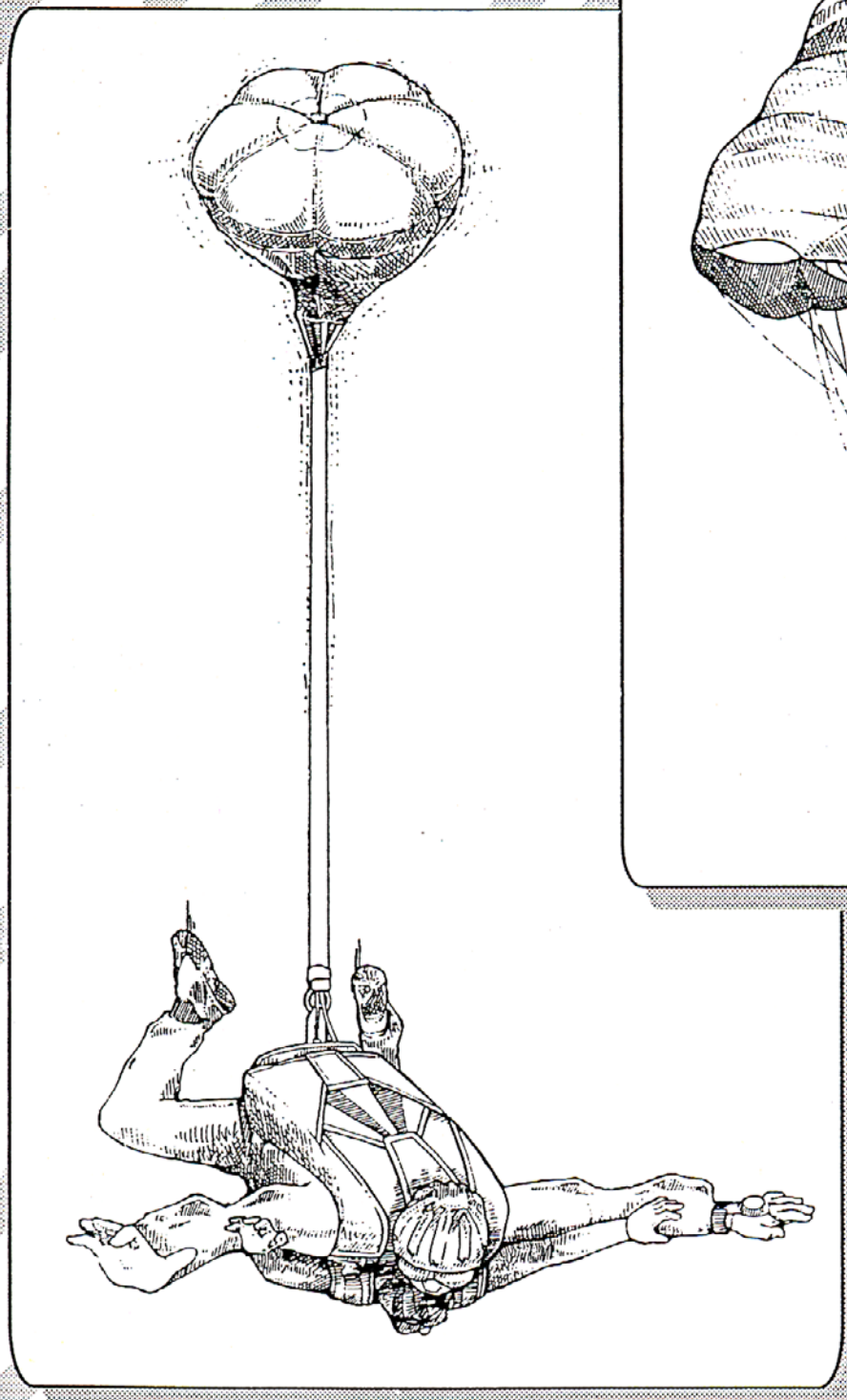

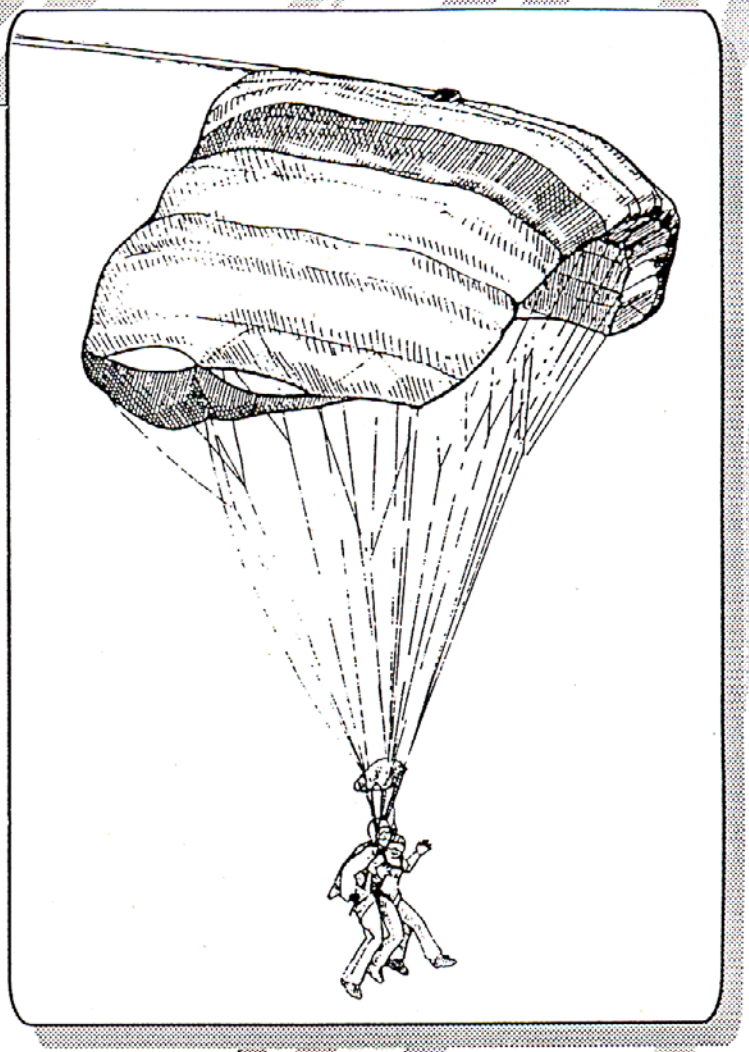

Tandem Vector Manual

Rev 0

Tandem Vector Owner's Manual

March, 1993

Rewrites and consultant: Rob Laidlaw
Illustrations / compilation: Sandra Williams

WARNING

Sport parachuting is a hazardous activity that can result in injury or death.

Parachutes sometimes malfunction, even when they are properly designed, built assembled, packed maintained and used. The results of such malfunctions are sometimes serious injury or death

The US Parachute Association estimates that there are about 30,000 skydivers in the U.S., and these jumpers made approximately 2 million jumps in 1989. The Association reported 36 skydiving fatalities that year, meaning the probabilityof dying on a skydive is approximately 1 in 55,500. It also seems that the more experienced a skydiver is, the less likely he or she is to be killed while jumping.

Experts estimate that hundreds of people are also injured. Some of these deaths and injuries are the result of equipment malfunctions.

If you use your Vector Tandem System, or if you allow someone else to use it, you are acknowledging sport parachuting's risks and accepting the fact that the Vector or its components may malfunction.

If you are not willing to accept the risks of sport parachuting, or if you aren't willing to accept the possibility that your Vector Tandem System or its components may malfunction or perhaps cause you to be injured or killed, then you may return your Vector Tandem System for a full refund beforeitisused. Details on how to do this are printed below.

Disclaimer - No Warranty

Because of the unavoidable danger associated with the use of this parachute system, the manufacturer makes no warranty, either expressed or implied. The rig is sold with all its faults and without any warranty of fitness for any purpose. Manufacturer also disclaims any liability in tort for damages, direct or consequential, including personal injuries, resulting from a malfunction or from a defect in design, material, workmanship, or manufacturing whether caused by negligence on the part of the manufacturer or otherwise.

By using this rig, or allowing it to be used by others, the buyer waives any liability for personal injuries or other damages arising from such use.

If the buyer declines to waiver liability on the part of the manufacturer, buyer may obtain a full refund of the purchase price by returning the parachute system, before it is used, to manufacturer within 30 days from the date of original purchase with a letter stating why it was returned.

Neon and fluorescent colored fabrics and tapes fade rapidly. Color brilliance may be lost within a year of manufacture. The Relative Workshop assumes no respon-sibility for this condition.

WARNING

Read this information carefully and understand it completely. Any jump that utilizes the Tandem Vector System is considered a "tandem jump': Using this system outside the student/ Tan-dem Instructor training environments considered a violation of federal law (FAA exemp&on No. 4943)

Examples of violations: demonstration jumps; stunt jumps; intentional water jumps; night jumps; jumping with any student less than 1 S years of age; any tandem jump that takes place off of a designated drop zone. (These restrictions do not apply to military Tandem applications).

the uninsured
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SECTION 1: Introduction

SECTION 2: Equipment

SECTION 3: Instructor Techniques - Normal

SECTION 4: Malfunctions & Emergencies

SECTION 5: Student Techniques, and Activities

APPENDICES

SECTION 1: Introduction

Applicant Qualifications
Course Requirements
Course Schedule/Activities
Probation
Currency Requirements
Recertification
Recurrent Training

Applicant Qualifications

Before an applicant may attend a tandem certification, the following criteria must be met:

1) Currently possess, or at one time been issued, a USPA static-line instructor, or USPA AFF jumpmaster or instructor rating. (Or the foreign equivalent)

2) Have logged at least 500 ram-air jumps.

3) Hold a current FAA Class I, II or III medical certificate. (Or foreign equivalent)

4) Hold a current USPA D license. (Or foreign equivalent)

5) Be at least 18 years of age.

6) Three years in sport.

Note: Each candidate has the responsibility to inspect the credentials of the Tandem examiner. Certification paperwork, filed by any examiner who is not a current Tandem Instructor, will be considered invalid by the Relative Workshop. *BE SURE YOUR EXAMINER IS HOLDING A VALID, CURRENT TANDEM EXAMINER LICENSE.*

Course Requirements

Each candidate is required to bring the following items to a Tandem certification course:

* USPA Expert license or foreign equivalent-valid
* Jumpmaster/instructor ratings
* FAA Medical certificate-valid
* Logbooks
* Jumpsuits (slow fall & fast fall)
* Wrist altimeter
* Goggles
* Notepad and pen
* Certification fee

In addition, it would be wise to bring along a fellow jumper who has at least 100 jumps experience to act as a Tandem passenger during some of the certification jumps.

Course Schedule/ Activities

A. Paperwork Time: 20 Min.
Fill out the applicant data on the blue "Relative Workshop Tandem Instructor Rating Form" and the yellow "Tandem Vector Training Logbook" with the required information.

B. Course Fee
Pay the required course fee to the examiner. This fee generally includes: Classroom/theory; ground-training; jump costs for the examiner and staff; and the rental of the gear to be used during the certification. The course fee does not include the candidates personal jumps or the cost of the experienced passenger who rides with the candidate during certification.

C. Classroom/Theory Time: 3-4 Hours
This portion of the course will run approximately four hours. The "Tandem Training Video" will be shown module by module with continued discussion after each module.

D. Ground Training Time: 2-3 Hours
Ground training covers: Passenger harness fitting; gear check and donning the Tandem system; hooking up the passenger; practice climb-outs, controlling the passenger's movements; exits; throwing the drogue; drogue-fall maneuvers; main canopy deployment; special features of the canopy's toggle system; landing procedures; and main canopy packing.

E. Certification Jumps

Each candidate will perform at least one solo jump with the Tandem system, or as many as necessary to become comfortable with the operation of the system. A minimum of four jumps will then be performed from the Tandem Instructor position. On at least one of these jumps, the candidate must ride in the passenger position, wither with the examiner or an appointed Tandem evaluator.

The record of each certification jump will be logged on the blue sheet and yellow logbook. The examiner will observe/ critique the packing of the main canopy, and issue the candidate instructions for the next jump.

The number of certification jumps that must be made by each candidate during the course will depend entirely on the performance level during the first five jumps. It is up to the examiner's discretion as to whether the candidate should make additional jumps to qualify. In some situations, the examiner may recommend that the candidate withdraw from the course due to poor performance/skills or bad judgment, etc..

If the candidate is successful and has completed the certification course, the examiner will file the necessary paperwork with the Relative Workshop. The candidate will retain the yellow logbook and continue to log future jumps until the minimum 25 probation jumps have been completed.

The course examiner will inform the Relative Workshop of any candidate who fails to complete the course and the reasons for the failure.

PROBATION

As outlined in the yellow "Tandem logbook," the probation period will be in effect for a minimum of 25 jumps. The first 5 jumps are for certification. The remaining 20 jumps are divided into 3 sections, each with its own special guidelines. Refer to the Tandem Vector Training Logbook for specific guidance.

The logbook, when complete, must be verified by a Tandem examiner or a Tandem rig owner. If the applicant is a Tandem Vector owner, then he must submit to the Relative Workshop a video tape of at least 3 of the final 10 probationary jumps along with the training logbook.

The TM must send the logbook and license fee to the Relative Workshop, whereupon an official Tandem Instructor license will be issued.

CURRENCY REQUIREMENTS

In addition to yearly recertification, Tandem Instructors are expected to maintain currency during the yearly recertification period.

A. If any currently rated Tandem Instructor has not made a Tandem jump in the preceding 90 days, he must make one Tandem jump with an experienced jumper acting as a passenger before taking a student passenger. The experienced jumper/ passenger must first be briefed on how to respond to Tandem emergencies.

B. If any currently rated Tandem Instructor has not made a Tandem jump within the last 180 days, he must complete recurrent training before taking a student passenger.

RECERTIFICATION

Renewal Procedures: Tandem Instructor ratings must be renewed every year.

To apply for the renewal of your Tandem Instructor rating, you must have made at least 25 Tandem jumps within the preceding 12 months, at least three of which have been made within the preceding 90 days.

If you have fulfilled the above requirement, you need only:

1) Have a Tandem Instructor Recertification form verified and signed by either a Relative Workshop Tandem Vector owner or Relative Workshop Tandem Examiner, and

2) Send the endorsed form and the license fee to the Relative Workshop. As soon as the applicant has mailed the renewal form and the check to the Relative Workshop, the rating is considered renewed; you do not have to wait for the response by the company, though you are required to keep a copy of the form to prove your currency.

If you have not fulfilled the above requirements, you must take recurrent training.

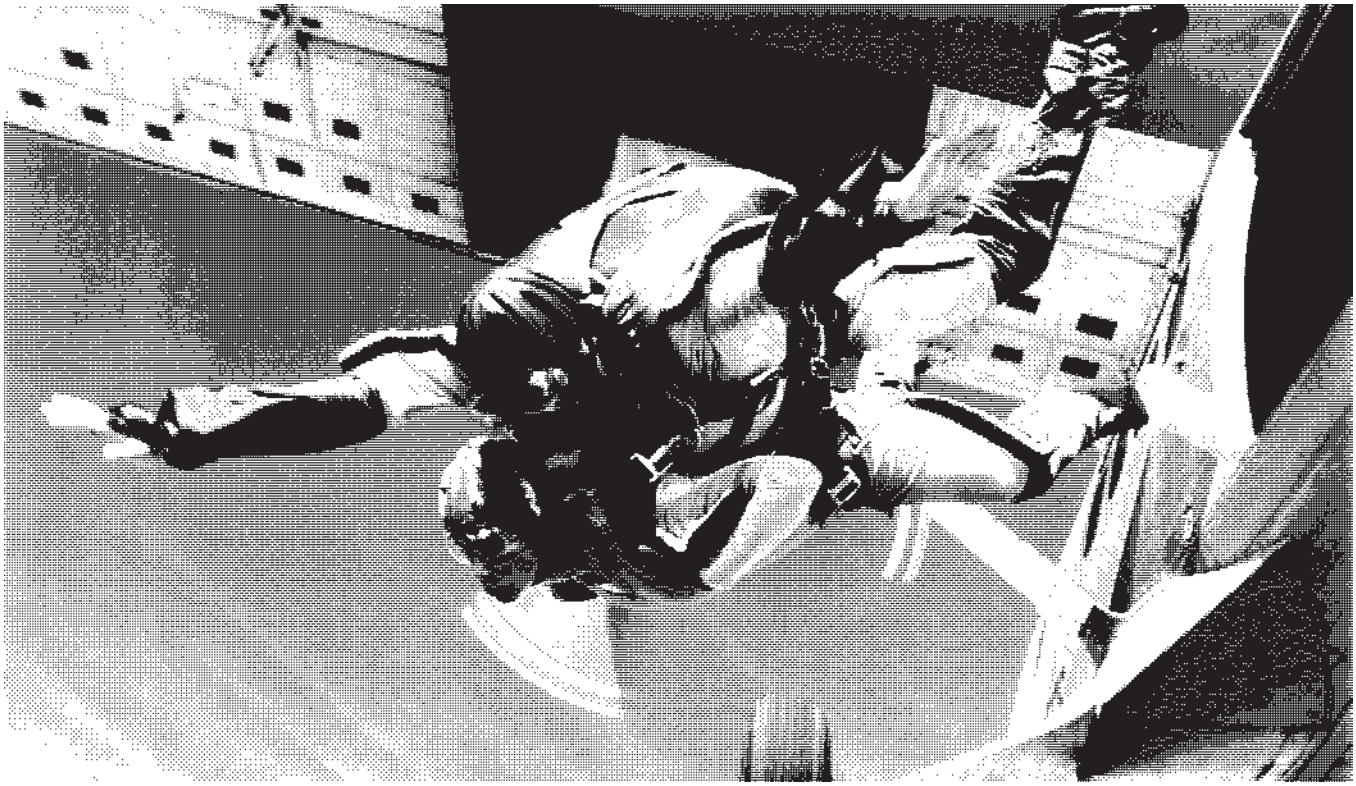
Recurrent Training

Recurrent Training consists of one solo drogue jump and one Tandem drogue jump with an experienced passenger. During the Tandem drogue jump, the applicant must make a stable exit from at least 10,500 feet, with drogue deployment within 10 seconds and opening by 4,500 feet. Applicant must demonstrate the ability to control heading during drogue-fall by making at least two opposite 360-degree turns. Applicant must also perform dummy ripcord pulls to both drogue release handles and the reserve ripcord. Landing must be stand-up (wind permitting) within 50 meters of the target.

These two jumps must be witnessed and signed off by a Relative Workshop Tandem rig owner or Relative Workshop Tandem Instructor Examiner. (If you are an owner or an examiner, you can sign yourself off).

Foreign Tandem Ratings

Foreign tandem ratings alone are not valid in the United States of America. A foreign national wishing to perform tandem jumps in the USA must possess the original Relative workshop tandem rating. In the future, USPA will also offer a tandem rating in conjunction with tandem manufacturers.



SECTION 2: Equipment

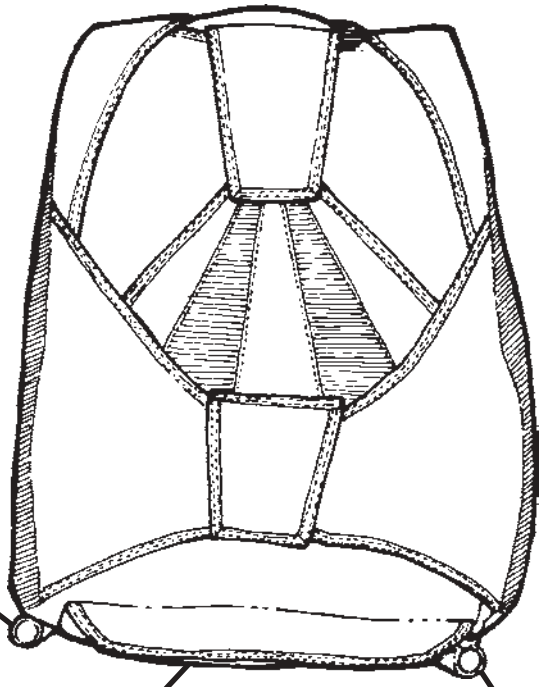
In this section the Tandem system and related components will be introduced. The following subjects will be covered. Familiarize yourself with each of them:

Description
Operation
Main Packing
Installation of secondary drogue release
Tandem Vector reserve packing instructio

Chapter 1: Description

A detailed description of the Tandem system's special components will be broken down into these areas:

Harness and container
Passenger harness
Main Canopy



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Drogue release handle:
Left hand pull, bottom of main container. Orange plastic handle with velcro retainer and cable. Pull of approximately 6" will release drogue.

Drogue pouch:
Spandex construction, elastic reinforced opening. Pouch holds drogue chute and Kevlar bridle

Drogue deployment handle:
Right hand pull, located on bottom of main container. Orange plastic handle attached to top of drogue.

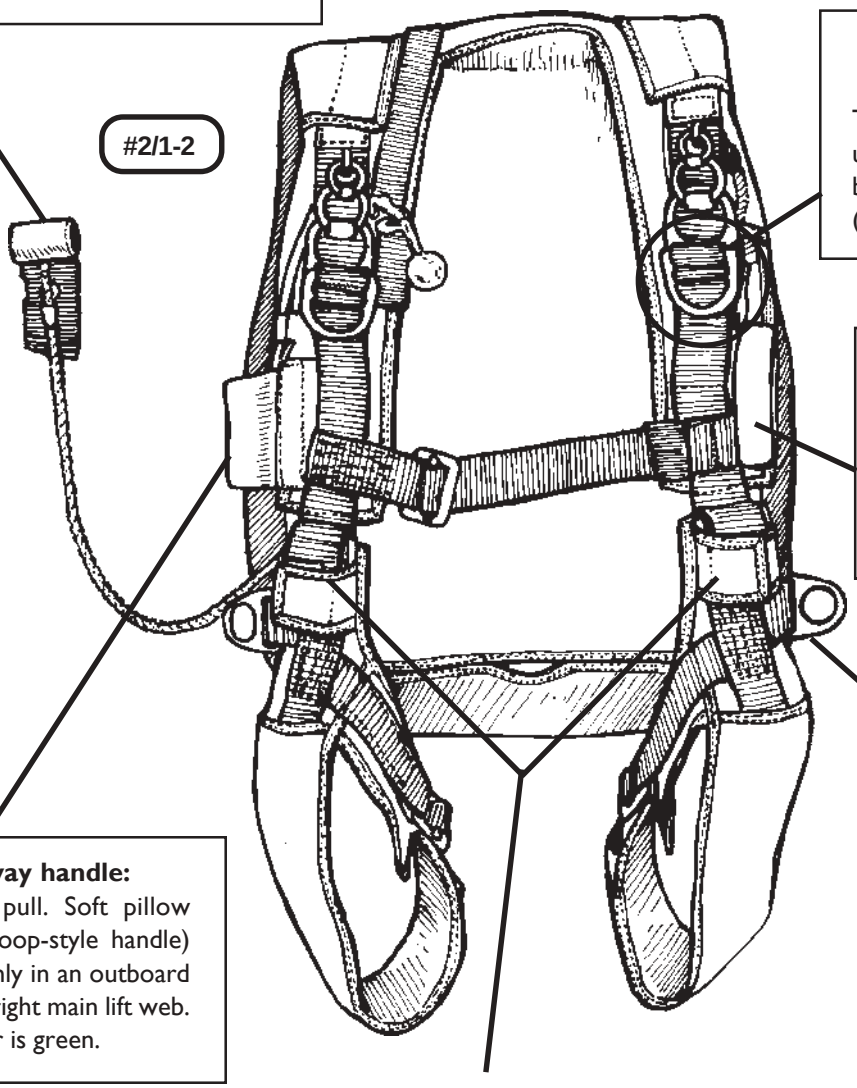
Harness and Container

Auxiliary reserve ripcord/Reserve Static-line Lanyard (RSL) — Dual Purpose

A. Auxiliary reserve ripcord: Right hand pull. Ball handle on reserve static line next to 3-Ring on right hand side of rig. To be used if left hand is incapacitated in any way, and unable to pull reserve ripcord. Ball must be pulled straight up to release RSL connection and initiate reserve activation.

B. Reserve Static-line Lanyard (RSL):
RSL can be released prior to landing in the event of high ground winds.

Auxiliary right hand drogue release handle:
Optional equipment. Right hand pull. Orange plastic handle which can be attached to either the student harness or the Tandem Instructor harness.



Top student attachment points:
Two D-rings mounted inverted under the large harness ring on both sides of the main lift web (MLW).

Reserve ripcord:
Left hand pull. Either a webbing loop handle (or soft pillow handle) attached firmly to the left main lift web in an outboard position. Handle color is red

Cutaway handle:
Right hand pull. Soft pillow handle (or loop-style handle) attached firmly in an outboard position on right main lift web. Handle color is green.

Bottom student attachment point:
Consists of two RW-7 rings mounted sideways, threaded through each diagonal on the left and right sides.

Main lift web adjustment point:
Webbing is lengthened or shortened through a pair of three bar adapters. Velcro covers are used to retain excess webbing.

Passenger Harness:

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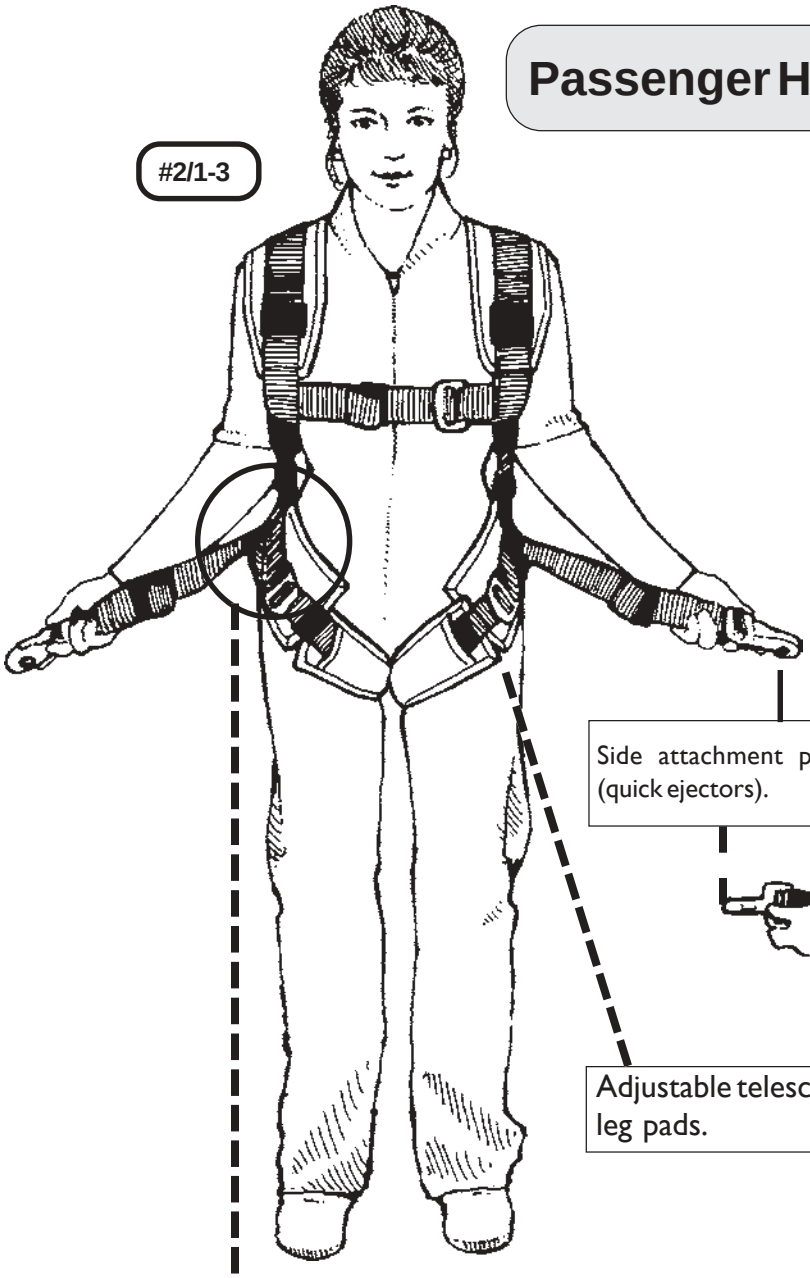
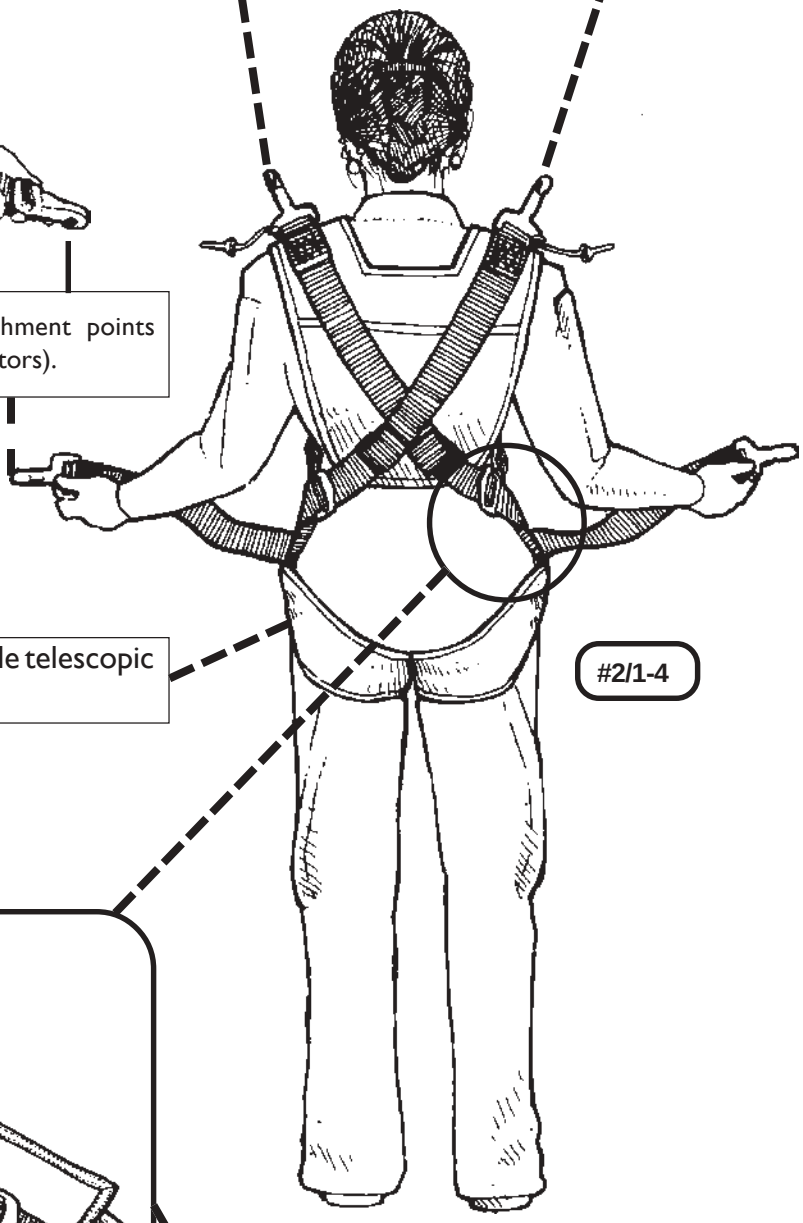


Top attachment points (snaps and safety pins).

Side attachment points (quick ejectors).

Adjustable telescopic leg pads.



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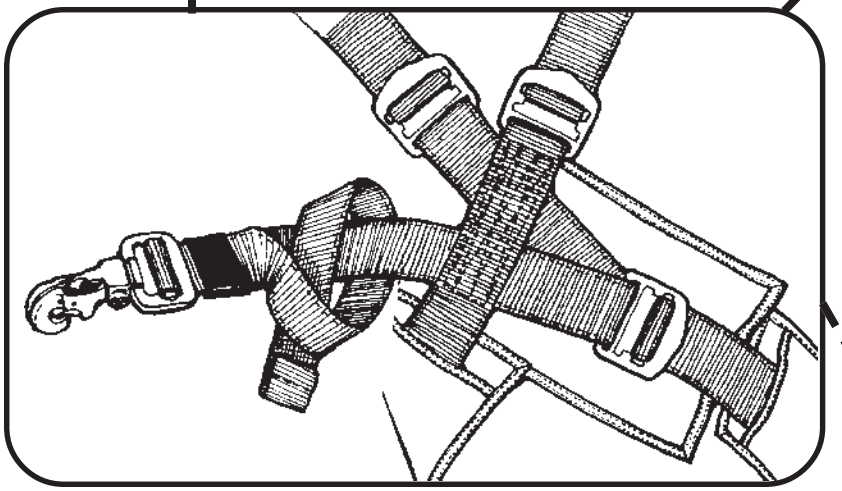

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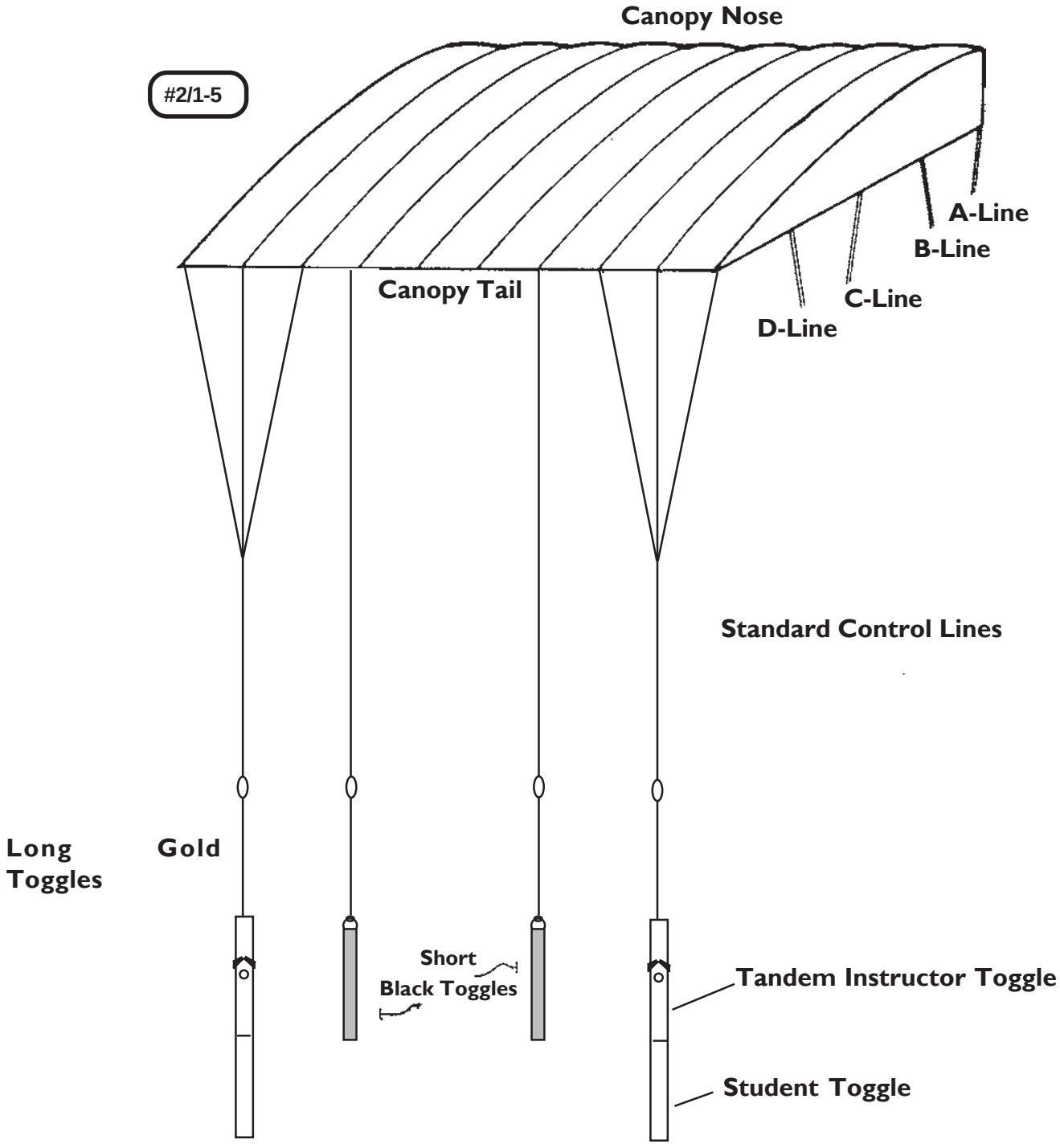
Adjustable main lift webs, leg straps and rear diagonals, using spring-loaded, non-slip adjusters

The Main Canopy

Line group identification

Steering line identification:

There are four steering lines on each side of the canopy. Unlike most canopies, they are attached at the full cell junctions, rather than at the half cell point.



Chapter 2: Operation

NOTE: This section will explain the special operational requirements of the different components on the Tandem Vector. The components which will be explained are:

Main Activation
Reserve activation
Canopy brakes and steering system

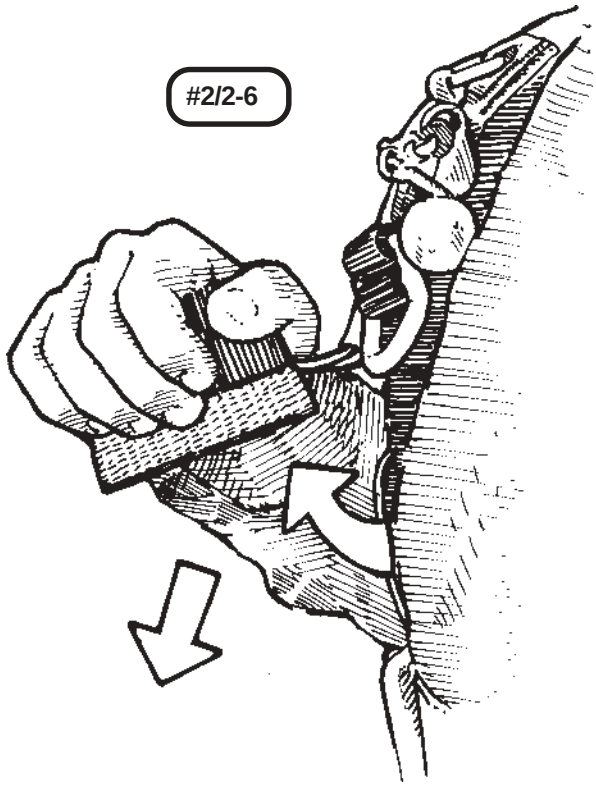
The Tandem Vector is a very different system from any sport skydiving system. There are more handles on the Tandem Vector, and they are all in different places. In particular, the reserve and cutaway handles are mounted outboard (otherwise they'd be blocked by the student). Because of this, no amount of jumps on solo sport gear will prepare a jumper for the Tandem Vector.

Every Tandem Instructor, no matter the number of jumps, must practice reaching for handles (especially the reserve) repeatedly on the ground and in the air. It is further recommended that the Tandem Instructor reach in and touch both drogue release handles and the reserve ripcord handle during droguefall on each and every jump. This will help with memorization of exact locations and assist the Tandem Instructor in identifying problems while there is still plenty of time to deal with them. (See fatality reports.)

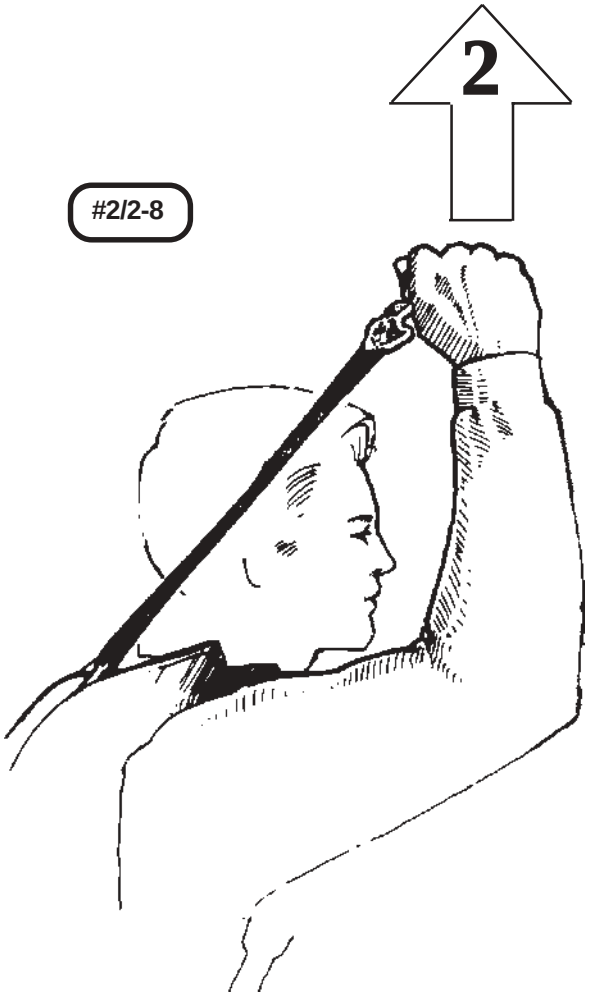
Reserve activation:

A. Cutaway and reserve handle practice
B. Reserve static line-reserve activation procedures

A. Cutaway and reserve handle practice:
The reserve and breakaway handles are in slightly different positions and are more securely held in place than on solo rigs. Therefore, it is mandatory that each Tandem Instructor practice several handle disengagements on the ground. Please note that the handles peel away easily in certain directions but are much harder to pull in others.



For an easy pull, the reserve and breakaway handles must be peeled upward and outward and THEN pulled down. This technique MUST be practiced on the ground so you will not be surprised in a real emergency.



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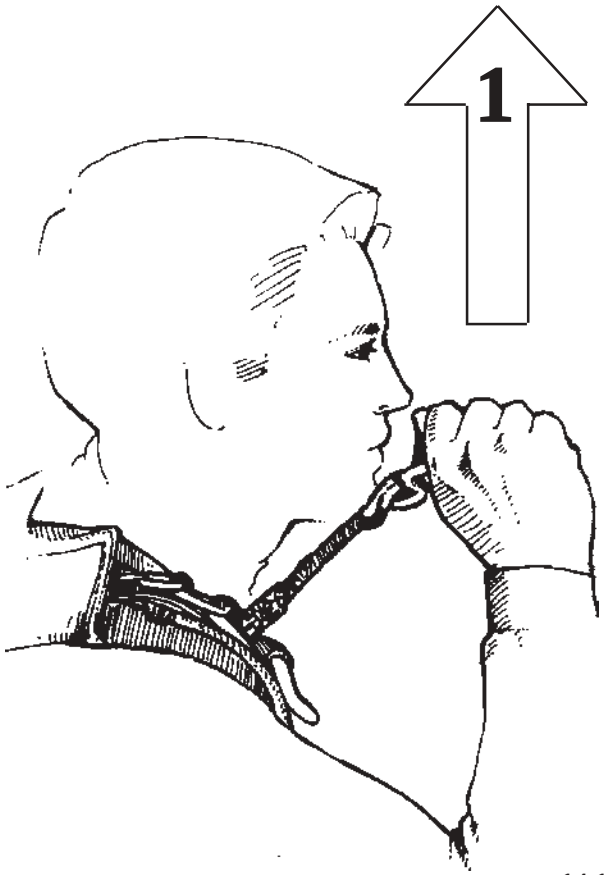
The reserve handle/pocket configuration was chosen because conventional D-handles are easily knocked out of their pockets; especially when mounted out-board. While a floating handle on a solo rig may be fairly easy to find and pull, the same task is considerably more difficult on a Tandem rig. In Tandem, the student's body is directly in the way, meaning it is very difficult to see any handle, and even harder to reach across for anything.

B. Reserve static-line/reserve activation procedures: Also note that the reserve static line lanyard will double as a right-hand-pull reserve ripcord. If a Tandem Instructor's left arm were to be injured, or otherwise incapacitated, it would be very difficult to pull the regular reserve ripcord - since it is on the left side. The reserve static line lanyard is on the right, and thus serves both as a static line and a reserve ripcord. To activate, pull the plastic ball straight up past your head. Do not pull down; this puts the velcro in shear and may be impossible to pull completely.



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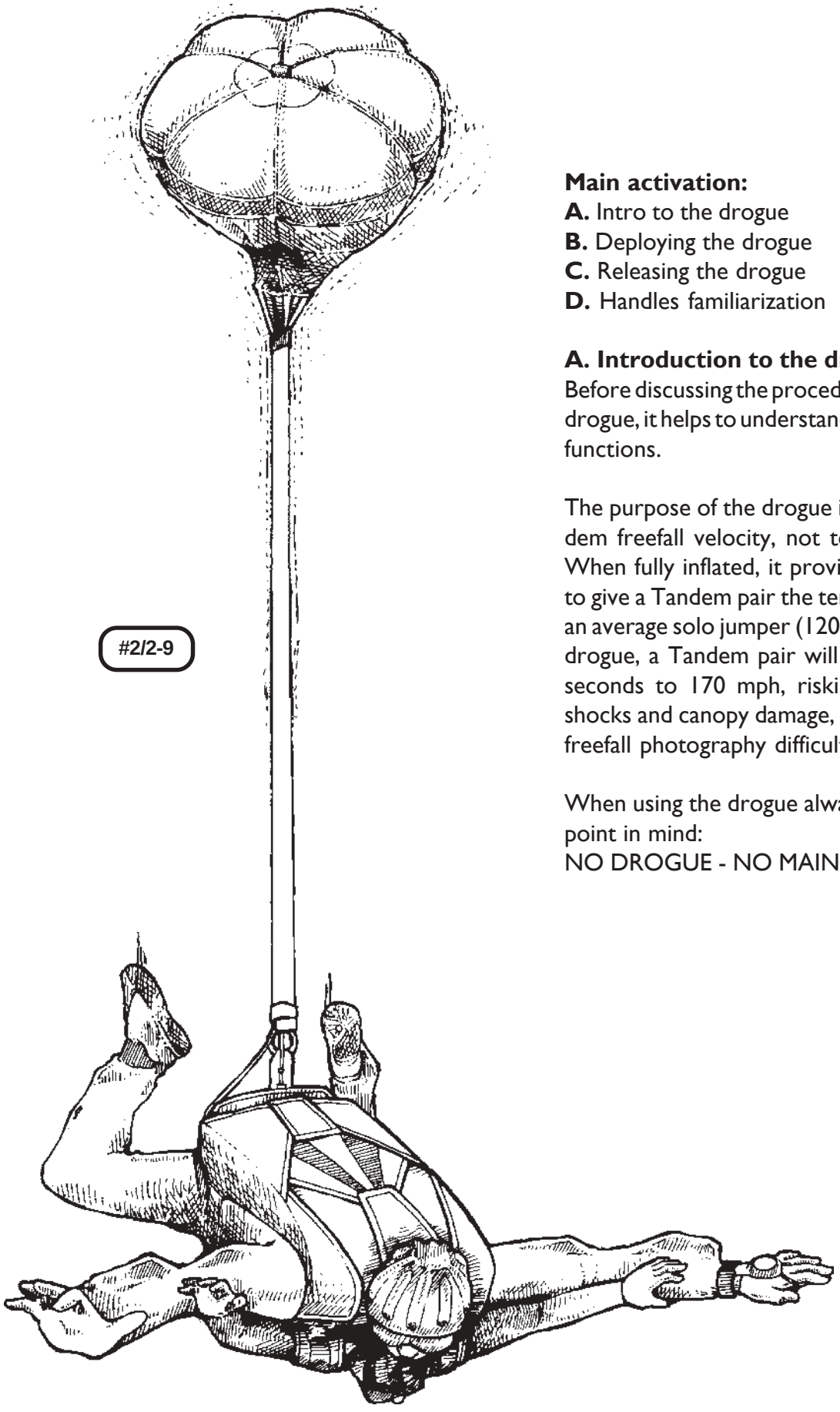

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Main activation:
A. Intro to the drogue
B. Deploying the drogue
C. Releasing the drogue
D. Handles familiarization

A. Introduction to the drogue:
Before discussing the procedures for using the drogue, it helps to understand how the drogue functions.

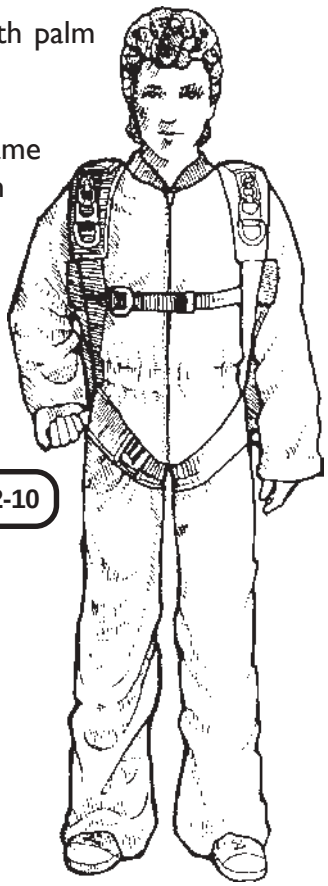
The purpose of the drogue is to reduce Tandem freefall velocity, not to aid in stability. When fully inflated, it provides enough drag to give a Tandem pair the terminal velocity of an average solo jumper (120 mph). Without a drogue, a Tandem pair will accelerate in 18 seconds to 170 mph, risking hard opening shocks and canopy damage, as well as making freefall photography difficult.

When using the drogue always keep this one point in mind:
NO DROGUE - NO MAIN!!!

B. Deploying the Drogue

1) Reach for the handle with palm forward and thumb out.

2) With the hand in the same position, take a firm grip on the handle or drogue canopy just below the handle. Be careful not to stick a finger in the hole of the handle as your thumb or finger may be injured upon deployment.



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4) Deploy the drogue with one continuous motion of the arm: Pull the drogue out in a sweeping arc, as your arm reaches its fullest extension at shoulder height, throw the drogue at the finish of the arc.

Do NOT hold onto or wave off with the drogue. The bridle is very long and may cause problems if allowed to deploy before the drogue.

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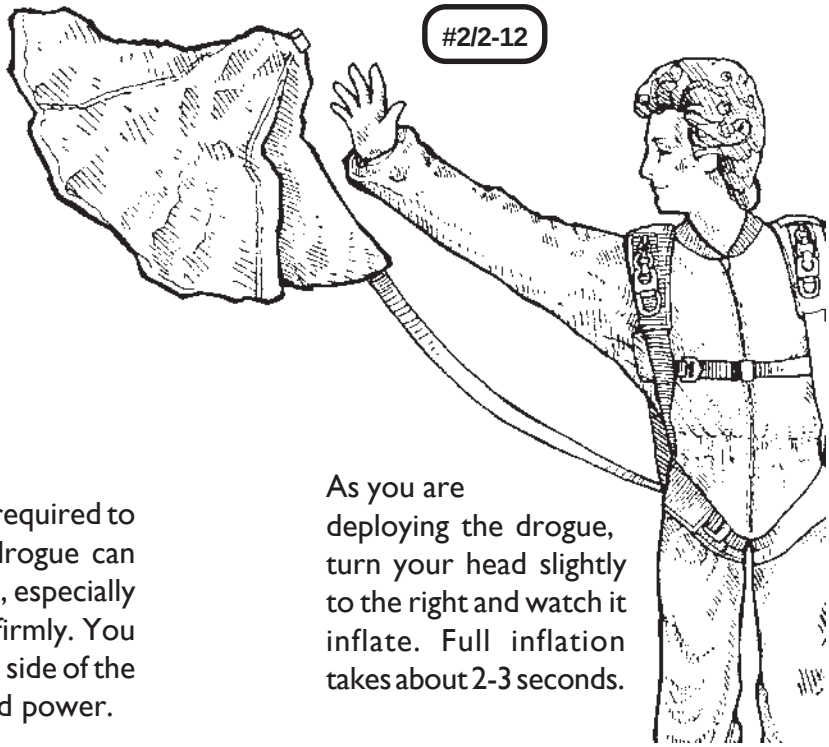
3) The force required to extract the drogue can be substantial, especially when the pouch is new, so grip and pull firmly. You may need to place your elbow against the side of the rig and use the leverage gained for added power.



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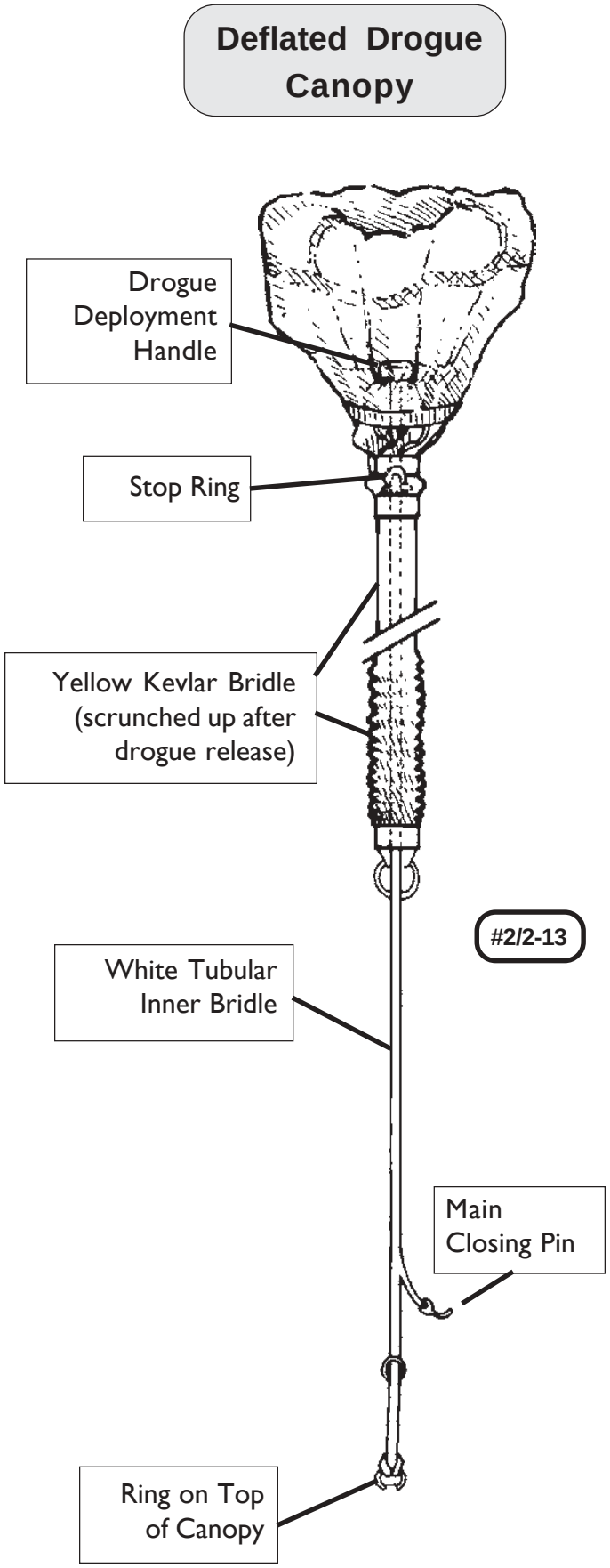
As you are deploying the drogue, turn your head slightly to the right and watch it inflate. Full inflation takes about 2-3 seconds.

C. Releasing the drogue:

1) Left side release handle:
Locate and pull drogue release handle with your left hand. The handle releases easily with a travel of about 6 inches.

2) Right side release handle:
Locate and pull drogue release handle with your right hand. The handle will require slightly more force to pull than the left handle due to the length of the housing.

When either drogue release handle is pulled, the kevlar outer bridle is released, but the tubular nylon inner bridle remains attached to the curved locking pin and your canopy. This causes the drogue to partially collapse by pulling its apex down to its base. In this partially collapsed configuration the drogue exerts enough drag to deploy the main canopy in a normal manner. (If the drogue was not partially collapsed, it would exert high loads on the main, possibly causing hard openings and canopy damage, as well as creating excessive drag behind the gliding canopy.)



D. Handles familiarization:

Prior to continuing, let's stop here and practice locating and pulling the handles.

Start by gearing up and practicing extracting the drogue and releasing the drogue release handle. This should be done both in the standing and prone positions. Alternate the use of both the left and right drogue release handles each time you throw the drogue.

Practice the pulling of these handles with the main in the container and the main OUT of the container. The sensations of locating and pulling the drogue and drogue release handles are slightly different in these situations. If you ever experience an accidental main container opening prior to either handle being released, the preparation of pulling these handles with the main out will be invaluable.

Now let's continue with the emergency systems.

NOTE: It may be helpful to substitute the handles with mock handles or have a rigger place temporary pins in to close the reserve so that both the reserve handle and auxiliary reserve handle can be pulled during practice.

Perform a thorough emergency drill, locating the cutaway handle and reserve handles, pulling the cutaway and then pulling the reserve handle. Perform this drill enough times to ensure that the movements become a natural reaction. Remember to peel and pull the handles correctly (see pg 11 reference to pulling handles up - not against velcro).

E. Vertical suspended harness drills:
After you have performed the above described emergency drills, have a partner act as a student and suspend yourselves in a hanging Tandem harness. Repeat the emergency procedures enough times to ensure that the movements become natural and instinctive. Take note of the different positions of the handles while in a suspended mode. (Statistics have shown that the Tandem Vector's most common malfunction mode is a typical main canopy malfunction where the control lines are entangled with the rear riser lines with a possible slider hang up. This problem can be avoided by proper packing, maintaining good line tension throughout, and the use of proper stow bands to prevent line dump.)

DO NOT TAKE THIS DRILL LIGHTLY. If you should ever experience a malfunction, this practice will give you the skills needed to deal with the problem effectively.

Once you are comfortable with the normal reserve procedures, perform the same exercise using the auxiliary reserve/RSL handle. Remember to pull straight up with the ball. Be careful not to stretch the small ring. (see page 12).

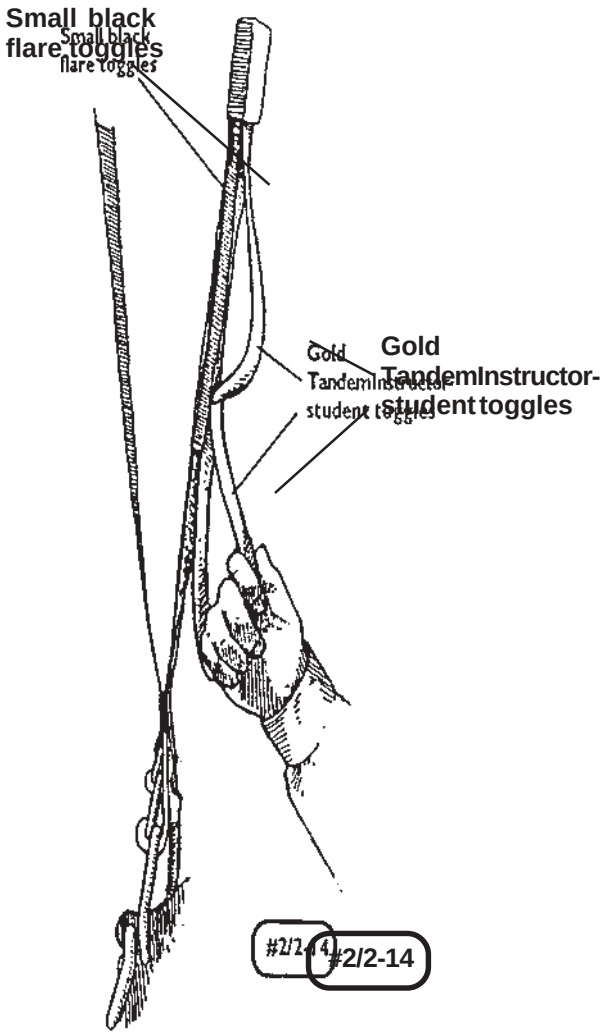
By ordering an extra pair of Tandem main risers and toggles, one can easily setup a training harness with an actual Tandem system. Remove the entire main canopy assembly (from risers to drogue) and suspend the system using the extra pair of risers. To prevent excessive wear of the Tandem system, order or produce your own training harness to be used exclusively for training and recurrency work.

Canopy brakes and steering system:
A. Deployment brake release
B. Double brake system
C. Toggles familiarization

A. Deployment brake release:

1) Grasp main steering toggles and pull outwards away from the riser, unsnapping the toggles. Use the student toggle position during brake release.

2) Pull toggles down to release the brakes. Do not pull on the small black flare toggle - leave it attached to the riser.



B. Double brake system for the Tandem Vector canopy.

The Relative Workshop Double Brake System is an innovation in the steering line set up on Tandem systems that provides reduced toggle pressure and faster turns during normal flight while at the same time producing extra stopping power in low wind conditions.

As shown in Illustration #2/1-5 on page #10, there are four steering lines (360 & 421 models) on each side of the canopy, (and five steering lines on the 500 model). Unlike most canopies, the lines are attached at the full cell junctions, rather than at the half cell point. When so much of the canopy tail is pulled down for landing, it makes for an exceptional flare, and therefore, a softer landing. For normal flight and turns, the inside lines are not needed. In fact, they are a hindrance during turns, increasing toggle pressure, and slowing turn rate. To deal with this situation, the double brake system has been set up so that the inside "extra" lines are used only during the flare for landing.

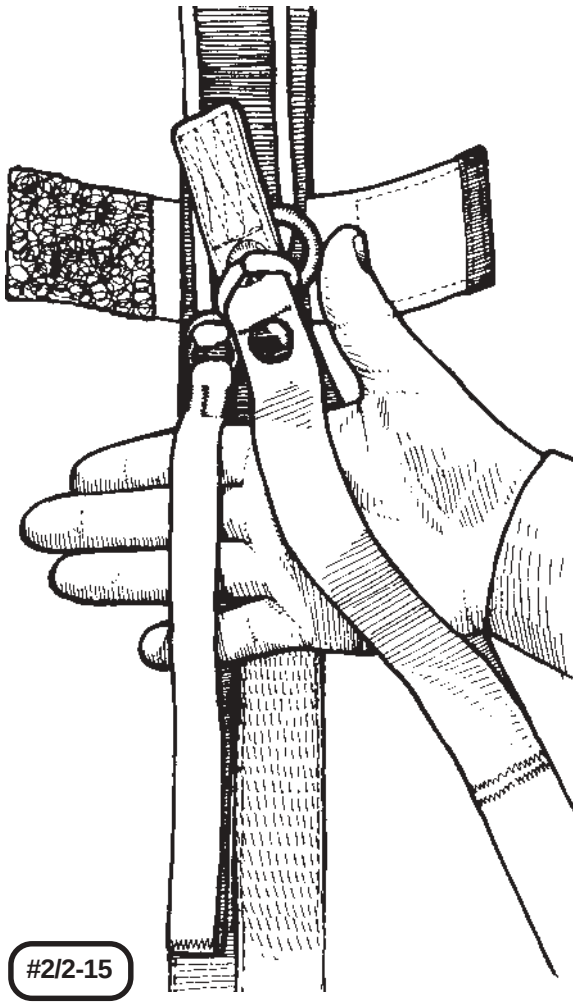
C. Operation:

During main canopy opening, reach up and grab the right and left gold, lower passenger toggles only (do not touch the black flaring toggle). Peel the toggles in a rearward direction for easy toggle and brake release. If toggles are pulled straight down, their release will be difficult or impossible due to the amount of velcro and the additional snap holding them in place.

For normal flight, from opening altitude down to approximately 300 feet, use only the gold toggles. Prior to landing, reach up and take the black flaring toggles by inserting four fingers and closing your grip. Now you are ready to land. The black toggles lay flat and may be difficult to access quickly. We recommend that sometime during main canopy flight, that the black toggles be peeled off the velcro and then reattached so the loop opening is easier to access later when needed.

D. Toggles familiarization:

Stop at this point and practice the release of the brakes and the set up of the "Double Brake System". Practice by releasing the toggles and brakes as well as reassembling them. Do this with the rig outstretched on the floor as well as with a suspended harness if available.



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Chapter 3: Main packing

This section will be broken down into the following:
Preparation for packing
Inspection
Packing sequence (Refer to Relative Workshop Tandem main packing video.)

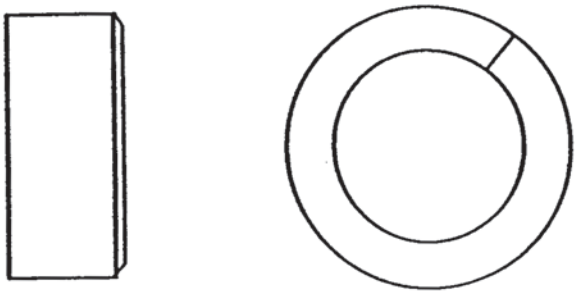
Preparation for packing:

A. Stow bands
B. Double drogue release loop
C. Drogue release handles repositioned

A. Selecting the Proper Stow Bands

Band types for:
1) All Dacron lined canopies:

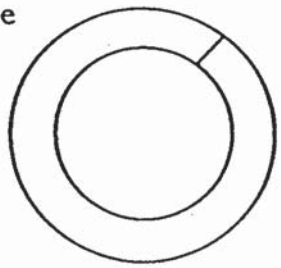
Tandem tube stows



Stow band shown actual size

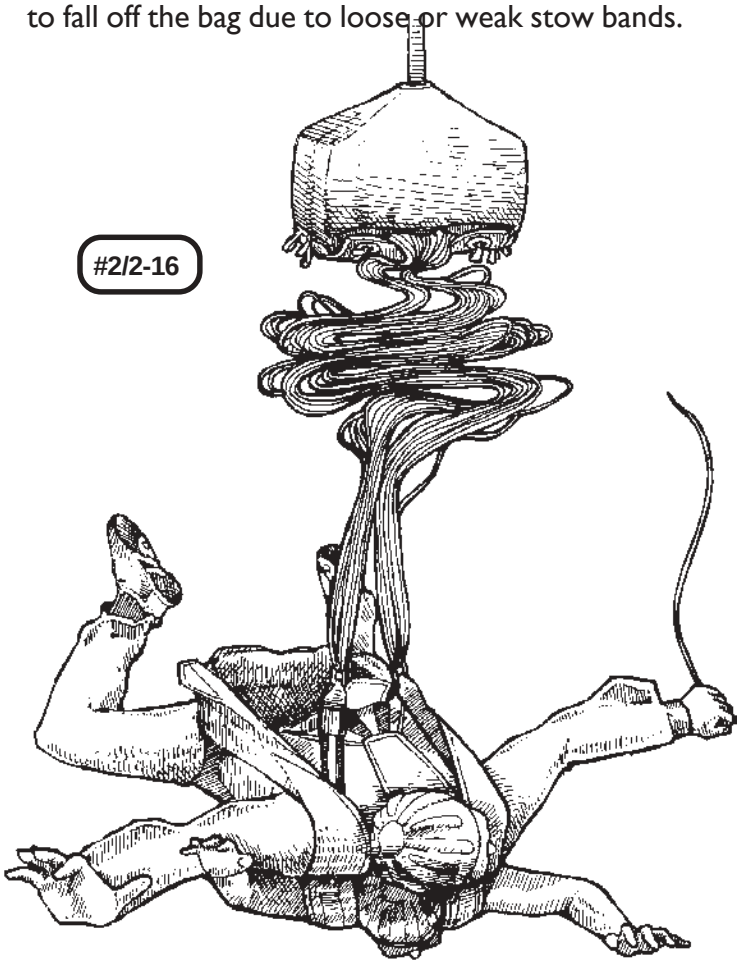
NOTE: If you run out of all specialized Tandem rubber bands, it is possible to use two regular rubber bands for each line stow. Be sure the combined width of the two rubber bands does not exceed 3/4 inch in width. Any substandard bands should be replaced with Tandem bands as soon as possible.

2) Microline:
Special Tandem Microline tube stows



2) Line Dump

Definition: During bag lift-off, the rapid acceleration of the main bag can cause the entire line stow group to fall off the bag due to loose or weak stow bands.



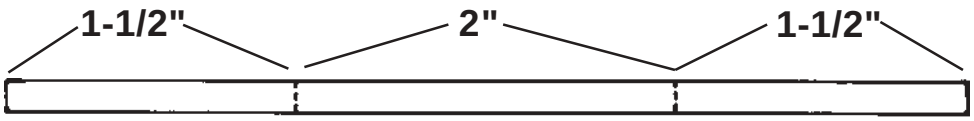
The stow bands used on the Tandem Vector are very important. Even more so than sport rigs, as the Tandem main bag is lifted out of the container at a more rapid rate. The Tandem Vector must have the suspension lines securely stowed. Be cautious of bands which are too weak or stretch too much as they can cause deployment problems. Because of the increased weights involved in carrying two people, the forces on the bag at deployment time can be enough to cause line dump if the bands are not tight enough. On the other hand bands that are too tight may cause problems disrupting the even sequencing of the deployment.

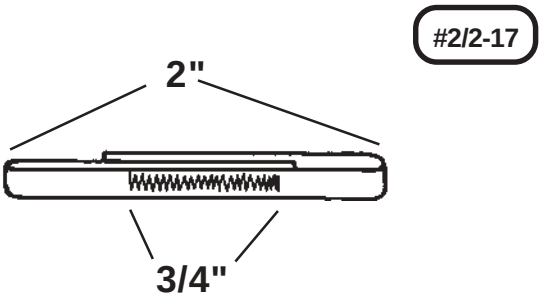
Line dump can lead to partial malfunctions as the loose suspension lines quickly come under tension, and will at times form pressure knots, causing lines to entangle.

B. Double drogue release closing loop specifications:

The Relative Workshop uses only type-2 sheathing when constructing the closing loop for the Tandem Vector equipped with the auxiliary right hand drogue release. Use of any other material, or a different loop construction method could result in a drogue in tow malfunction.

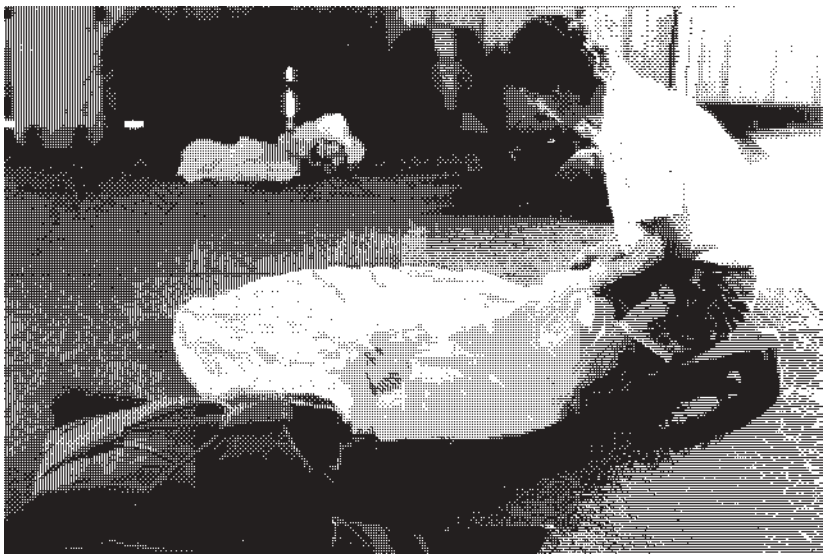
For the best results use only double drogue release closing loops which have been manufactured and supplied by the Relative Workshop. Certified riggers may construct their own loops.





Inspection:

- **A.** Drogue inspection procedures
- **B**. Canopy inspection
- **C.** Drogue release inspection
- **D.** Pin attachment point
- **E.** Sequence checklist



Inspect the drogue for wear each time you pack.

ATTENTION RIGGERS:

Take note of this information.

A. Drogue inspection procedures:

Consider the abuse a drogue takes on every jump. A 4' drogue is thrown out with 400 lbs in tow and expected to perform flawlessly for hundreds of jumps. On each skydive, it buffets violently as it is dragged through the air at 120 mph.

The drogue is constructed as durably as possible, considering that it must fit in a small pouch and be easily deployable. Some owners have gotten well over 500 jumps on a single drogue without much repair; however, because of the abuse the drogue takes, it will eventually wear out. In most cases, the drogue canopy itself will wear out before the white tubular bridle, but if the drogue canopy is continually patched and refurbished, the tubular may fail first.

The drogue assembly - and particularly the tubular nylon inner bridle - should be inspected before every jump. The best time to do this is during packing. There are three particular spots that have proven vulnerable to excessive wear: bottom, middle, and top of the bridle. These must be checked on every jump.

1) Bottom:

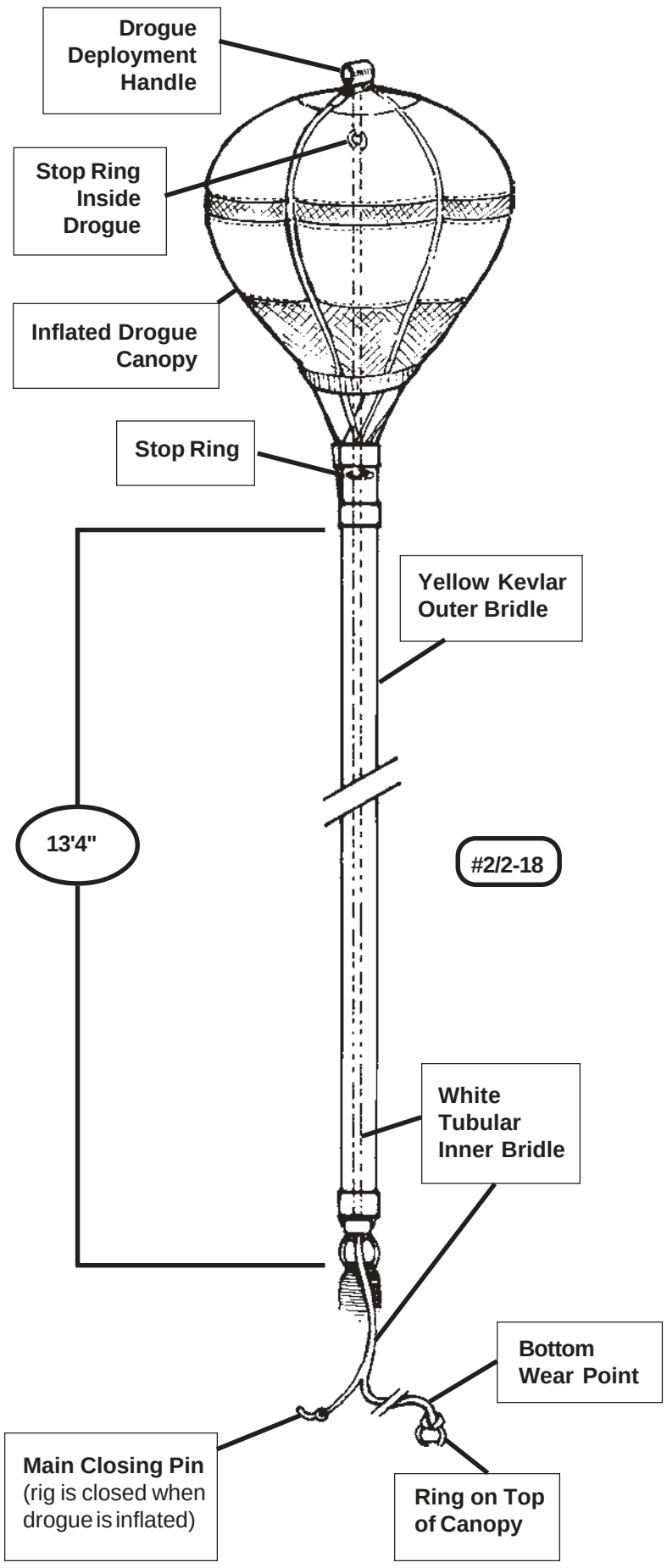
The loop which connects the drogue bridle to the main canopy can fray as a result of being squeezed between the ring on the top of the canopy and the ring at the top of the bag during bag lift-off.

a. The result:

If this area of the white tubular fails, it will happen during drogue release. The drogue canopy itself will detach, and the main may or may not be pulled from the container. If the main does not come out, the Tandem Instructor must then pull the reserve handle with the sure knowledge that the main will fall out of the container during reserve deployment and may deploy completely. Not a good situation.

b. How to check for signs of wear:

The wear at this point is caused by abrasion, so the white tubular will fray considerably before failing. Before every pack job, check this point for signs of fraying. If any exist, it is time to replace the white tubular section of the drogue assembly.



2) Middle:
Another particular wear point is on the inner white tubular bridle, specifically the section between 6' and 9' toward the drogue from the container closing pin. As the drogue is released, the yellow Kevlar outer bridle is scrunched up, resulting in friction burns where it comes to rest on the white tubular. The effects are concentrated on this 2' or 3' span of the white tubular bridle.

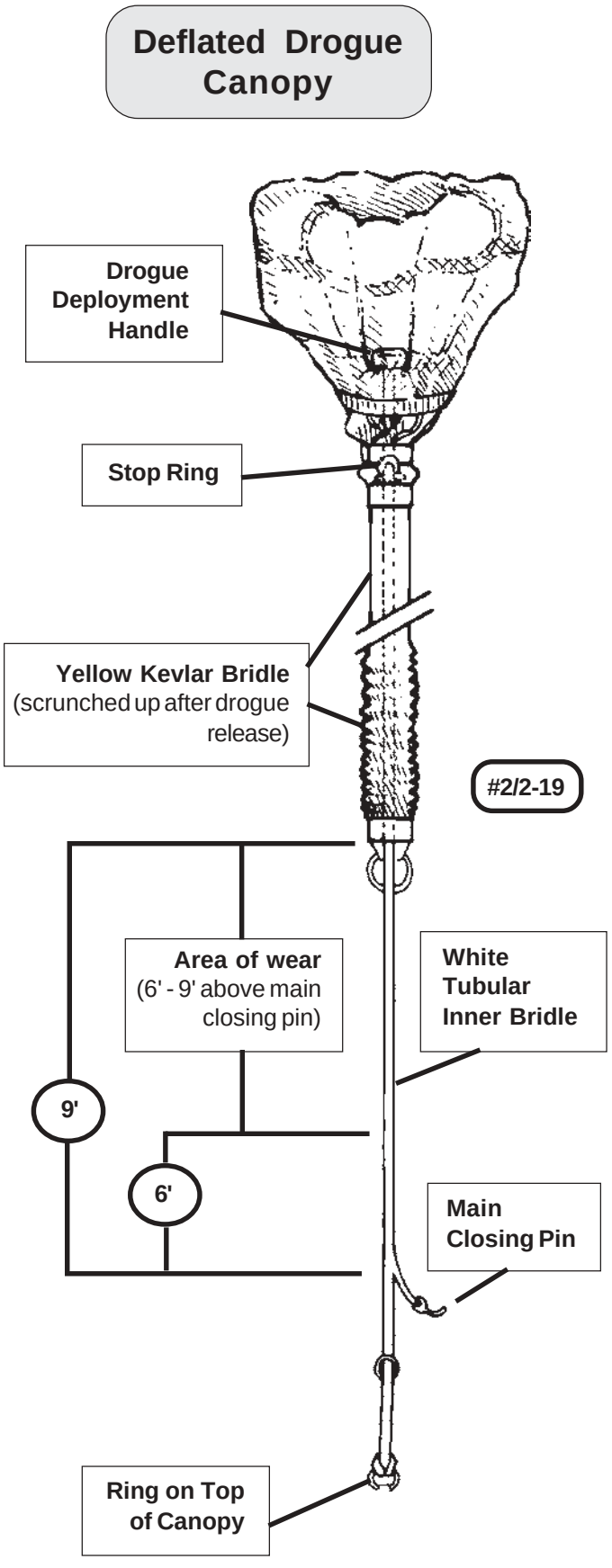
a. The result:
If this particular area of white tubular fails, it will happen during drogue release. The drogue canopy itself will detach, and the main may or may not be pulled from the container. If the main does not come out, then the Tandem Instructor must pull the reserve knowing that the main will also deploy.

b. How to check for signs of wear:
The white tubular will not fray before failing. It remains in one piece, and then fails completely. However, there are definite signs that the bridle is weakened and should be replaced.

The white tubular changes color from white to tan. All of the tubular will become dirty with use. The shade of dingy tan resulting from wear is not the same as dirt. This can be distinguished by the yellow color code threads running down the middle of the tubular start to blend in with the background. Even on a normally dirty piece of white tubular, the yellow lines are distinct. When serious wear takes place, these same lines become faint and indistinct.

The texture of the tubular also changes. Normal white tubular, even if it is dirty, will feel smooth. Tubular that is worn will feel fuzzy to the touch. If you run your fingers over the whole length of the white tubular, you'll be able to feel the change in texture from smooth to fuzzy as you hit a worn spot. (Refer to the Tandem Training Video-module #2.)

The best time to check this critical area is before the drogue is set. Start by running your hand along the entire length of the white tubular to check for a fuzzy texture while also performing a visual inspection.



3) Top:

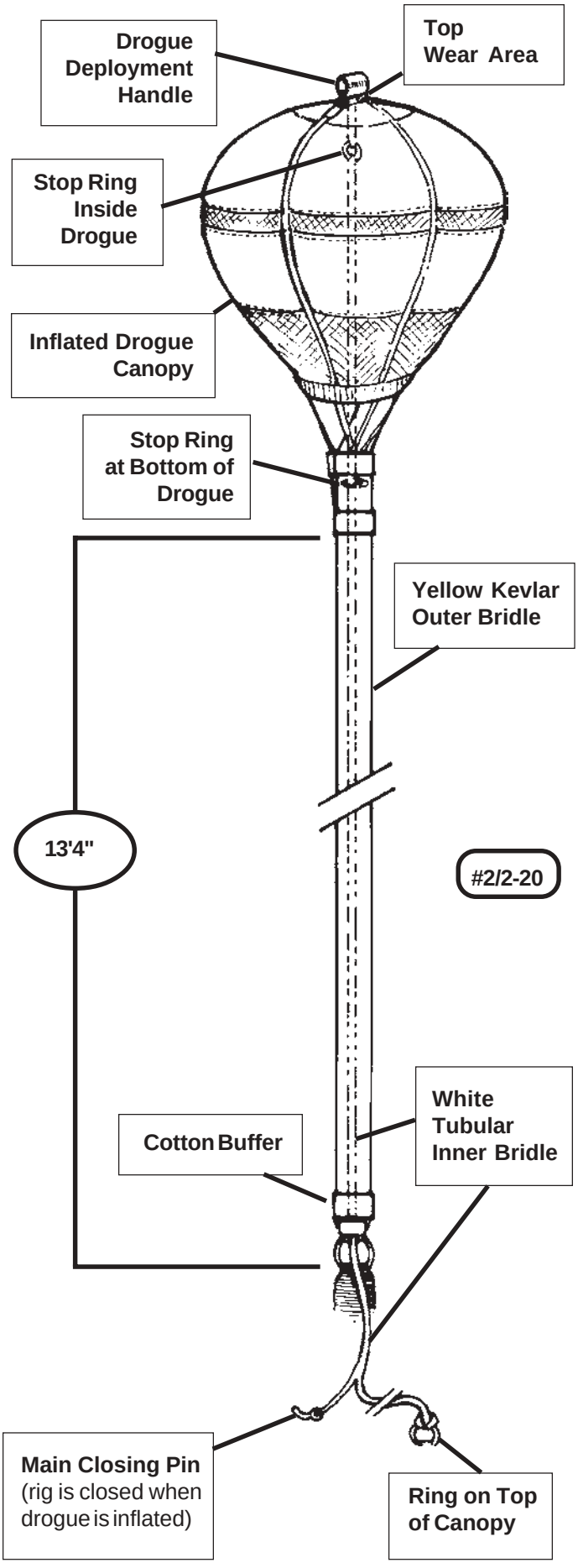
The other place to check for wear is where the white tubular bridle loops through the drogue deployment handle on the top of the drogue canopy. Wear in this area occurs far more quickly if your drogue has 900 lb. Dacron line as the handle attachment instead of white tubular.

a. The result:

If this part of the white tubular or dacron line should fail, the result will be a very hard main canopy opening (the drogue won't be collapsed during main deployment).

4) Other places to check:

Basically check all points on the drogue/ bridle set up that might be subject to wear. These include: the stop ring at the bottom of the drogue; all Kevlar attachment points and the cotton buffer at the base of the yellow kevlar bridle - just above large attachment ring.



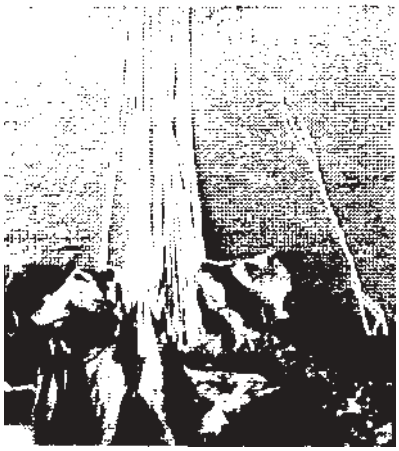
B. Canopy inspection:

1) *bridle attachment point on top and inside of canopy*

The bridle attachment point at the top of the canopy is a very high wear point and should be checked for any signs of damage occurring to the stitching both on top and inside of the canopy.

2) *canopy cells, panels and seams*

As you flake the canopy, take a good look at each panel for any tears, burns or broken stitches. After every 25 jumps inspect the canopy more closely to include looking inside the cells as well as inspecting all of the reinforcing tapes through-out the canopy.



3) *line condition and attachment points*

During the flaking of the canopy, take a look down the length of the lines watching for any damage or deformities. Every so often walk down the length of the lines inspecting all cascade points and looking for any burns or broken stitching.

4) *steering lines, brake lock loops and toggle attachment*

While inspecting the steering lines watch for damage especially at the brake lock loops, the toggle attachment points and at the attachment points at the canopy.

5) *slider condition*

Check the slider grommets for any wear (dings, nicks, sharp surfaces). Check the entire slider for holes, burns or fraying.

6) *connector links*

Ensure that the link protectors are secure. If no link protectors are present then check to ensure that the omission is intentional and that the connector link barrels have not loosened.

Rigger Note: Using "Mechanics Loc-Tite" on the barrel threads, and marking the barrel and link with a brightly colored paint line may help to insure the barrels tightness and speed up link inspection.

C. Drogue release inspection:

1) *release loop*

Check the loop for fraying. If fraying has started then replace the loop.

2) *3-ring attachment.*

Check for webbing and hardware condition.

D. *Pin attachment point*

Check the pin attachment point on the bridle for any wear on the Dacron line both at the pin and bridle attachment.

E. Sequence checklist

Main Canopy Assembly Inspection Guide

- drogue chute handle attachment
- drogue chute fabric and seams
- drogue chute tubular center line
- drogue chute bridle attachment point
- drogue kevlar bridle
- drogue bridle/ canopy attachment point
- main pin and attachment point
- deployment bag
- canopy fabric and seams (top, bottom, skin and ribs)
- canopy reinforcement tapes
- lines and cascades
- steering lines and brake loops
- slider and grommets
- connector links
- risers
- 3-Ring release system

Packing sequence for the main canopy:
The main packing section is split into the following steps:

A. Folding the main
B. Stowing the brakes
C. Folding the nose
D. Closing the container
E. Drogue hook-up
F. Setting the drogue
G. Packing the drogue
H. Using the double drogue release handle

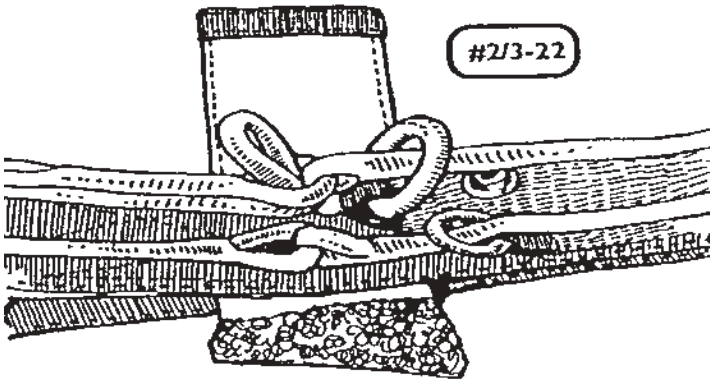
A. ***Folding the main canopy:*** (Refer to Tandem Packing Video)

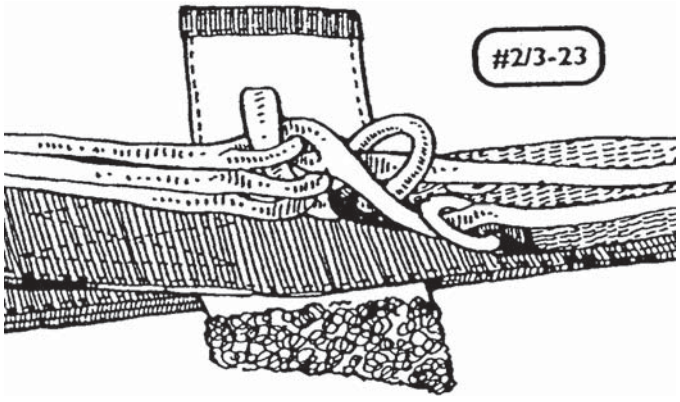
FAA regulations require that the main canopy be packed either by the Tandem Instructor who will be jumping the system, or a licensed rigger, or under the supervision of a licensed rigger. Anyone packing a Tandem canopy must have read and be familiar with all material in this manual and the Tandem Training Video.

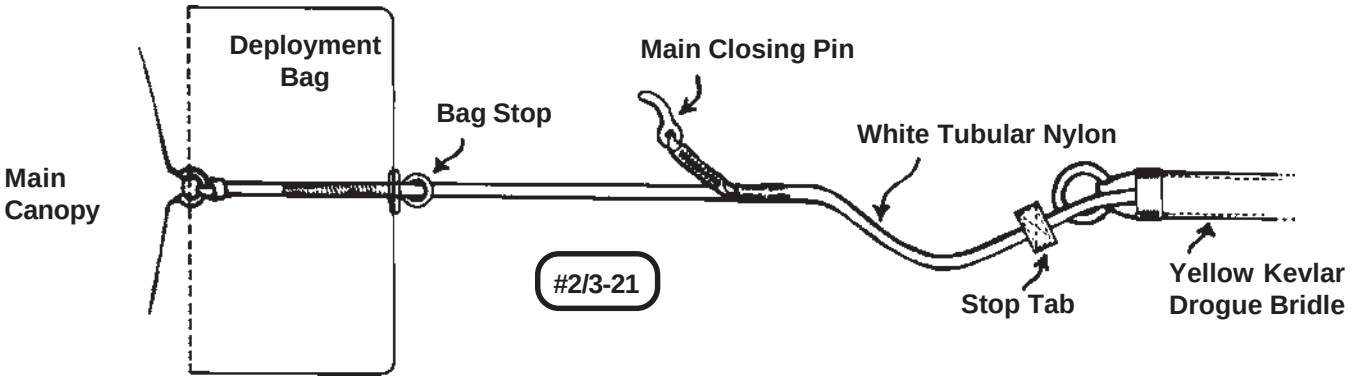
1) Check that the reserve canopy is in date. Inspect main, perform thorough line check.

2) Make sure that the white tubular nylon that comes out of the yellow kevlar bridle is fed through the grommet on the top of the bag and is attached to the canopy as any pilot chute would be using a clove hitch knot as shown in illustration #2/3-21.

B. Stowing the brakes:
3) The brake system consists of two sets of steering lines, the set on the gold toggle are the primary lines and the set on the black toggle are the secondary lines. To set the brakes, pull all of the toggles and lines down at once, till the junction of the loops is at the large guide ring on the riser. Thread the riser loop through the primary loop first and then the secondary loop as shown in illustration #'s 2/3-22 and #2/3-23. **BE SURE THE RISER LOOP IS threaded THROUGH BOTH LOOPS.**



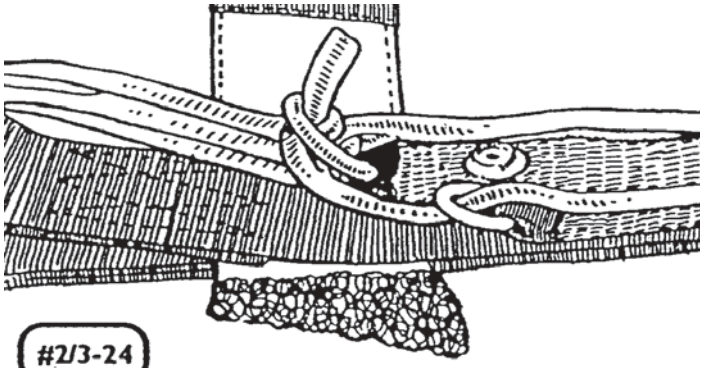




NOTE: When setting the brakes, it is possible to either set the secondary lines, or to leave them unstowed. Although initial tests indicate that openings are the same whether the secondary lines are set or not, the Relative Workshop recommends that the secondary lines be set along with the others (heavy weight drop test were done with primary and secondary lines set). Taking the extra few moments to set the secondary lines makes some packing methods easier when flaking the canopy. Some Tandem Instructors have reported softer openings with the secondary lines set.

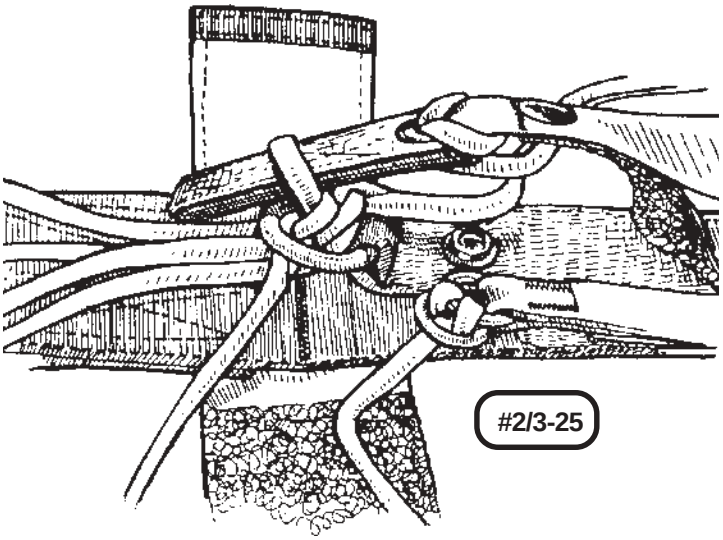
NOTE: If you pull the small toggle line through the ring, it might not release when you pull the large yellow handle to release the brakes. It would then be necessary to unvelcro the small black handle and pull it all the way down to release it's brake line - a lot of needless trouble.

4) Thread the riser loop through the large guide ring as shown in illustration #2/3-24.



#2/3-24

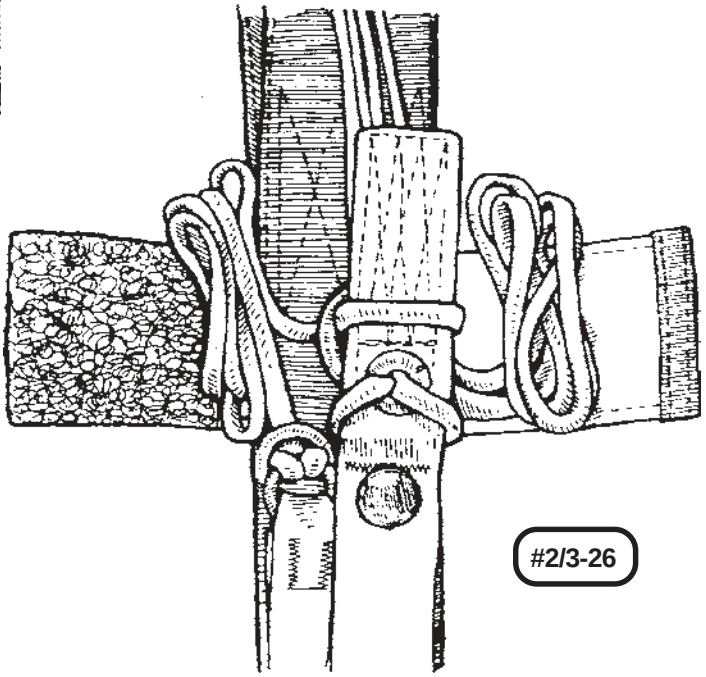
5) Thread the top part of the large gold toggle through the riser loop as shown in illustration #2/3-25. Attach the gold toggle to the riser with the snap first then mate the black velcro.



#2/3-25

6) Next, attach the secondary toggle (black) to the riser so that the small ring on the top of the toggle is right up against the small guide ring on the riser with the excess line pulled through and laid off to the side for stowing.

7) S-fold the two lines on either side of the riser as shown in illustration #2/3-26, and close the cover.

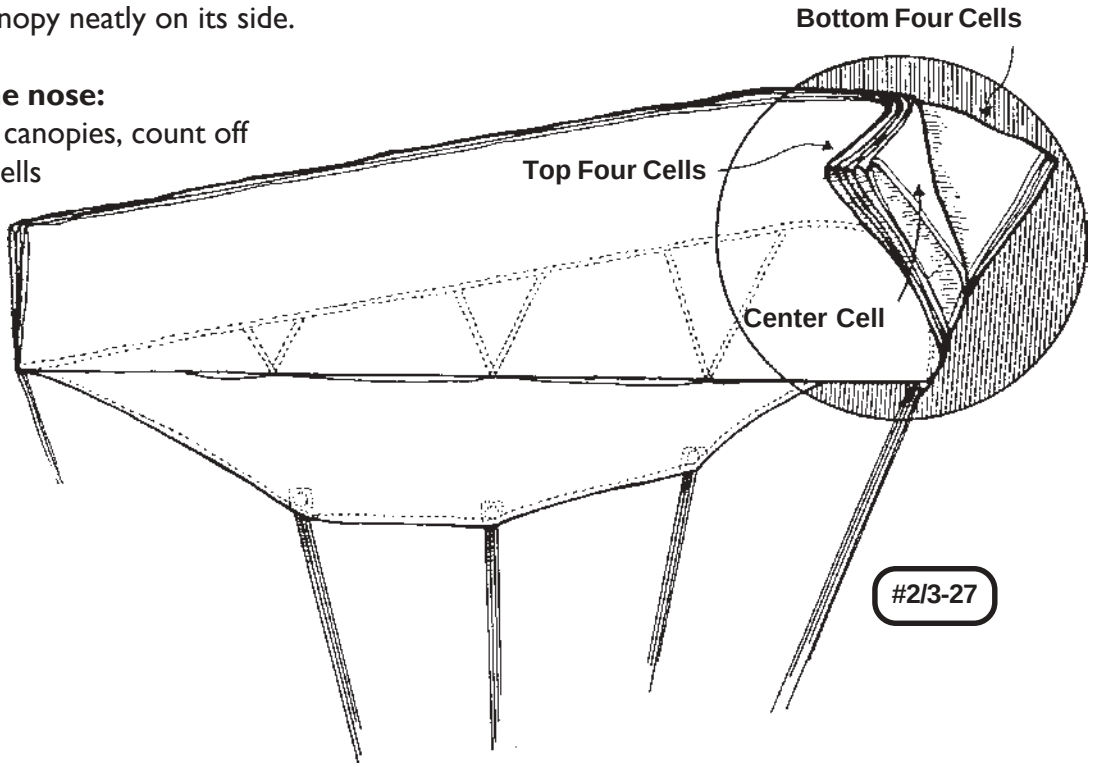


#2/3-26

8) Flake the canopy neatly on its side.

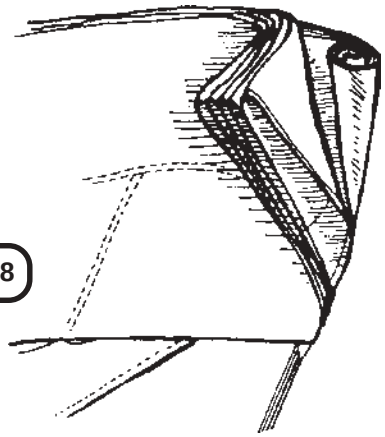
C. Folding the nose:

9) On all 9 cell canopies, count off the top five cells and fold them back as shown in illustration #2/3-27.



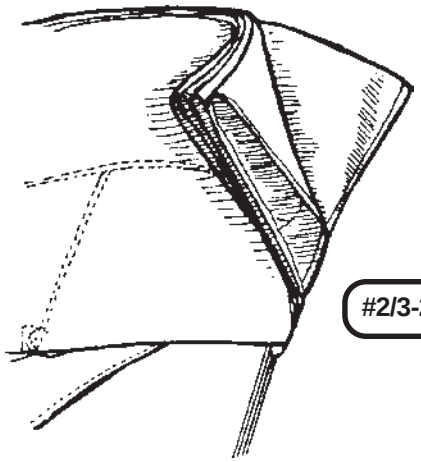
#2/3-27

10) Take the bottom four cells and roll them in towards the center as shown in illustration #2/3-28.



#2/3-28

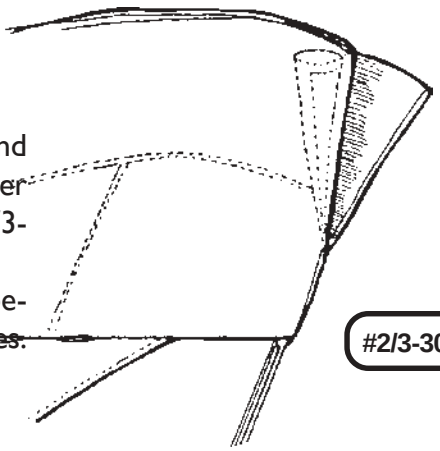
11) Pull the middle cell back to the center as shown in illustration #2/3-29.



#2/3-29

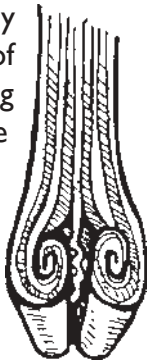
12) Take the top four cells and roll them in towards the center as shown in illustration #2/3-30.

13) Fold the center cell in between the two center cell halves.



#2/3-30

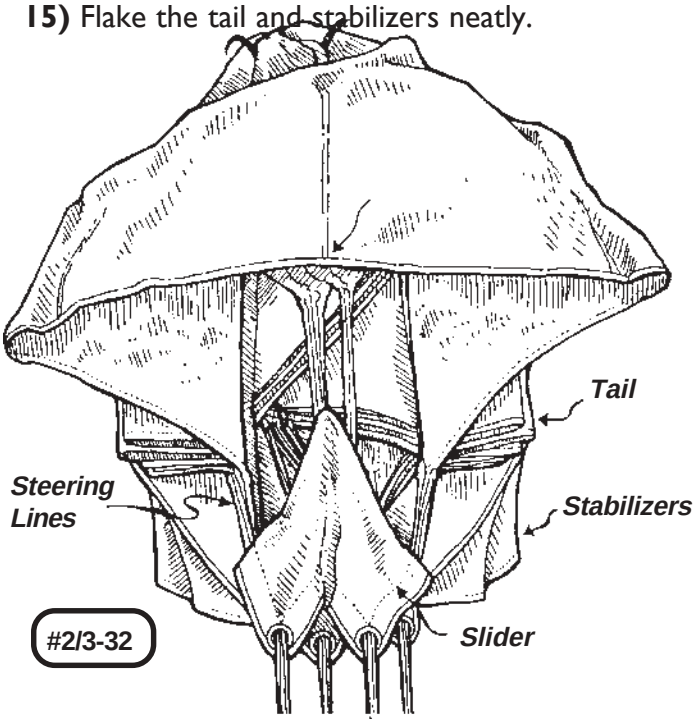
From the top of the canopy, this packing method looks like illustration #2/3-31, with both sides rolled and the center cell left loose, the canopy can now open in the more orderly manner; from the middle out, instead of from one side as with the old packing method with the nose rolled all to one side.



#2/3-31

14) Fold the canopy as per our Vector Tandem Packing Video or by the traditional method of stacking the "B" line group on top of the "A" line group, and then stack the 'C" line group on top of the "B" line group, and so on.

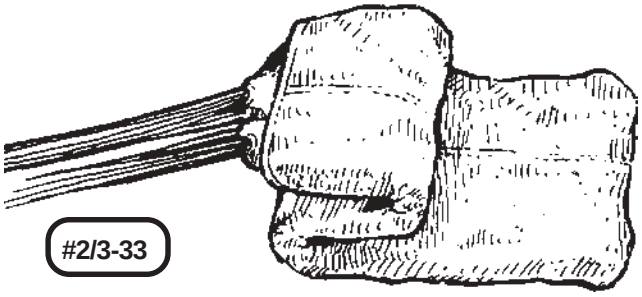
15) Flake the tail and stabilizers neatly.



#2/3-32

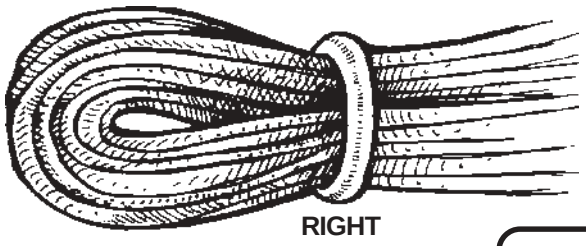
16) pull up slider as shown in illustration #2/3-32

17) Stack, beginning as shown in illustration #2/3-33, put in bag and stow lines maintaining good line tension throughout.



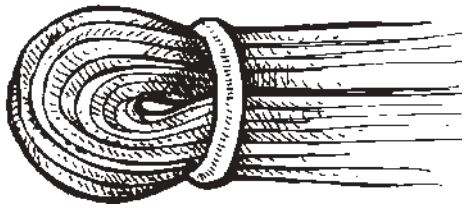
#2/3-33

18) Close the bag and stow the lines keeping about 2" of lines beyond each rubber band or tube stow as shown in illustration #2/3-34. (Insure that proper



RIGHT

#2/3-34

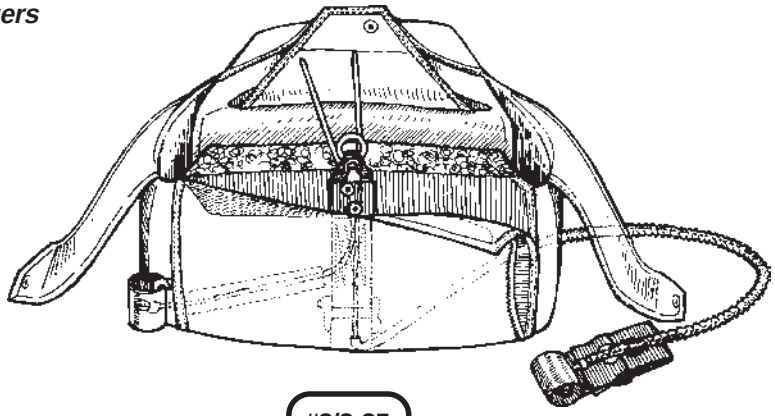


WRONG

stow bands are used - see page 18 for details).

19) Before placing bag in the container, install the drogue release handle by threading the yellow drogue release cable through the slot on the closed side of the pouch, then through the channel on the back of the drogue riser. (Refer to illustration 2/3-35).

Note: Installing the drogue release handles is much harder to do once the container has been closed.

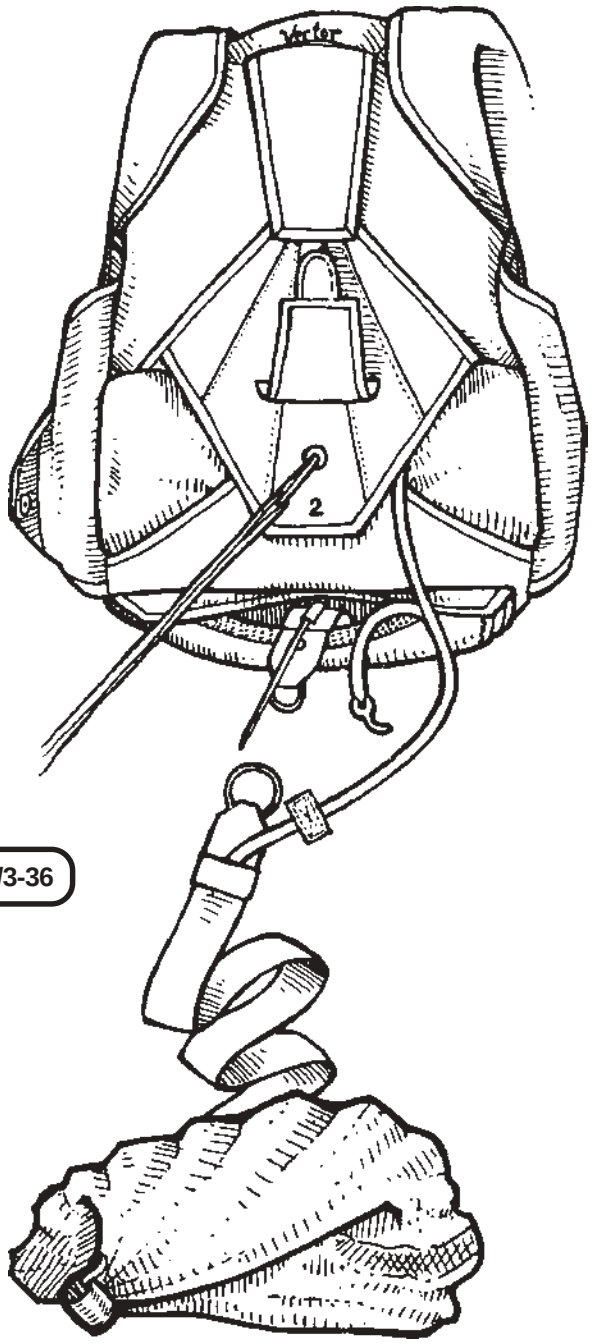


#2/3-35

20) Place the bag into the main pack tray, with the lines at the bottom. Push the bottom corners of the bag deeply into the container. Place your knees on top of the bag and push the top corners of the bag into the top of the main container.

C. Closing the container:

21) Check the condition of the main closing loop, then close the bottom flap first, then the top flap as

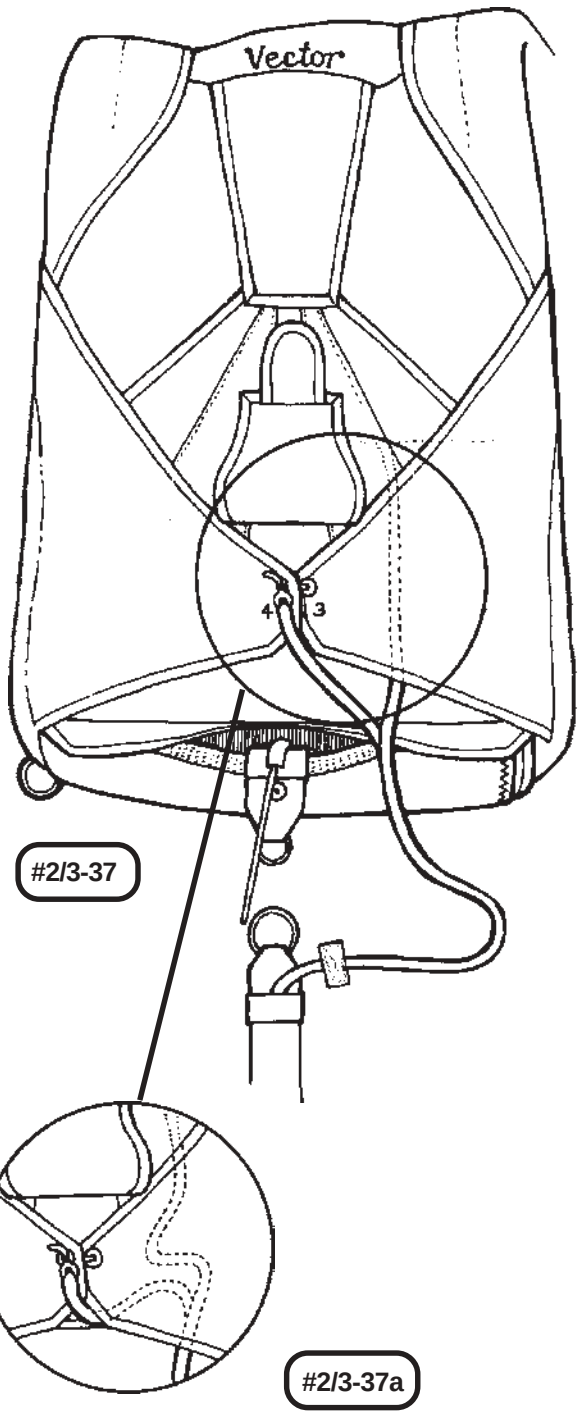


#2/3-36

shown in illustration #2/3-36. Note that the white tubular nylon bridle with pin is routed out the bottom on the right side. This is different from the bridle routing on a regular sport Vector.

22) Close the right flap(flap #3), then the left flap(flap#4),

23) Insert the closing pin from the bottom as shown in illustration #2/3-37. Tuck the pin connector cord firmly under the right side flap as shown in illustration #2/3-37a. Close pin protector flap.

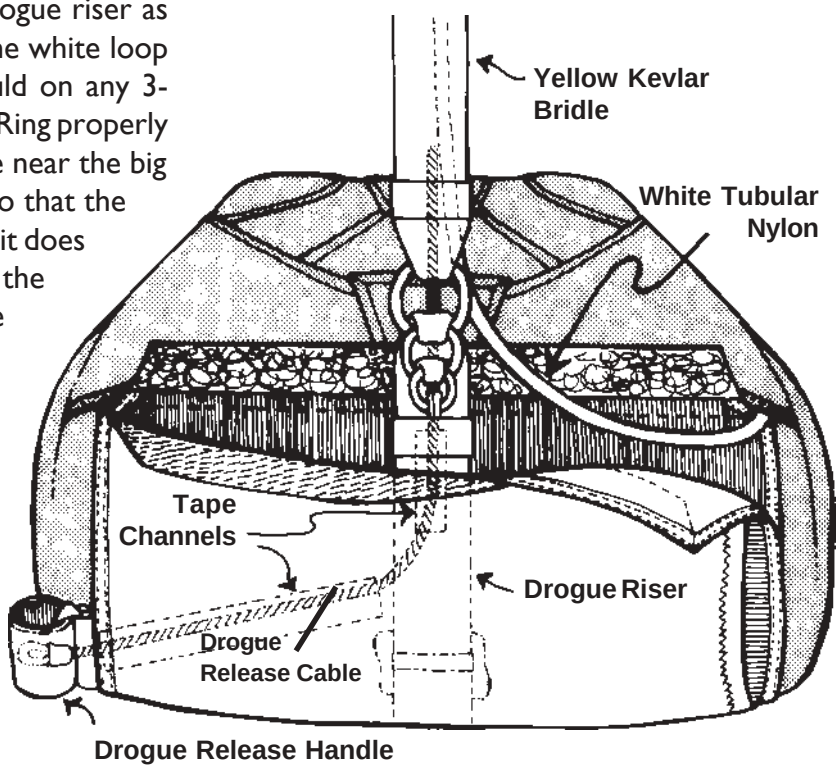


#2/3-37

#2/3-37a

E. Drogue hook-up (single release only)

24) Attach the large ring on the Kevlar drogue bridle to the remaining two rings on the drogue riser as shown in illustration #2/3-38, using the white loop and yellow release cable as you would on any 3-Ring. Illustration #2/3-39 shows the 3-Ring properly attached. The slot in the Kevlar bridle near the big ring must face the container system so that the tubular nylon bridle that comes out of it does not wrap around anything. Note that the end of the release cable goes into the same slot in the Kevlar bridle which holds the tubular nylon. Note: if rig is equipped with optional right hand drogue release handle, then refer to illustrations #2/3-52 and #2/3-53, beginning on page 34.



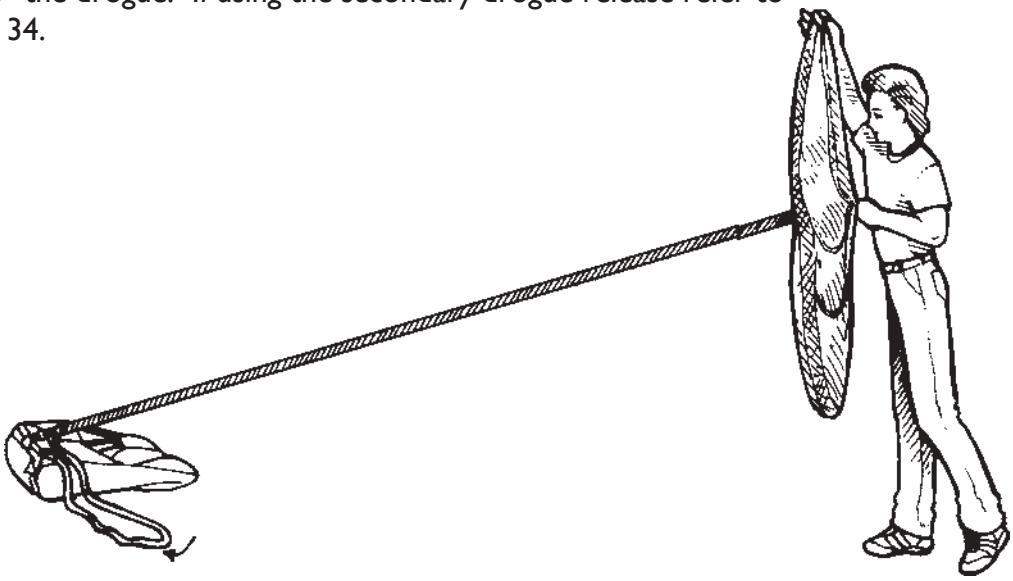
#2/3-38

WARNING: If the main container is opened for any reason on the ground or before jumping, remove drogue chute, release 3-ring and re-close container from the beginning. The configuration of the tubular nylon bridle makes it possible to pack a "collapsed drogue chute in tow" malfunction if the rig is popped open and re-closed hastily. It is best to take the few extra minutes and make sure the rig is closed absolutely correctly.

#2/3-39

F. Setting the drogue:

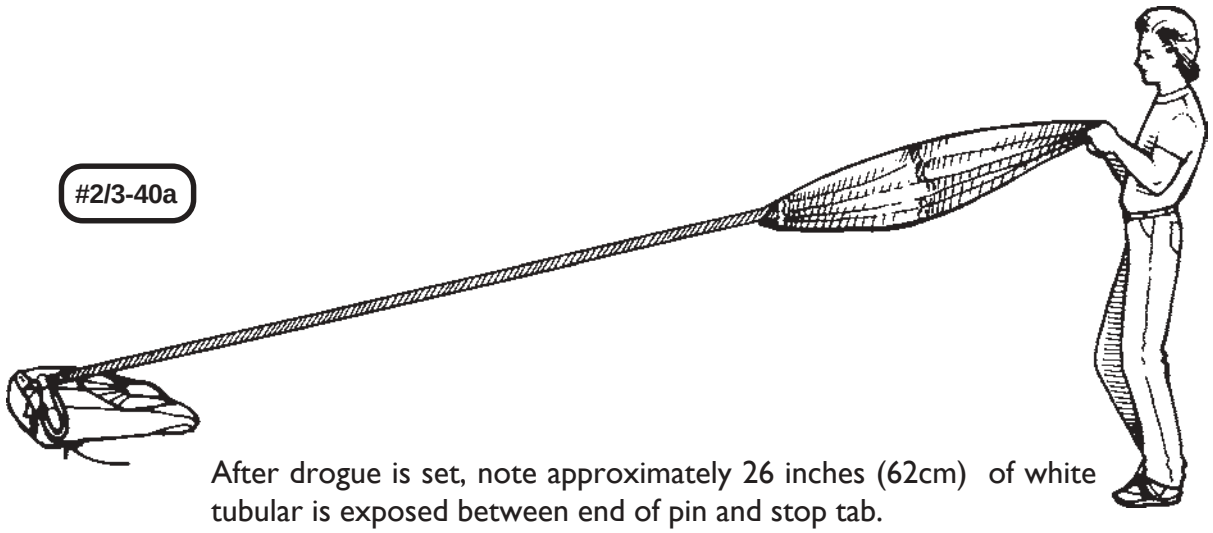
25) Ensure that the 3-Ring is hooked up prior to attempting to set the drogue. If the white tubular is twisted inside or outside the yellow Keflar bridle, then remove the twists before setting the drogue. Take the orange handle on the top of the drogue chute as shown in illustration #2/3-40, and walk away from the rig until both the Kevlar bridle AND the drogue are fully extended as shown in illustration #2/3-40a. This "sets" the drogue. If using the secondary drogue release refer to page 34.



#2/3-40

Before setting drogue, note 4 feet of excess white tubular.

WARNING: Drogue must be set after each use. If drogue is not set completely, a collapsed drogue could occur on the next jump.

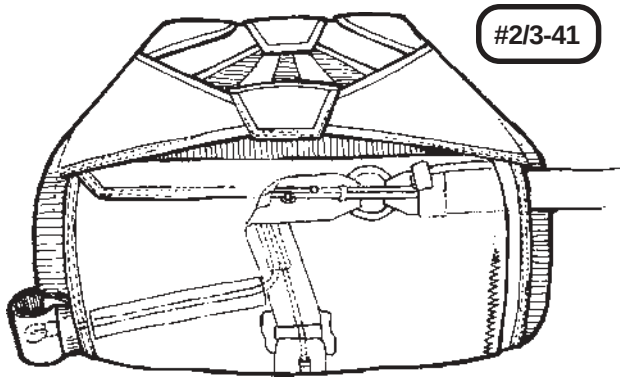


#2/3-40a

After drogue is set, note approximately 26 inches (62cm) of white tubular is exposed between end of pin and stop tab.

Pull till stop tab is against yellow Kevlar, do not yank too hard. The stop tab must be installed on all drogues. (Refer to Stop-Tab installation in Appendices section).

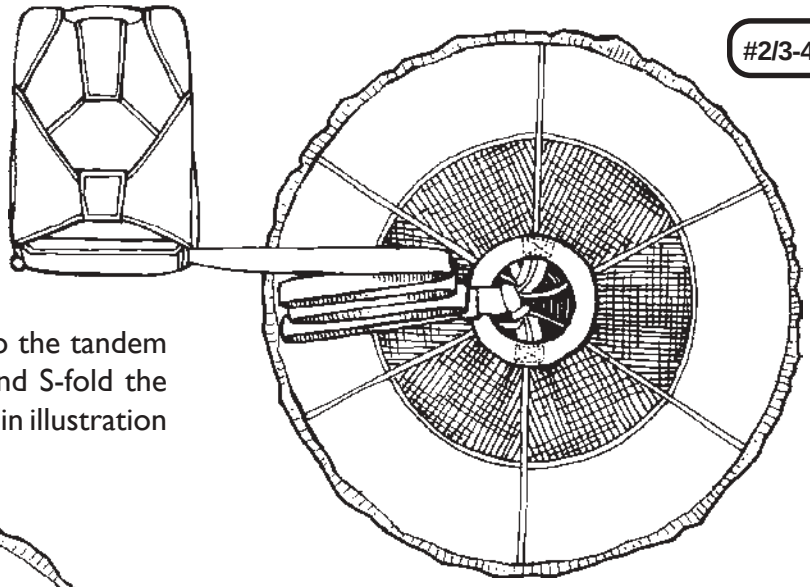
WARNING: There should be approximately 26 inches (62 cm) of tubular nylon left over between the 3-Ring and the curved locking pin. If there is considerably more than 26 inches (62 cm) of tubular nylon left over (there will be about 4 feet (120cm) if the drogue has not been set), then the drogue is collapsed and will streamer for 10 seconds or more after being deployed.



#2/3-41

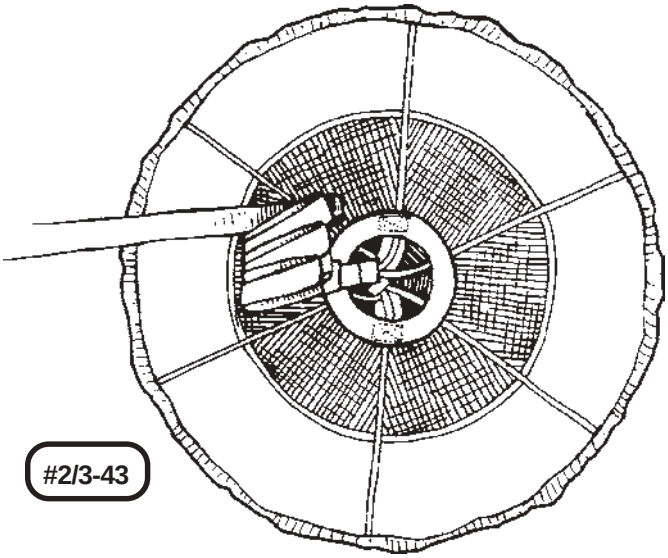
G. Packing the drogue

26) Fold the drogue riser over inside the pouch as shown in illustration #2/3-41. The end of the release cable must not extend beyond the edge of the pouch. For this to work, the folded riser will have to be pushed to the left a little, making the fold slightly sharper than 90 degrees. Close the velcro flap on the top of the pouch.



#2/3-42

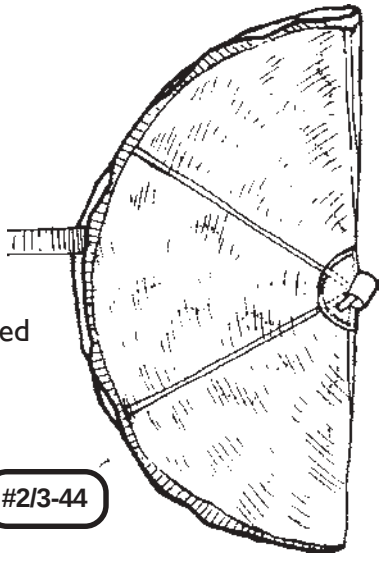
27) Lay the drogue chute out next to the tandem container with the mesh facing up, and S-fold the bridle over the drogue chute as shown in illustration #2/3-42.



#2/3-43

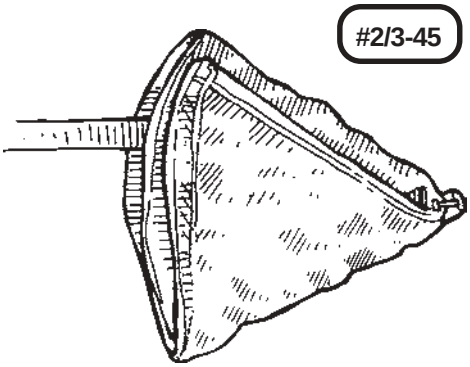
28) Fold the whole bridle back on itself in a stair-step pattern as shown. All the bridle should then lie within the mesh circle of the drogue as shown in illustration #2/3-43.

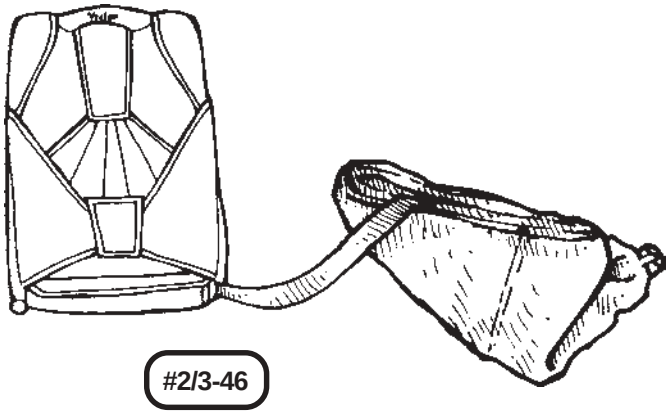
29) Fold the drogue canopy in half over the folded bridle as shown in illustration #2/3-44.



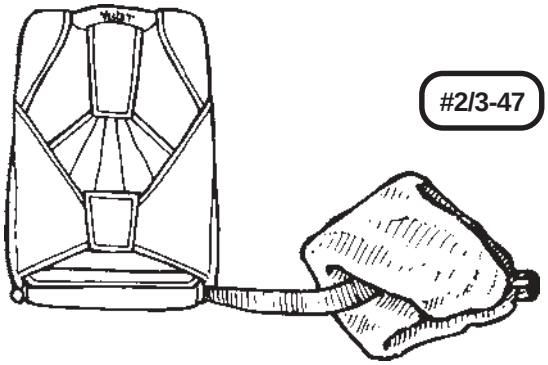
#2/3-44

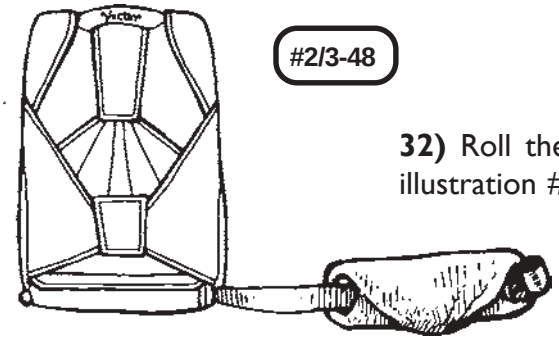
30) Fold this half circle into thirds as shown in illustration #2/3-45.


#2/3-45

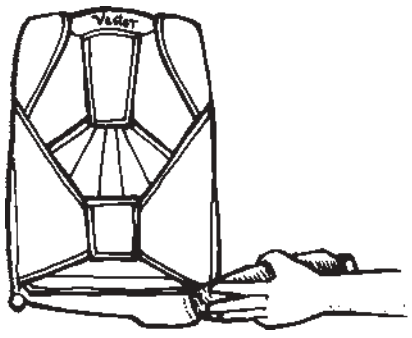

#2/3-46

31) Fold one corner of the triangle up to the drogue handle, then the other as shown in illustration #2/3-46 and #2/3-47.


#2/3-47


#2/3-48

32) Roll the drogue from one side as shown in illustration #2/3-48.


#2/3-49

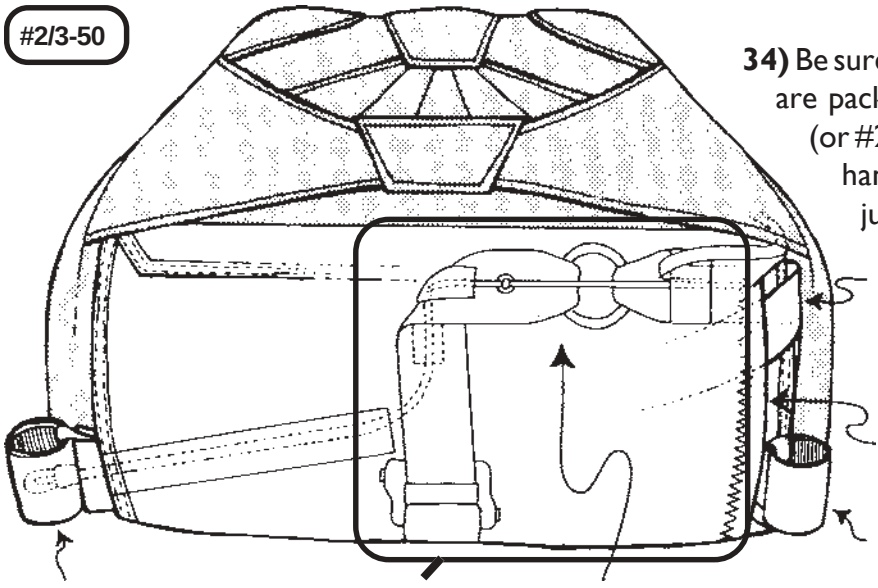
33) At this point, leave the drogue on the floor and pound on the center of the Spandex pouch a few times with your fist. This will make a concave dent in the bottom of the rig, leaving a little extra slack in the pouch, allowing for easy insertion of the drogue.

Fold and insert the drogue into the pouch as shown in illustration #2/3-49. Packing the drogue this way makes it easier to extract. It also helps the velcro on the pouch to last longer by keeping it from being pulled open each time the drogue is packed.

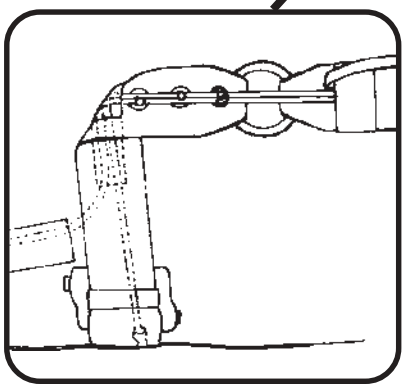
Packing the drogue correctly into its pouch will make it easier to extract in freefall.

WARNING: It is possible to pack the drogue so that it cannot be extracted in freefall.

#2/3-50



34) Be sure the drogue and all of its components are packed as shown in illustration #2/3-50 (or #2/3-50 for systems with optional right hand drogue release handle) before jumping the system.

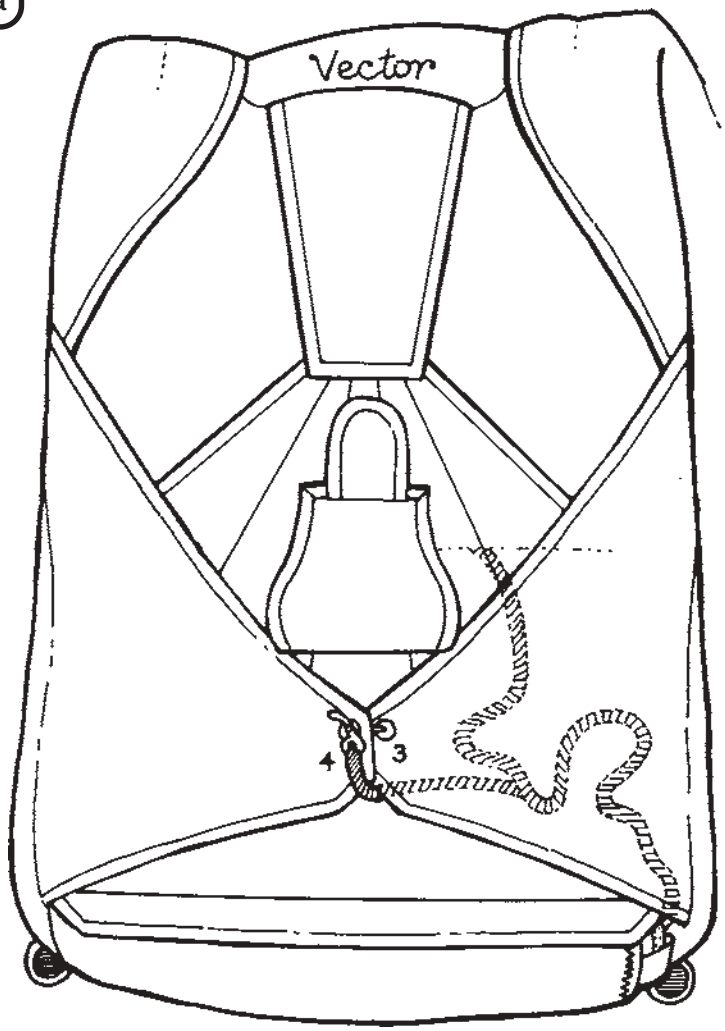


#2/3-50a

NOTE: If rig is equipped with optional right hand drogue release handle, then drogue bridle should look like this when packed

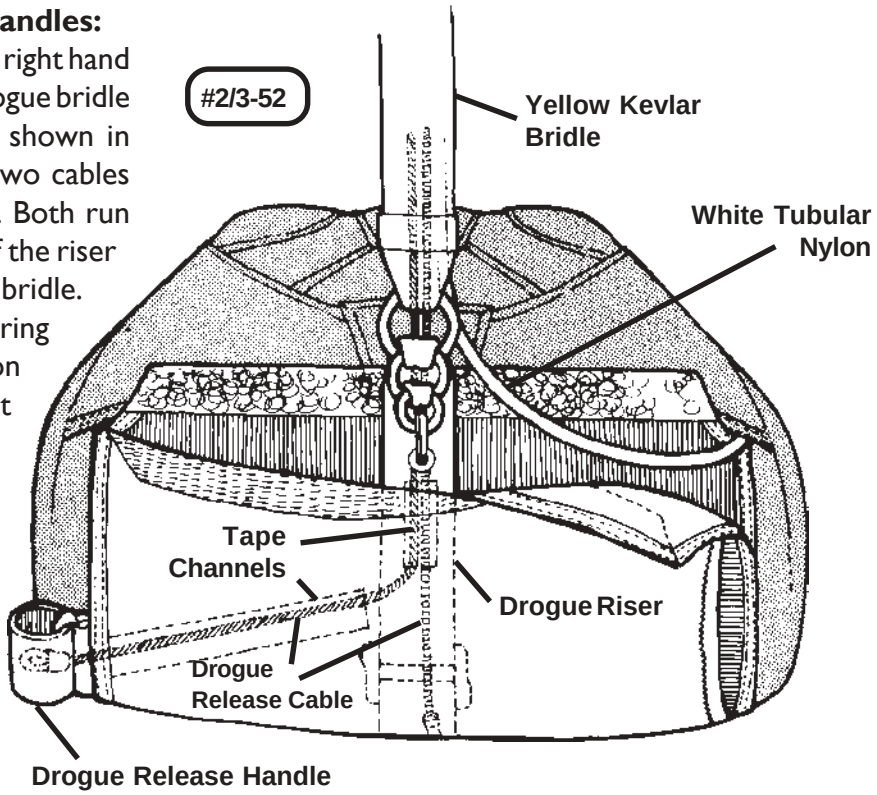
35) Tuck the remaining 12" of tubular nylon under the right side flap as shown in illustration #2/3-51.

36) Inspect the packed rig.



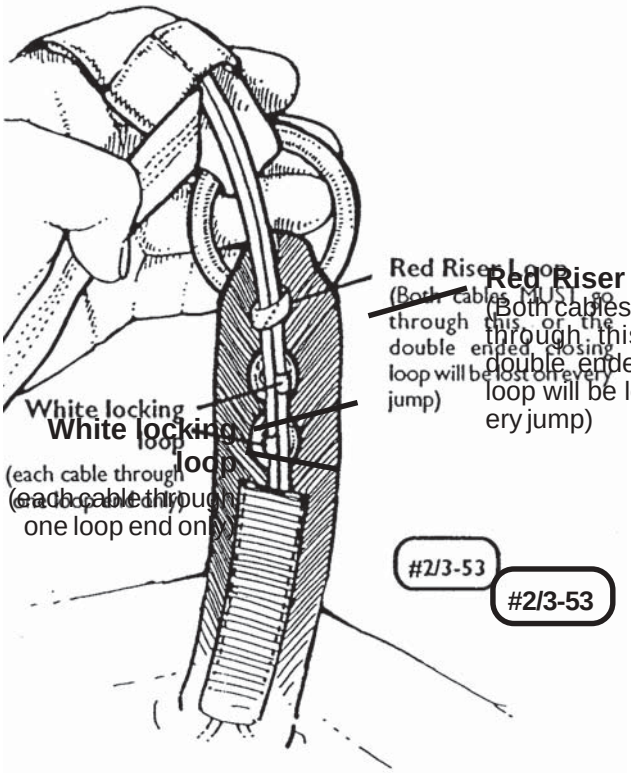
#2/3-51

H. If using Double Drogue release handles:
If the system is equipped with the optional right hand drogue release handle, then the 3-Ring drogue bridle attachment will be slightly different. As shown in illustration #2/3-52, there will now be two cables running up the back of the release riser. Both run through the same channels on the back of the riser and into the opening of the Kevlar drogue bridle. The slot in the Kevlar bridle near the big ring should face the rig so that the tubular nylon does not wrap around anything. Note that both of the release cables go into the same slot in the Kevlar bridle which holds the tubular nylon.



WARNING: Be sure that only one cable goes through each end of the white double ended 3-Ring locking loop.

38) To attach the 3-Ring with the optional right hand drogue release handle installed, first note that the new locking loop has two open ends and is not attached permanently to the riser. One end of the loop goes through the top grommet and is secured by one cable, the other end goes through the small ring and through the bottom grommet and is secured by the other cable as shown. It doesn't matter which end of the loop goes with which cable. Just be sure that each cable goes through only one end of the loop as shown in illustration #2/3-53. If both cables go through all locking loops, it may be necessary to pull both drogue release handles to release the drogue.



NOTE: If the system is equipped with the optional right hand drogue release handle, then the drogue riser should look like this when packed.

Chapter 4: Installation of the right hand drogue release handle:

Conversion kit
Installing the housing and handle
Installing the new drogue release riser
Installing the handle on the Tandem Instructor's harness
Installing the handle on the students harness
Disconnection after landing
If the student is to release the drogue

For those who prefer, the Relative Workshop offers a right hand drogue handle for Tandem Vectors. The system is intended mainly as a right hand drogue release handle for the Tandem Instructor. With the addition of this handle, the Tandem Vector system will have drogue release handles on both sides as well as reserve ripcords on the right and left sides. In other words, if either arm of the Tandem Instructor is incapacitated, he can still activate either the drogue release or the reserve ripcord.

The handle can also be used as a training ripcord for the student, or as a backup for passenger use during Tandem certifications. If the handle is to be given to a student, specific ground training must precede the jump to insure the student is aware of the purpose of the handle and its limitations. The handle should be positioned as seen in Illustration 2/4-54.

CAUTION: Use of this new handle carries with it new and greater responsibility for the Tandem Instructor. . Read these warnings carefully before using the new right hand drogue release/ training ripcord on the Tandem Vector.

WARNING: Always attach the handle to the Tandem Instructor's harness immediately after each jump. Be sure the handle is attached to the harness before puting the system on your back.

#2/4-54

WARNING: Use of this handle creates new malfunction possibilities. Among these are:

1) Dangling housing and handle. If the handle is not attached or attached incorrectly, it will trail behind the jumpers, possibly to entangle with the drogue, the main deployment or the reserve deployment.

2) If the release system is not attached properly, it may be necessary to pull BOTH drogue release handles in order to release the drogue. If you pull one drogue release handle and the drogue does not release, **PULL THE OTHER HANDLE IMMEDIATELY.**

Conversion kit:

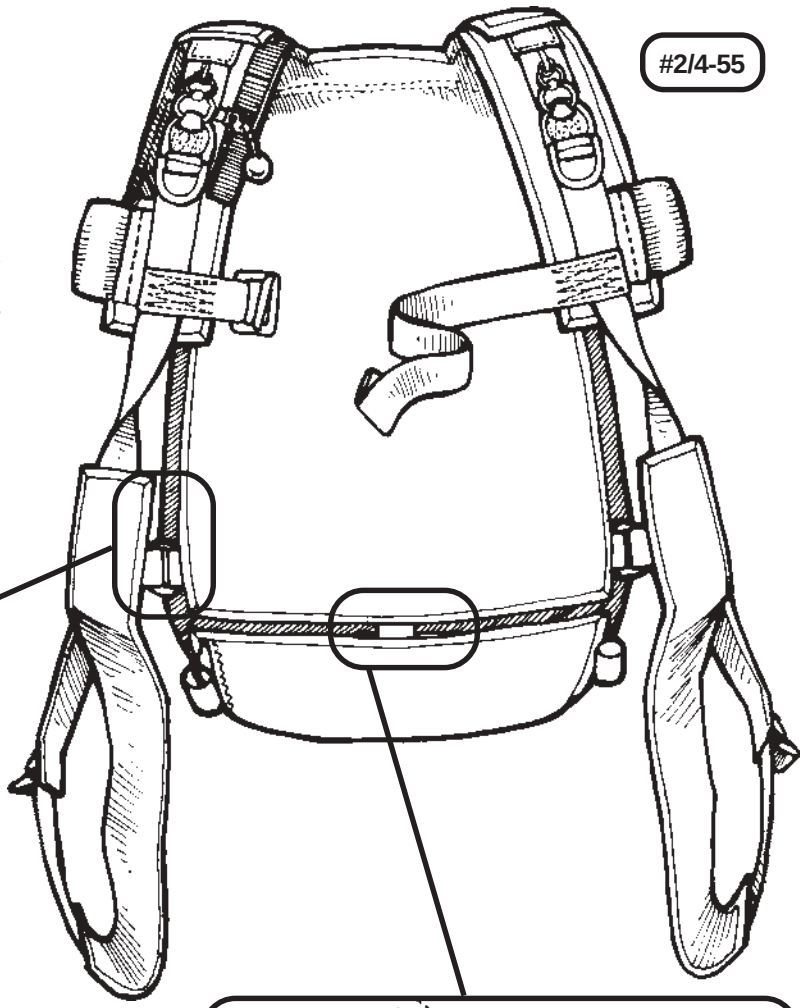
Included in this conversion kit are the following items:

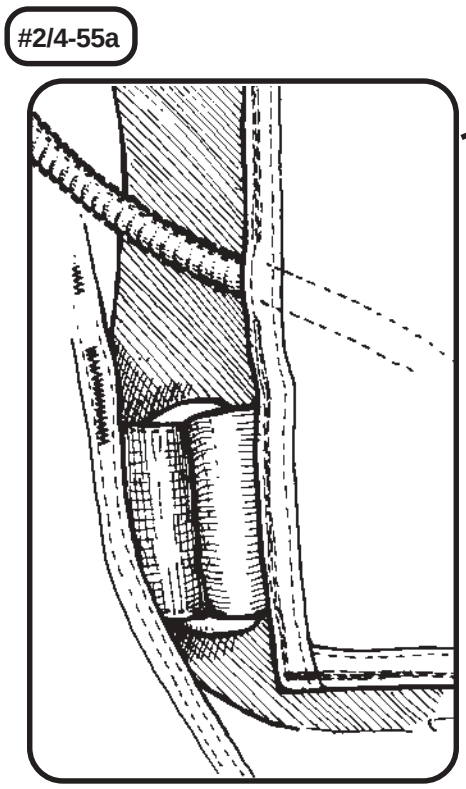
1) Student release handle.

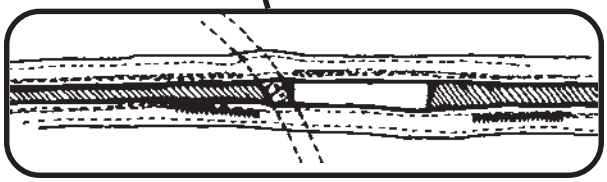
2) Cable housing.

3) New drogue release riser with five double ended release loops (four spares).

This conversion can be performed with or without a sewing machine. If you elect not to use a sewing machine, you will need waxed tacking cord.







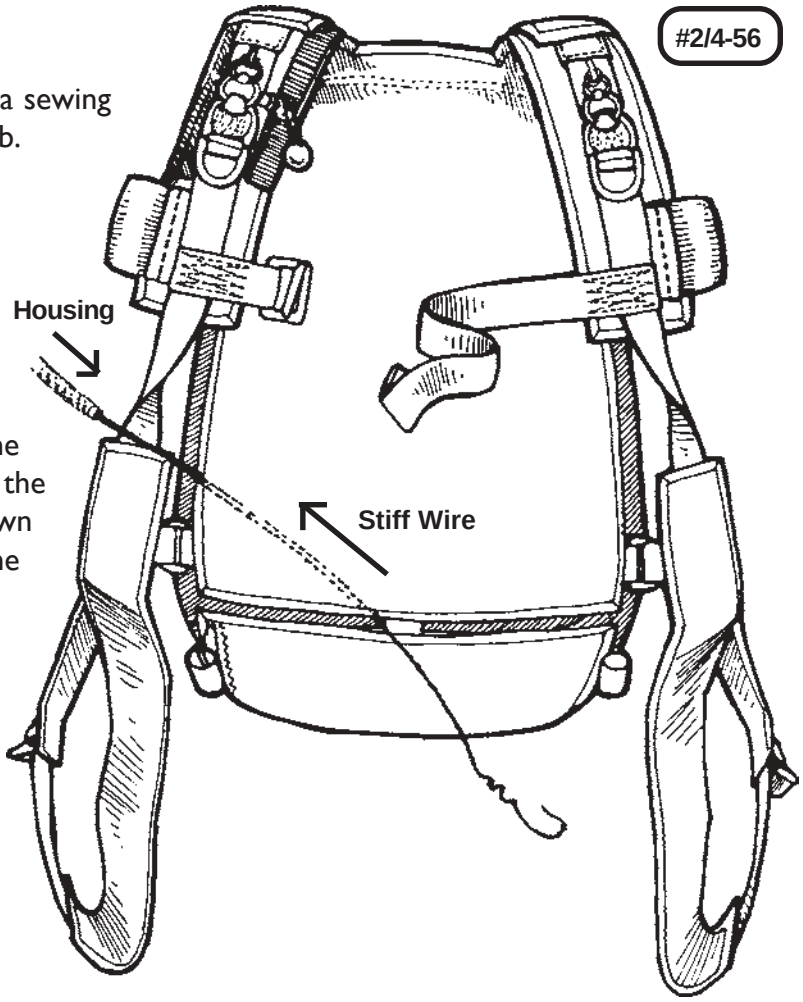
Installing the housing and handle: The passenger handle housing will be threaded under the backpad and tacked in place inside the pouch. To achieve this, follow directions 1, 2, 3 and 4.

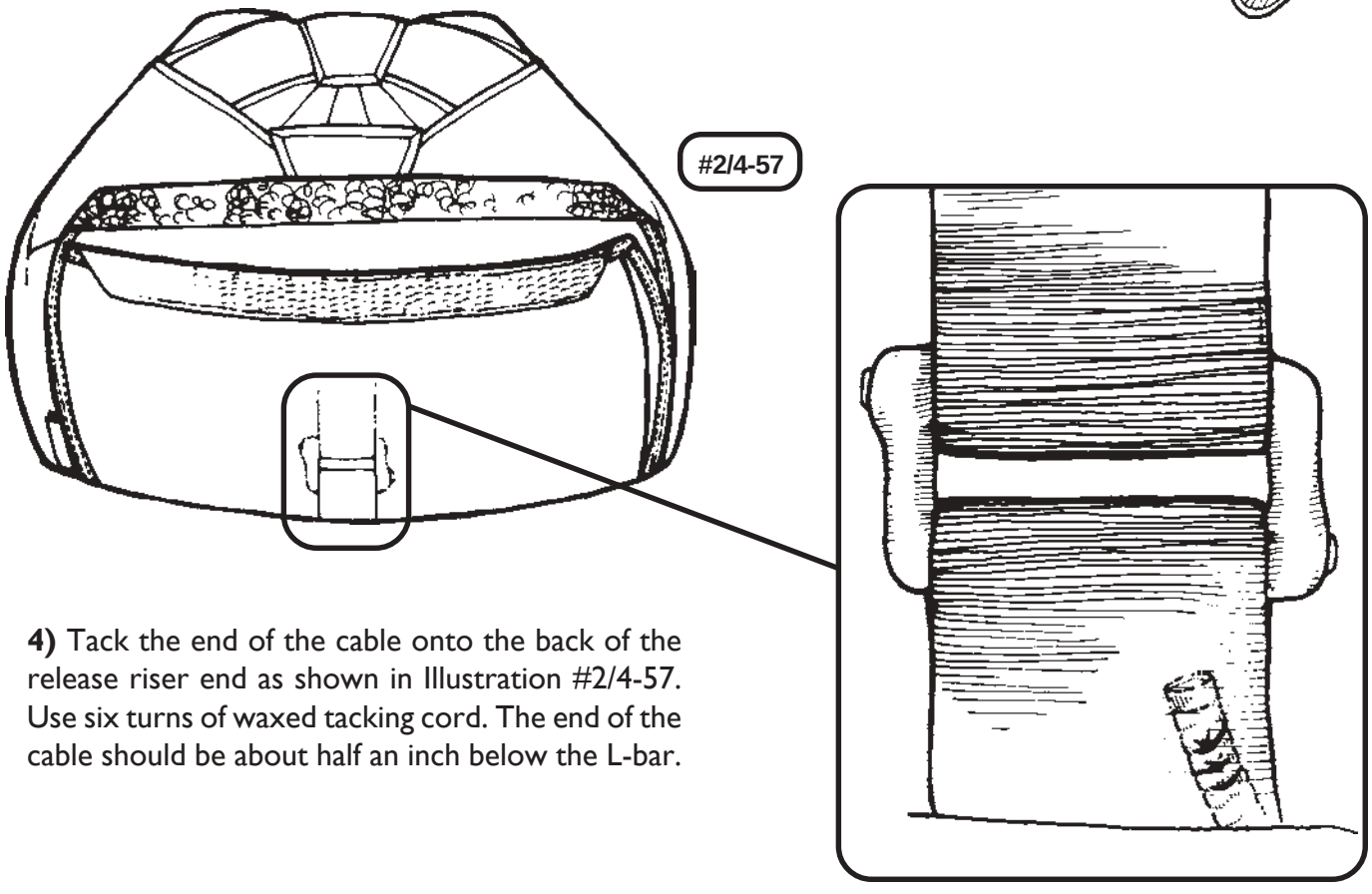
1) Remove the drogue from the pocket and the main canopy from the container. Undo about 1 inch (2-3cm) of the backpad stitching just above the diagonal. Be careful not to cut the stitching directly on the binding tape. One side of the resulting hole should already be backstitched and should not require reinforcement. To keep the stitching from coming undone any further on the other side of the opening, tack the edge with waxed tacking cord, or sew it over with a sewing machine as shown in illustration #2/4-55a (straight stitch, bartack or zig zag is fine). If you use a sewing machine, you may have to unpack the reserve to facilitate the work.

2) In the middle of the pocket is the base of the release riser. There is space next to this riser for the housing to fit, so no modification need be made directly on the pocket. On the backpad, undo the stitching on the backpad for about an inch just to the left of the riser end as shown. Be careful once again not to cut the stitching right on the binding tape. One end of the resulting opening should already be backstitched and should not require reinforcement. To keep the stitching from coming undone any further on the other side of the opening, tack the

edges with either waxed tacking cord or a sewing machine, as shown in Illustration #2/4-55b.

3) Thread the cable through the two spaces in the back pad and into the pouch so that it is under the release riser. To do this, you will need to use a piece of stiff wire (a straightened-out coat hanger with a rounded or taped end will work fine). Run the wire under the back pad from the riser to the diagonal. Slide the housing over the wire from the diagonal to the riser as shown in Illustration #2/4-56. Carefully remove the wire.



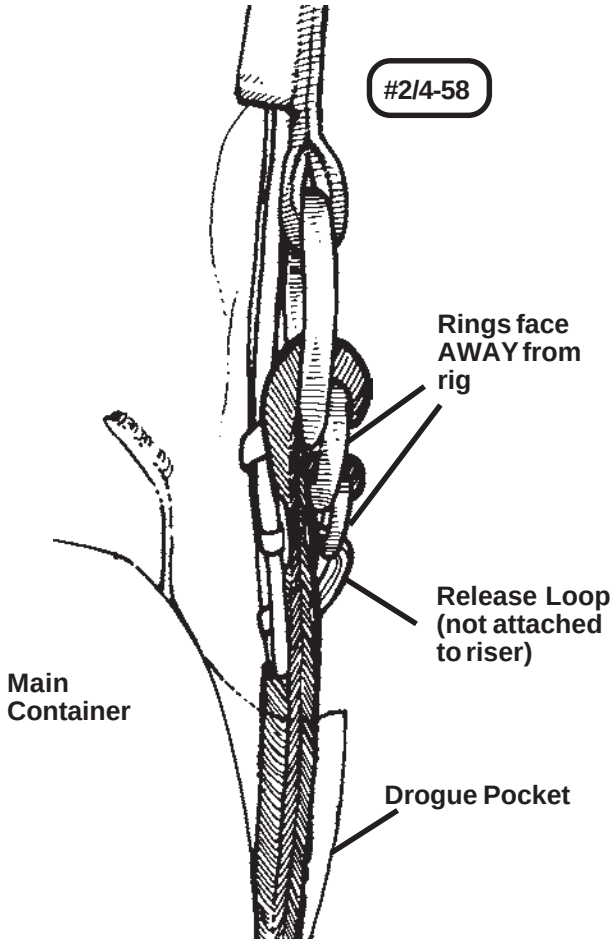


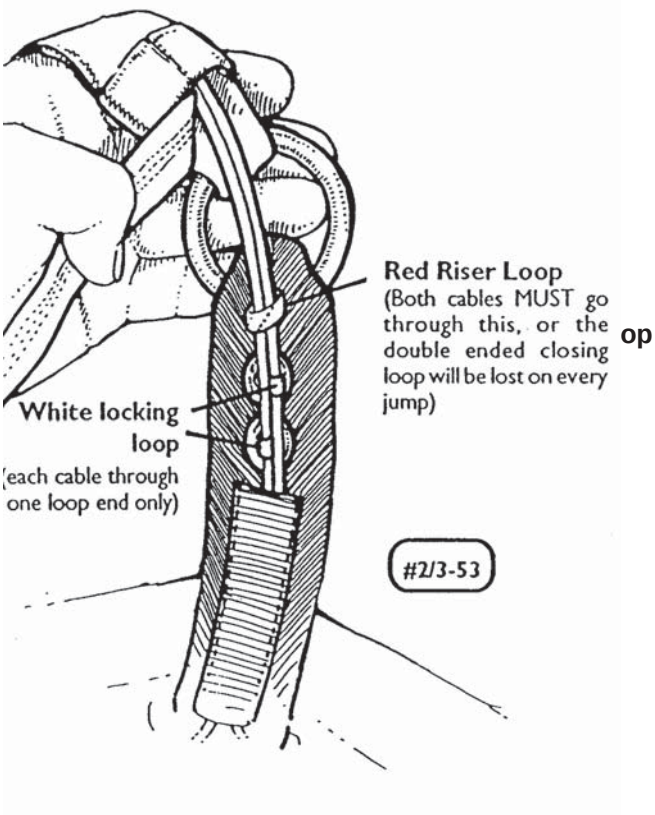
4) Tack the end of the cable onto the back of the release riser end as shown in Illustration #2/4-57. Use six turns of waxed tacking cord. The end of the cable should be about half an inch below the L-bar.

Installing the new drogue release riser: The new drogue release riser is designed to accept a special double-ended loop and two drogue release cables.

1) To install it, simply use a flat blade screwdriver to undo the L-bar inside the drogue pouch, and replace the old riser with the new version. Be sure the rings on the riser face away from the rig as shown in Illustration 2/4-58.

2) There will now be two yellow cables running up the back of the release riser; one for the left hand drogue release and one for the right hand drogue release. Both cables run through the same channels on the back of the riser and into the opening of the Kevlar drogue bridle.





3) The new release loop has two open ends and is not permanently attached to the riser. One end of the loop goes through the top grommet and is secured by one cable, the other end goes through the small ring and through the bottom grommet and is secured by the other cable as shown in Illustration 2/4-59. It doesn't matter which end of the loop goes with which cable. Just be sure that each cable goes through only one end of the loop.

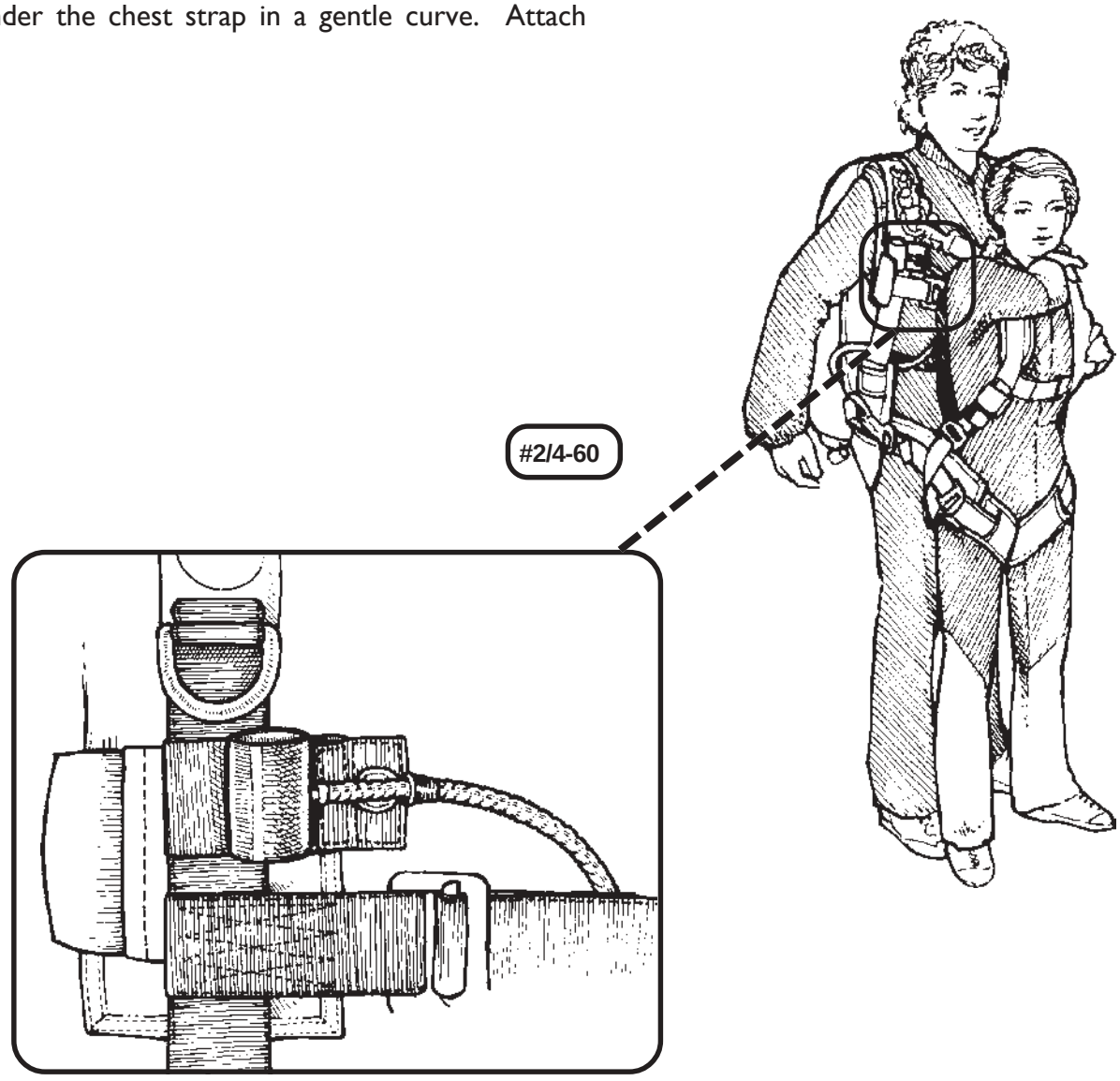
4) There is a red loop above the grommets on the release riser. It is important that both yellow cables go through this loop. This will prevent the double ended release loop from being lost when the drogue is released.

Installing the handle on the Tandem Instructors harness

Some Tandem Instructors prefer the student not have access to any handle. In this situation, the right hand drogue release handle can be left attached to the Tandem Instructor's harness. Listed below are four recommended locations.

1) MLW Above Chest Strap:
Route handle behind the right main lift web (MLW), under the chest strap in a gentle curve. Attach handle to MLW above chest strap, below the D-Ring, and next to the breakaway handle as shown in Illustration #2/4-60.

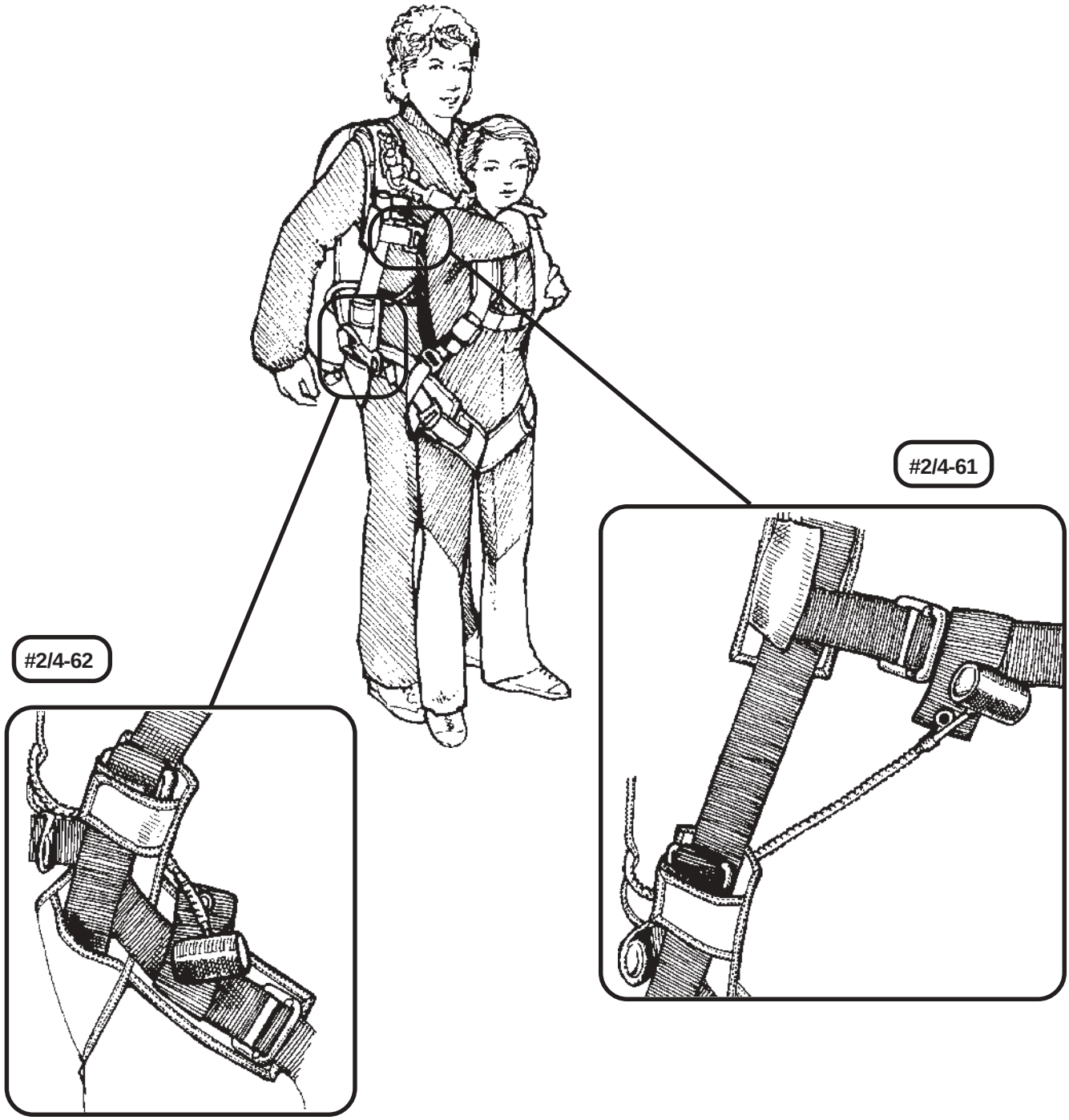
2) MLW Below Chest Strap:
Route the handle from backpad directly to the right main lift web. Attach the handle to the MLW below the chest strap, and above the MLW adjustment.



3) On the Chest Strap:
Route the handle behind the right main lift web and directly up to the chest strap. Attach the handle as shown in illustration #2/4-61.

4) Upper Leg Strap:
Route the handle behind the right MLW, and directly down to the right upper leg strap as shown in illustration #2/4-62.

A NOTE ON USE OF THE SECONDARY DROGUE HANDLE: If the secondary drogue release handle is installed, and is not to be used by the student, the Tandem Instructor should use it every other jump to open the main canopy. Frequent use will reinforce the muscle-memory reaction necessary to operate this handle during an emergency.



Installing the handle on the student harness

The secondary drogue release will be attached to the student as you hook them up in the aircraft prior to the jump. Follow these steps for ease of hook-up:

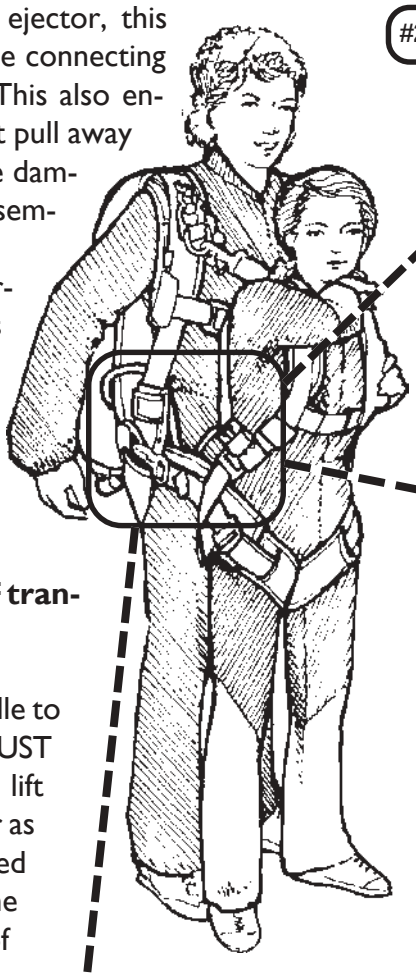
1) Attach right lower quick ejector, this allows freedom to move while connecting the drogue release handle. This also ensures that the student can not pull away from you, preventing possible damage to the drogue release assembly.

2) Attach handle to student harness as shown in Illustrations #2/4/63-64a.

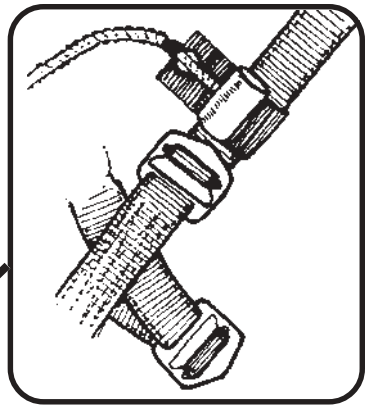
3) Complete the hookup process by attaching the left side quick ejector, and both top snaps and locking pins.

Handle placement for AFF transition

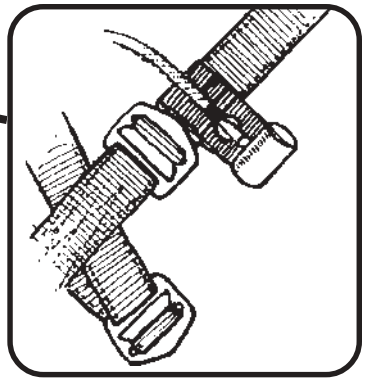
NOTE: When attaching handle to student harness, the housing MUST be routed UNDER the main lift web of the Tandem Instructor as shown in #2/4-64. If it is routed to the outside of the MLW, the housing could get in the way of drogue deployment.



#2/4-63

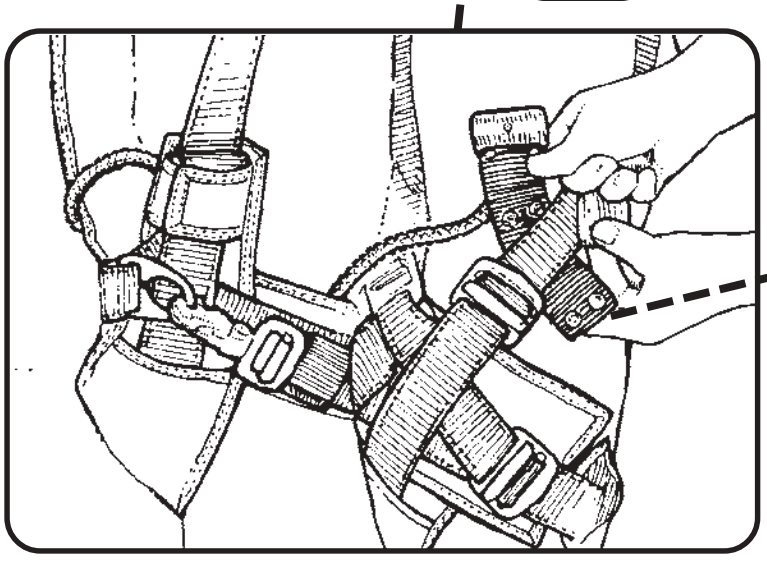


RIGHT: Domed ends of snaps are just under the handle, on top of main lift webbing. Handle lays on main lift web.



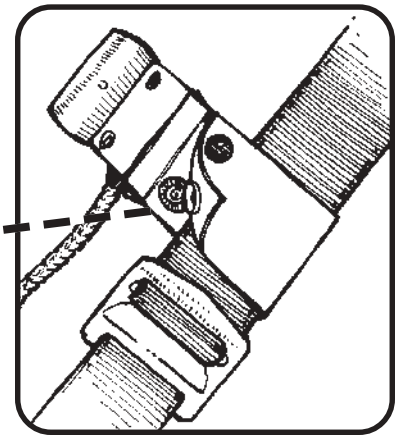
WRONG: Domed side of snaps are on backside of main lift web. Handle sticks out beyond main lift web. **WARNING:** If pulled in this configuration, the whole handle set-up could detach from the main lift web.

#2/4-64



Fold up and Attach Snaps

#2/4-64a



Disconnection after landing:
After landing the drogue release handle must be disconnected from the student harness prior to disconnecting the student. If the handle is not disconnected and the student walks away, this will jerk the handle assembly and put excess strain on the housing and tacking which holds it in place. Following disconnection the Tandem Instructor should attach the housing and handle to his system, in one of the appropriate locations.

The secondary drogue release handle must never be left dangling, even when the system is packed and sitting in the hangar. After every jump, the Tandem Instructor should detach the student completely and then attach the handle to his own harness. Attach the handle in the appropriate location as soon as the jump is completed so that no changes will be necessary if the handle is to be left with the Tandem Instructor on the next jump.

This is very important. If the handle was to be left loose inadvertently, or on the student as they walk away, it could cause: A) damage to the housing; B) a malfunction of the drogue system; or C) entanglment with the main or the reserve.

Note: Read this section carefully before placing the secondary drogue release handle within the reach of the student on any jump.

If the student is to release the drogue:
The student must receive extensive ground training before allowing them access to the drogue release handle. The right hand drogue release can be an excellent training aid for the student when used properly, and can be integrated into many different types of training programs.

Warning: The student should not have access to the drogue release handle if a videoman or relative workers are present on the jump. If the student should release the drogue prematurely, while jumpers are above, the result could be disastrous.

Note: If both handles (primary drogue and auxiliary drogue release handles) are pulled, the closing loop will be lost. For this reason, always assign your student an opening altitude higher than your own.

Chapter 5: Tandem Vector reserve packing instructions

Note: This section supplements the reserve packing video available through Relative Workshop or its dealers.

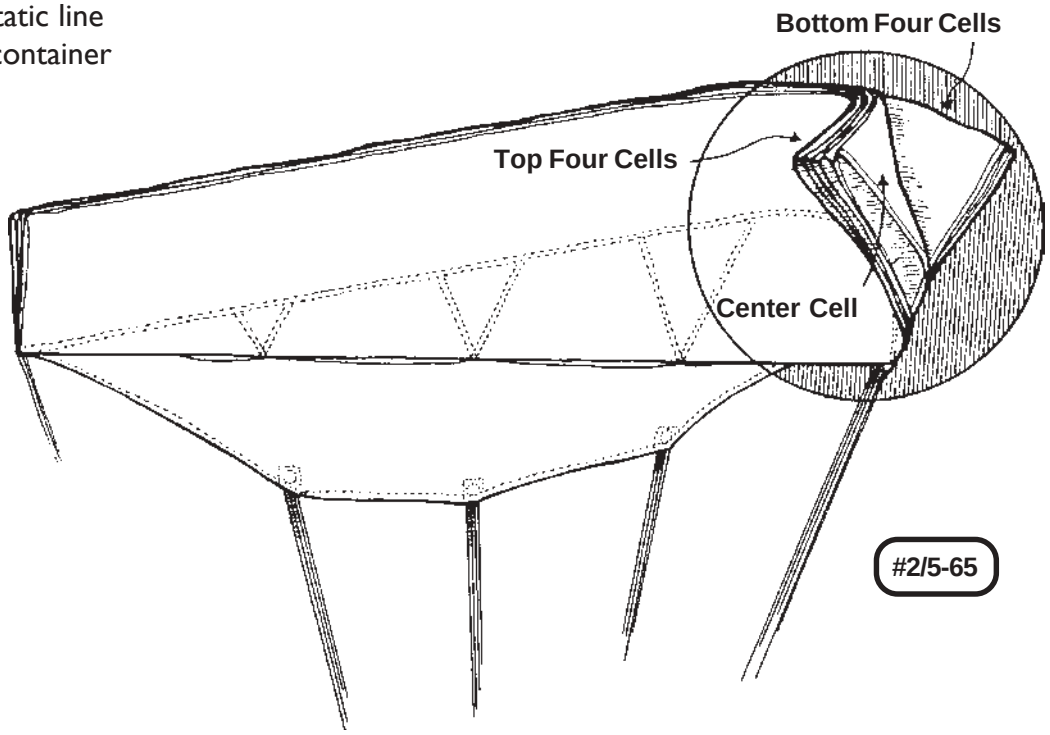
Rigger must be thoroughly familiar with packing free-bag ram-air reserve systems

The reserve packing section is split into these groups of steps:

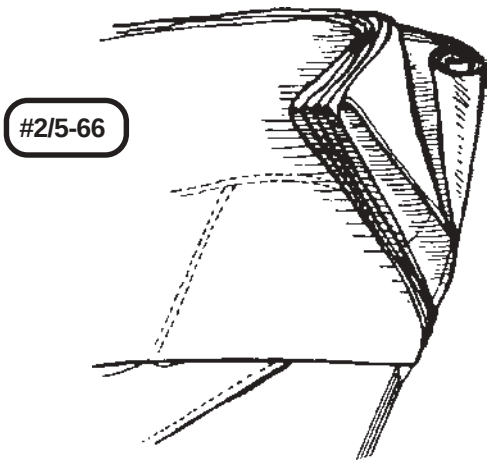
Tools
Folding the reserve canopy
Attaching the reserve steering toggles
Setting the brakes
Reserve steering system
Installing the reserve static line
Placing the bag in the container
Closing the container

Folding the reserve canopy

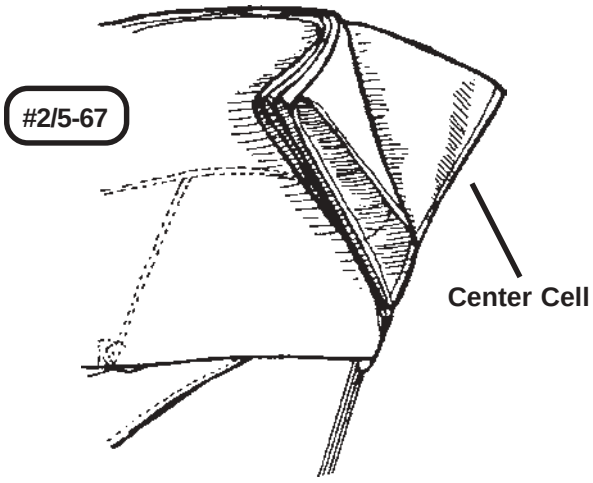
1) Flake canopy neatly on its side, count off top five cells and fold them back as shown in Illustration 2/5-65.



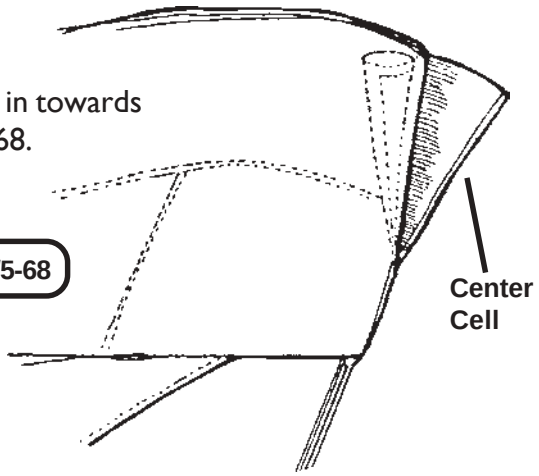
2) Take the bottom four cells and roll them in toward the center as shown in Illustration 2/5-66.



3) Pull the middle cell back to the center as shown in illustration 2/5-67.



4) Take the top four cells and roll them in towards the center as shown in Illustration 2/5-68.



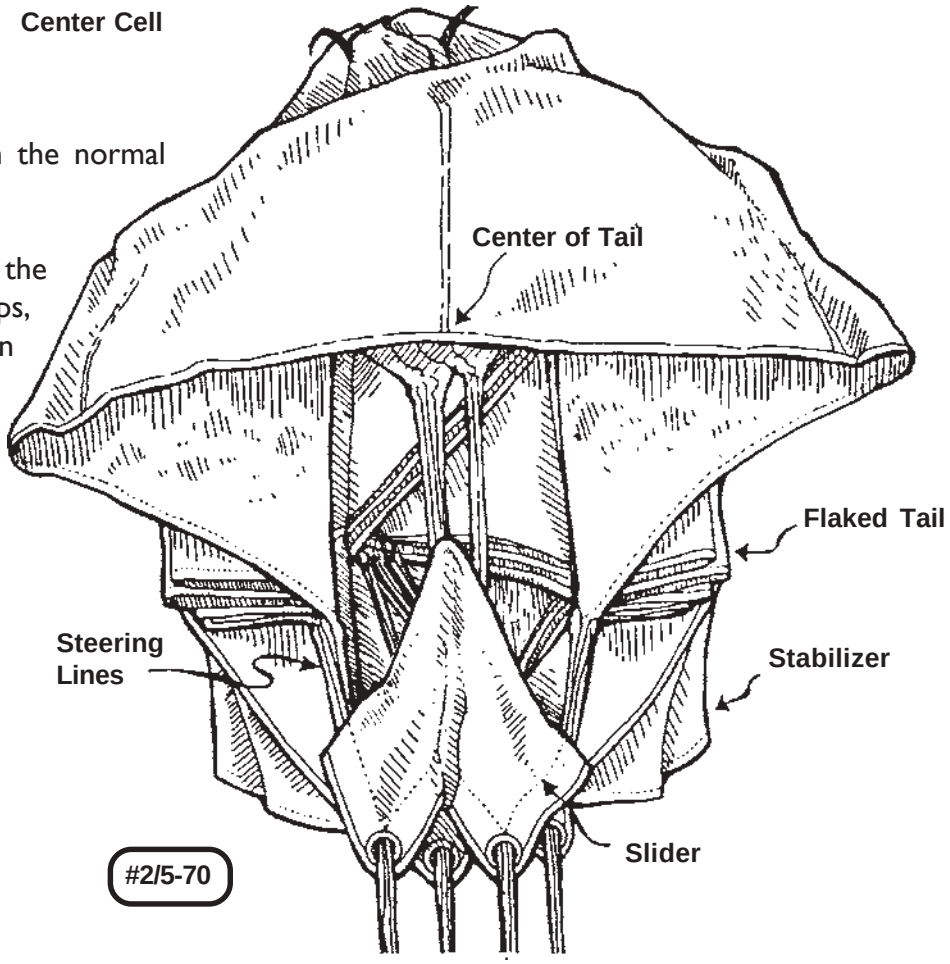
5) Fold the center cell in between the canopy halves.

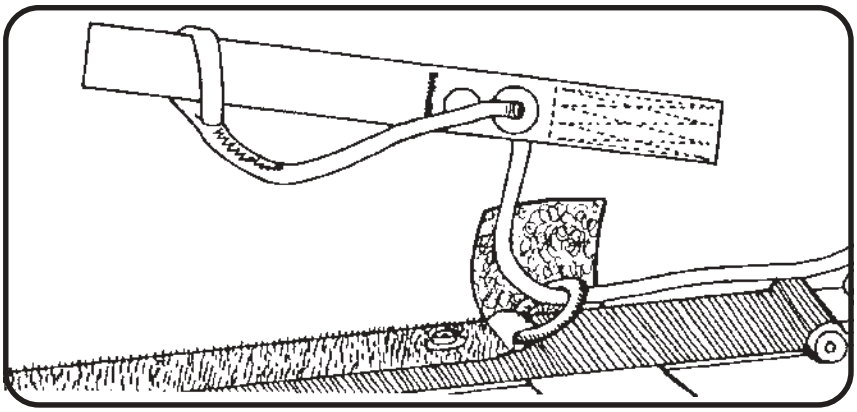
6) From the top of the canopy, this packing method looks like illustration #2/5-69, with both sides rolled in towards the middle and the center cell tucked in between them. With both sides rolled inward and the center cell left open, the canopy can now open in a more orderly manner; from the middle out, instead of from one side as with the old packing method with the nose rolled all to one side.

7) Stack canopy on top of itself in the normal manner (S-folds).

8) Set deployment brakes by passing the riser loop through the two larger loops, and then through the riser ring as shown in Illustration #2/5-72 (see next page). Be sure to stow the extra brake line and close the Velcro cover over the set brakes.

9) Flake the tail and stabilizers neatly and pull up slider as shown in illustration #2/5-70.



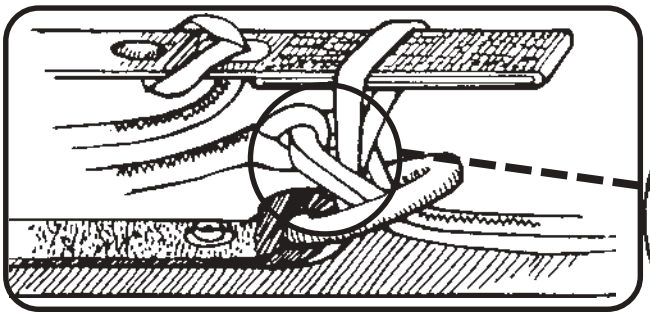


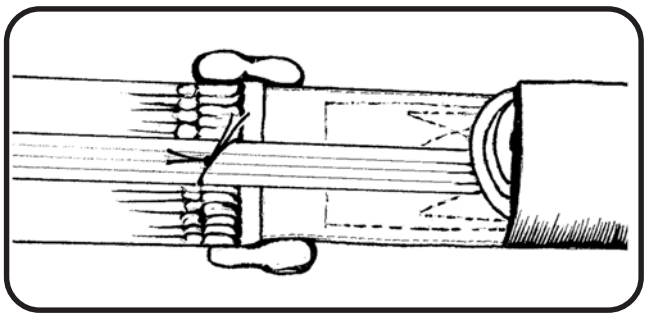
#2/5-71

Attaching the reserve steering toggles

Put loop on end of steering line through toggle grommet and then put the BOTTOM of the toggle through the loop as shown in Illustration #2/5-71.

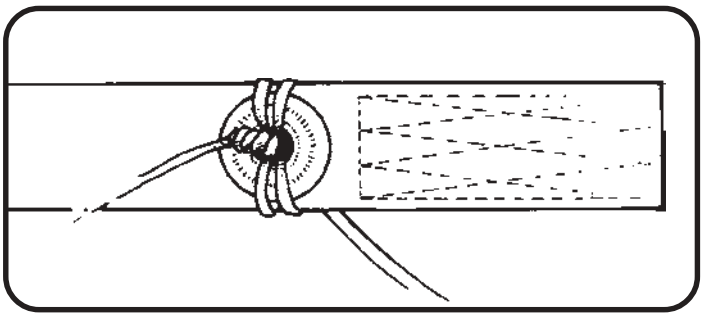
Reserve Steering System
Proper Brake Setting





#2/5-72

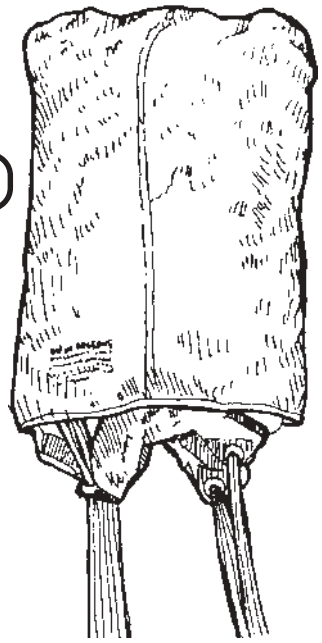
Secure the steering/control lines to the respective L-bars with doubled Seal thread. This will reduce the possibility of the lines catching under the corners of the L-bars.



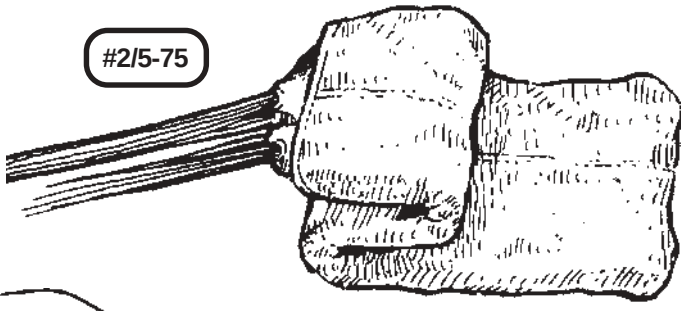
#2/5-73

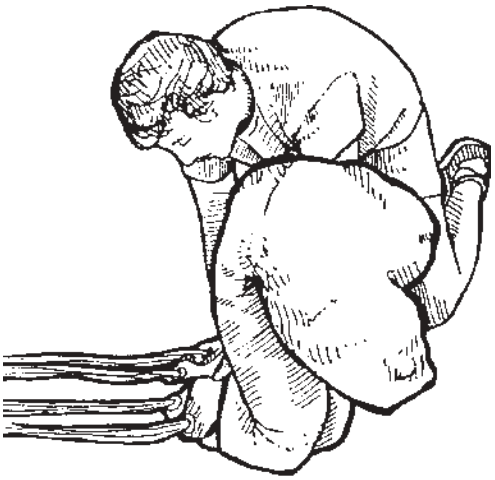
If the end of the steering line does not have a loop, thread the end of the line through the grommet in a figure 8 pattern and tie off with a surgeons knot as shown in illustration #2/5-73.

10) Pull the center of the tail down and wrap around canopy. dress canopy to a width 4" (10cm) wider than the bag (2" or 5 cm on each side) as shown in Illustration 2/5-74.

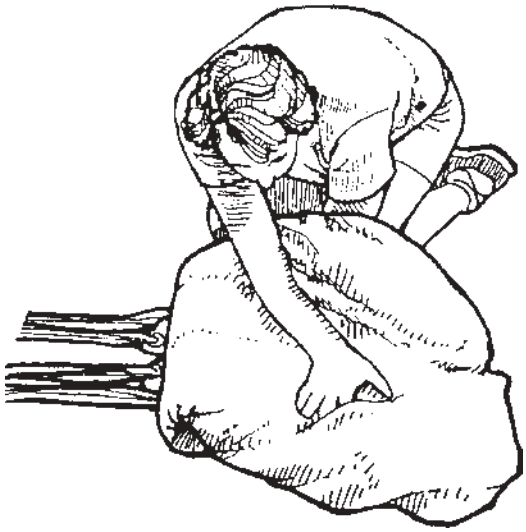

#2/5-74

11) Stack canopy on top of itself, making each fold no longer than the distance from the mouth of the bag to the grommets in the center of the bag as shown in Illustrations #2/5-75 through 78.


#2/5-75


#2/5-76

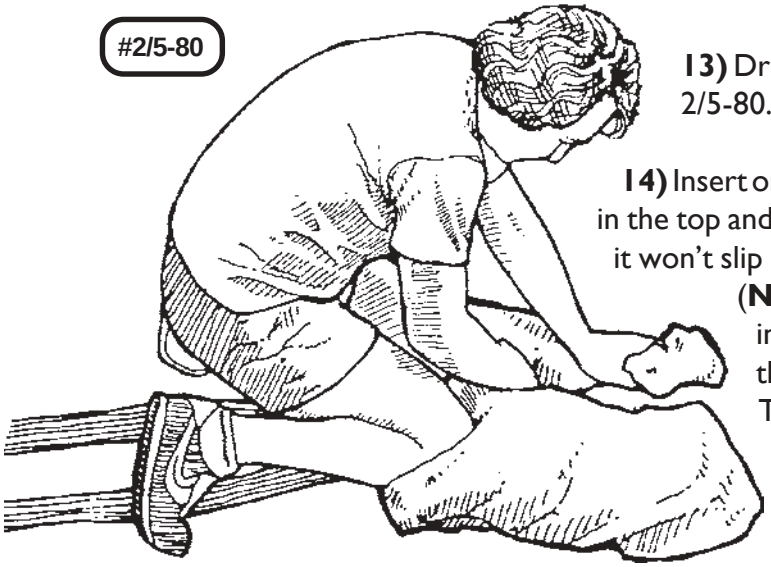

#2/5-77


#2/5-78

12) After the canopy is stacked on itself, unfold the top portion into two sections or "ears" as shown in Illustration 2/5-79.

#2/5-79

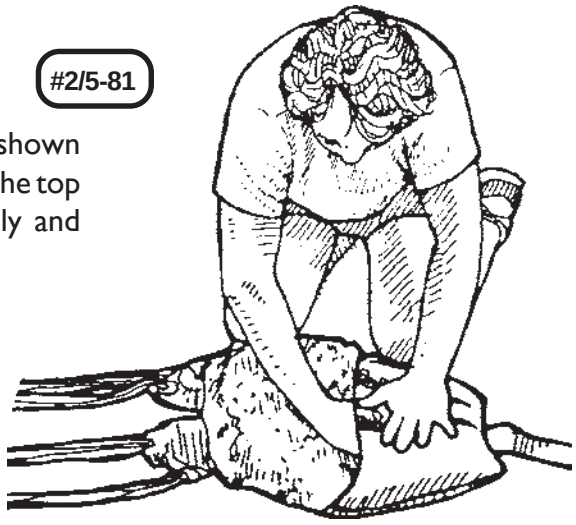
#2/5-80



13) Dress each section neatly as shown in illustration 2/5-80.

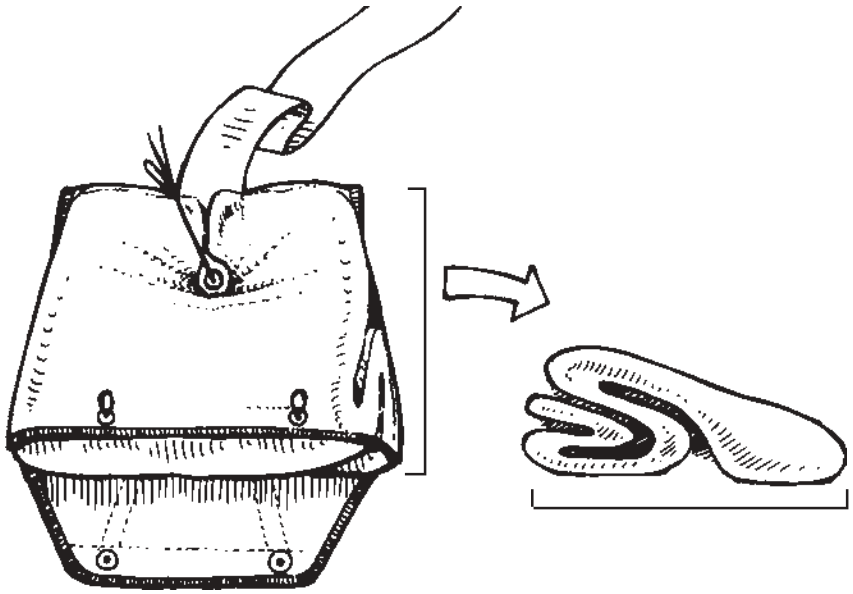
14) Insert one end of a pull-up cord through the grommets in the top and bottom of the bag. Tie it to the other end so it won't slip out during the rest of the packing procedure. (**Note:** Some riggers prefer to use a T-bar instead of a pull-up cord, inserting it through the bag from the bottom). This pull-up cord or T-bar will be used later to pull the locking loop through the bagged canopy.

#2/5-81

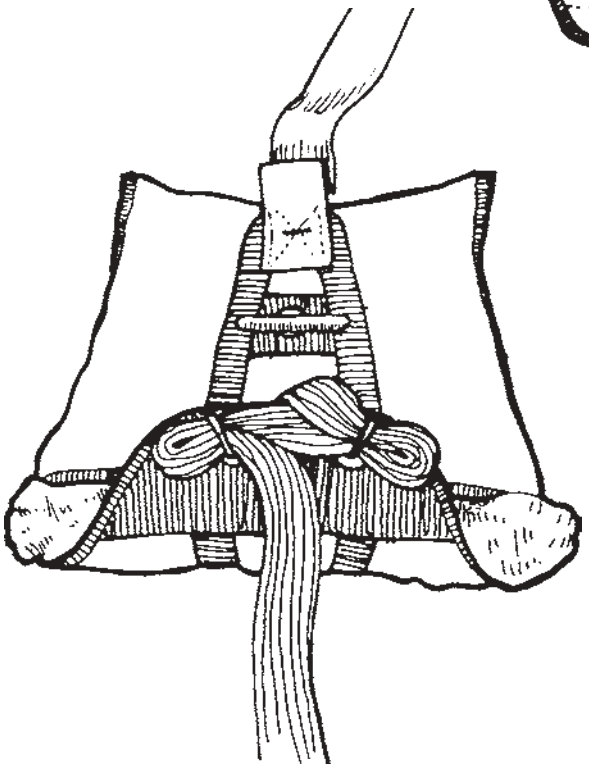


15) Carefully slide the bag over the canopy as shown in Illustration 2/5-81, pushing each "ear" into the top corners of the bag, filling the corners evenly and leaving a tapered shape.

NOTE: Illustration #2/5-82 shows how the canopy is stacked into the bag.



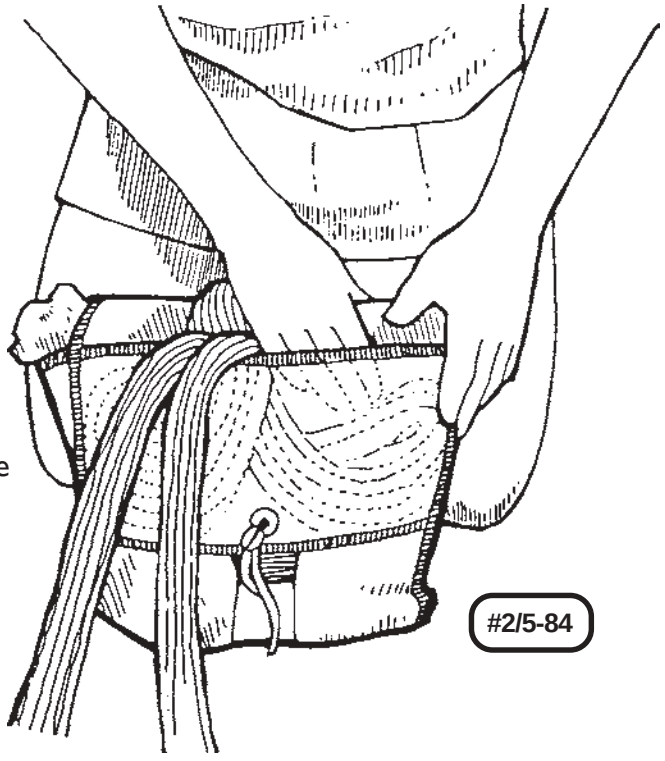
#2/5-82



16) Lock the bag closed with two bytes of suspension line as shown in Illustration #2/5-83. (A continuous nylon covered elastic loop is used, NOT rubber bands).

#2/5-83

17) Stow the remainder of the suspension lines into the pouch on the underside of the bag using folds that extend from one side of the pouch to the other as shown in Illustration #2/5-84. Be sure none of the lines are trapped between the Velcro at the mouth of the pouch.

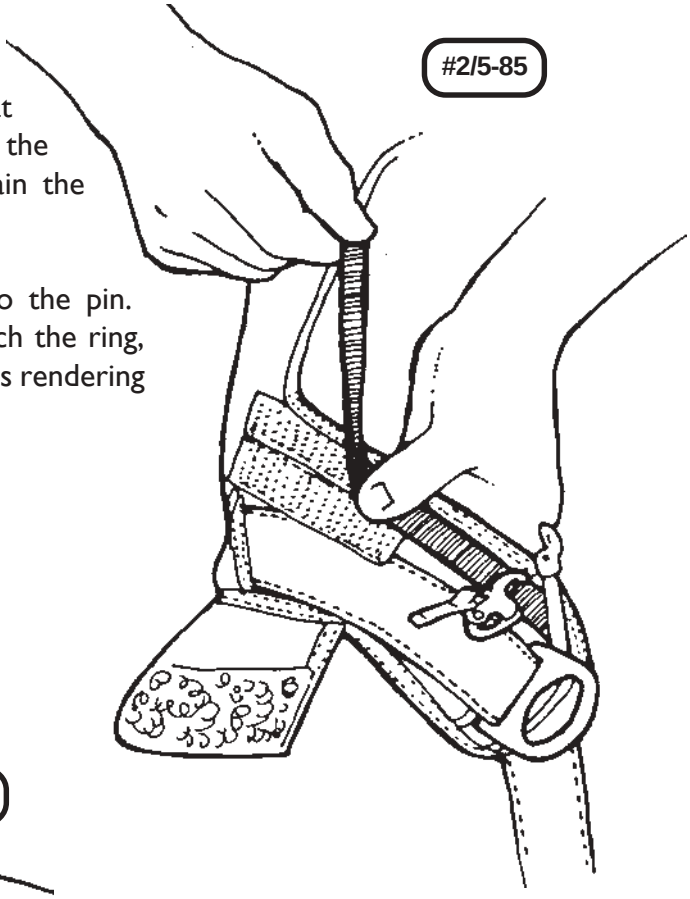


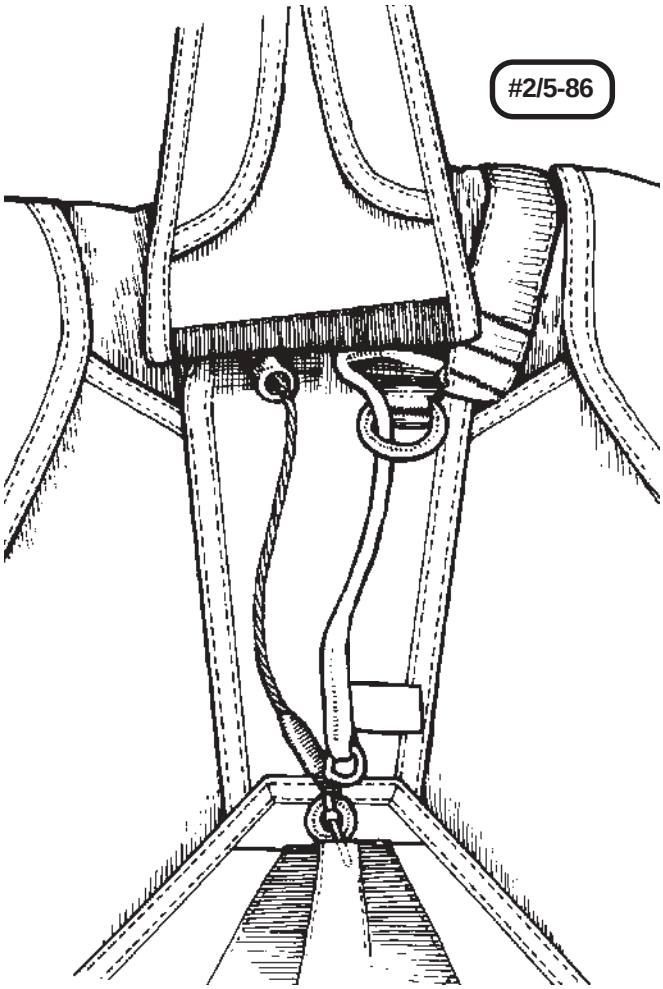
#2/5-84

Attaching the reserve static line

18) Inspect the reserve lanyard (RSL) for damage, and replace if necessary. Check that the snap shackle is operating smoothly and that the spring will retain the locking pin. Be sure the Velcro is clean and sufficiently tacky to retain the reserve lanyard.

Note: Carefully inspect the ring attached to the pin. Pulling on the ball-handle too often can stretch the ring, possibly causing it to separate from the pin, thus rendering the shackle inoperative.

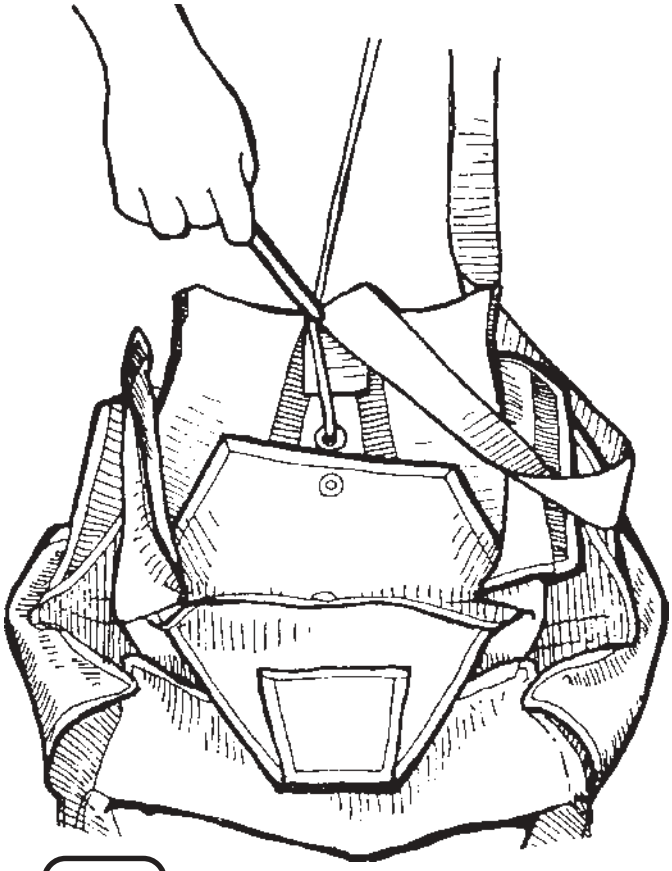




19) Route the pin-end of RSL through guide ring on flap #5. Mate the small yellow tab of Velcro on the reserve lanyard (about 1/2" (1.3cm) above the pin) to the yellow pile Velcro attached to flap #5 as shown in Illustration #2/5-85.

20) Route the reserve lanyard along its path next to the right-hand riser up over the shoulder to just above the reserve flap as shown in Illustration #2/5-86.

Note: The RSL snap shackle will be attached to the right main riser after the reserve is completely packed into the container.



#2/5-87

23) Place the bagged canopy in the pack tray, taking extra care to fill the lower corners. Then use the pull-up cord to pull the locking loop up through the bagged canopy. Secure it with a temporary locking pin.

Closing the Container

24) Close the inside bottom flap (flap#1), and secure with a temporary pin. Pack the first third of the bridle in the container by making long S-folds in the bridle from the top center of the bag to the bottom right hand corner of the reserve container as shown in Illustration #2/5-88.

Placing the bag into the Container

21) Set the bagged canopy on the main container and position the reserve risers in the reserve pack tray. Fan the links rather than stacking them on each other, placing the rear links to the outside. Be sure to place the reserve risers far enough in the pack tray so they will lie flat over the shoulders.

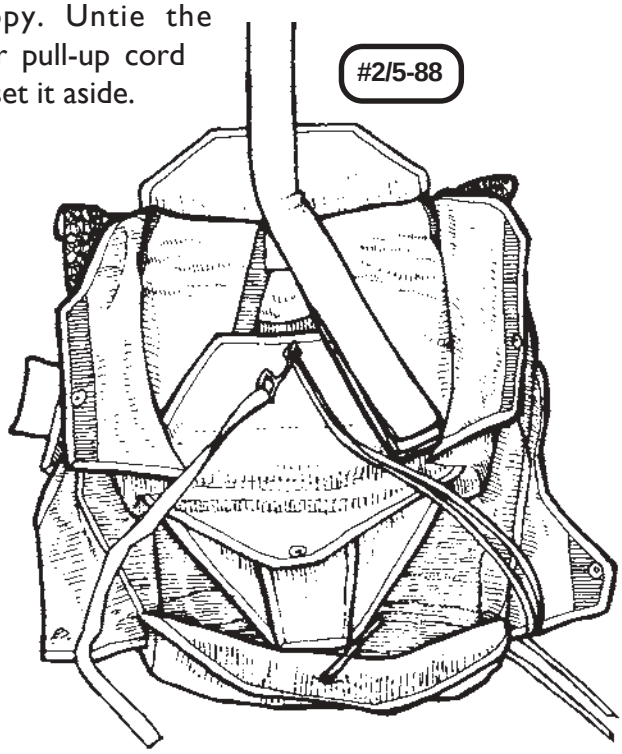
22) Pass the second pull-up cord through the reserve locking loop.

NOTE: Two (2) types of reserve closing loops are approved in Vector Systems. The standard Type II line sleeving, flattened and sized, 3/16" wide; or the CYPRES loop material, a Polyamide with 400 lb. tensile strength, 1.6mm wide.

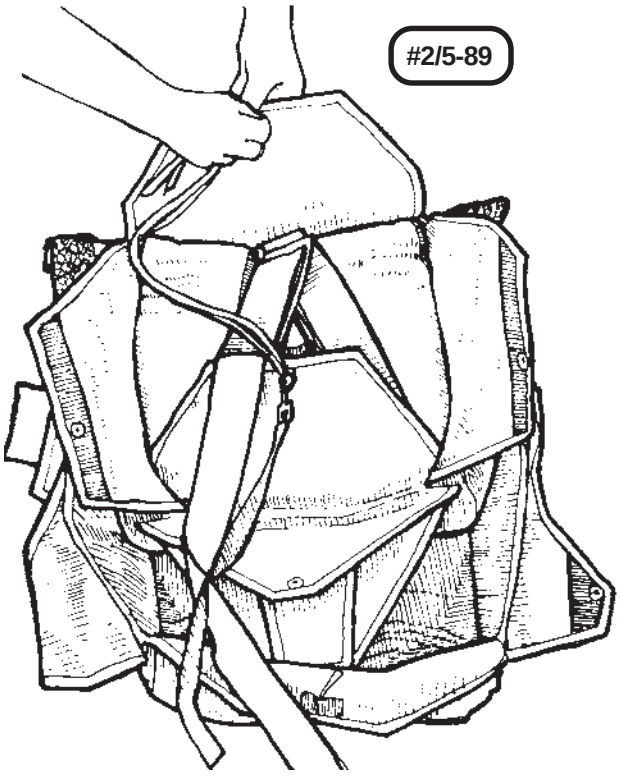
If a T-bar was passed through the bag, thread the ends of the pull-up cord through the hole in the end of the T-bar. Remove the T-bar from the bagged canopy, pulling the locking loop and pull-up cord through it as shown in Illustration #2/5-87.

If a pull-up cord was passed through the bag, untie it and tie the end protruding from the underside of the bag around both ends of the pull-up cord that was passed through the locking loop. Carefully pull on the other end to draw the pull-up cord and locking loop through the packed canopy. Untie the other pull-up cord and set it aside.

#2/5-88



25) Carefully tuck the bottom of the S-folded section under the inside bottom flap (flap #1) as shown in Illustration #2/5-89. Repeat the process on the left side with the second third of the bridle, making the S-folds from the top center of the bag to the lower bottom left hand corner of the container and tucking the bottom sections under the inside bottom flap. When completed, close the top inside flap (flap #2). Make sure there is at least SIX feet (2 meters) of bridle left loose between the left corner and the base of the pilot chute.



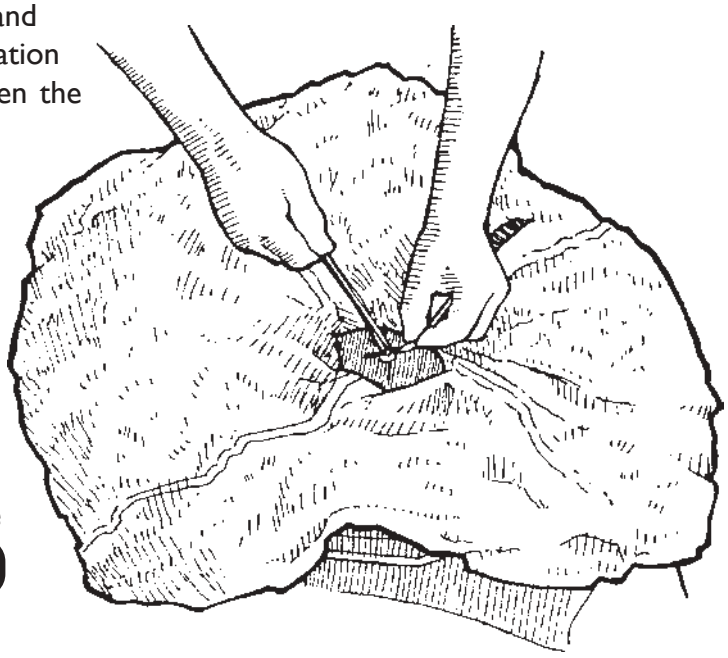
NOTE: In the first few days after it is packed, the reserve will compress and the new closing loop will stretch. This may cause the pilot chute to "stand-up" slightly inside the closed pack. It may be necessary to open the container and shorten the loop. To avoid this, some riggers close the container with a very short loop WITHOUT the pilot chute, wait a day or two for the canopy to compress and the loop to stretch and then re-close the container WITH the pilot chute and seal it.

26) Pass the pull-up cord through the bottom of the pilot chute and out the top as shown in Illustration #2/5-90.

27) Making sure the base of the pilot chute is centered over the loop, collapse the pilot chute and lock it with a temporary pin as shown in Illustration #2/5-91. Pull all the canopy fabric from between the spring.

After pulling the fabric from between the spring, check to make sure the pilot chute base is centered under the crown.

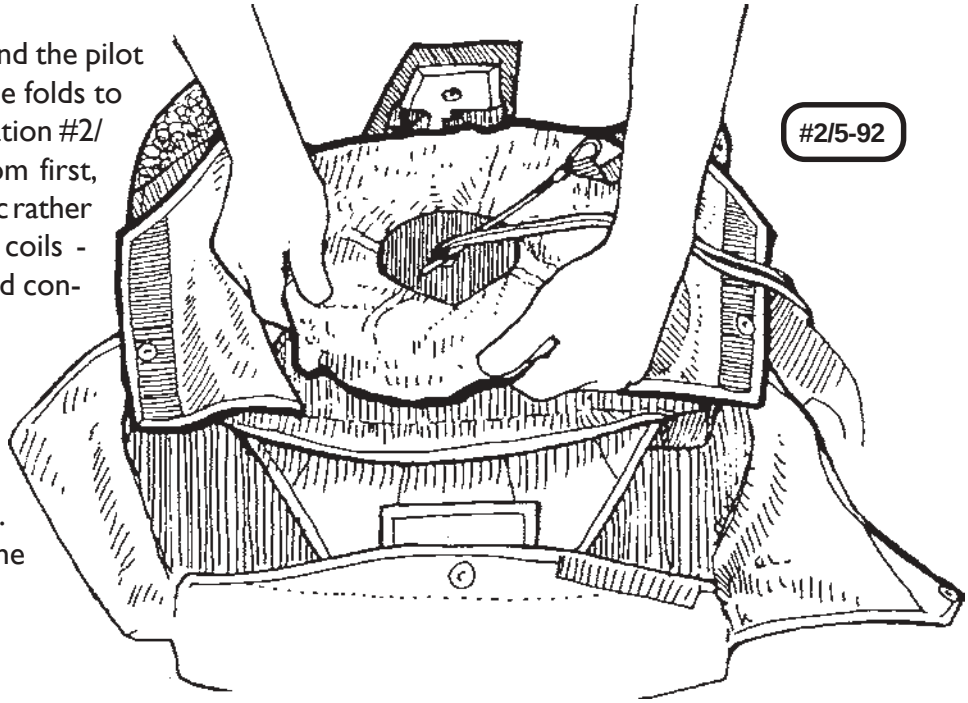
Now fully collapse the spring to see how much loop can be pulled through the top of the pilot chute. If you can pull more than 1/2 to 3/4 inches through, the loop is too long. Now would be the best time to open the container and shorten the loop.



#2/5-91

28) Lay the fabric flat all around the pilot chute and fold it under in wide folds to the center as shown in Illustration #2/5-92. Fold the top and bottom first, then the sides. Folding the fabric rather than stuffing it between the coils - reduces the bulk of the packed container.

29) Thread the pull-up cord through the side flaps (flaps #3 and #4) and close and secure with a temporary pin. Make sure that the folds in the pilot chute stay flat and neat.

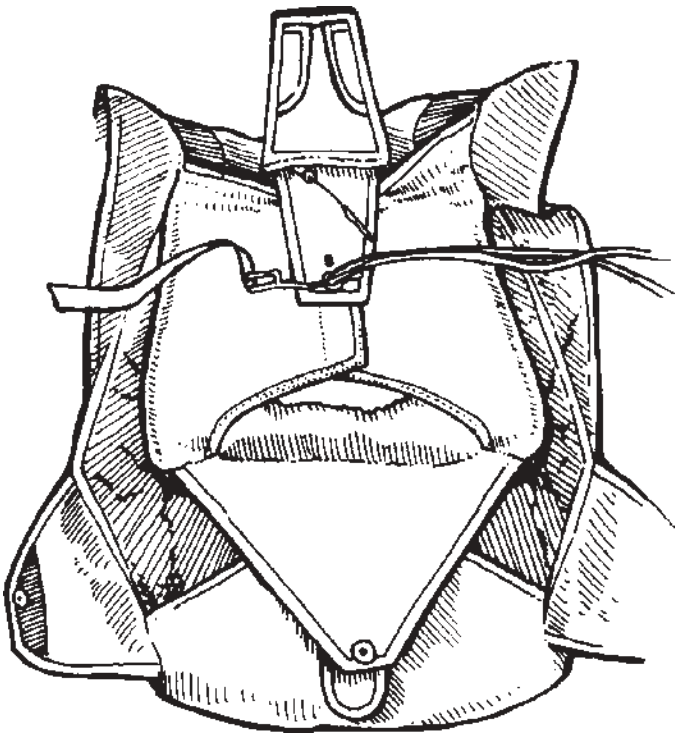


#2/5-92

WARNING: Do NOT tuck pilot chute fabric down the sides of the free bag. Doing so could impede the launch of the pilot chute.

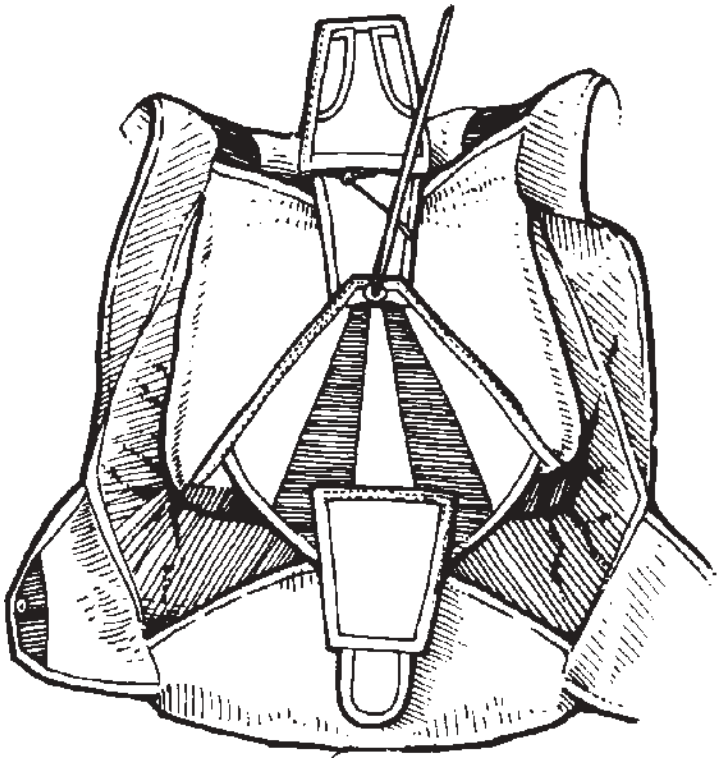
30) Thread the pull-up cord through the top reserve flap (flap #5). Remove the temporary pin, pull the loop through and secure once again with same temporary pin as shown in Illustration #2/5-93.

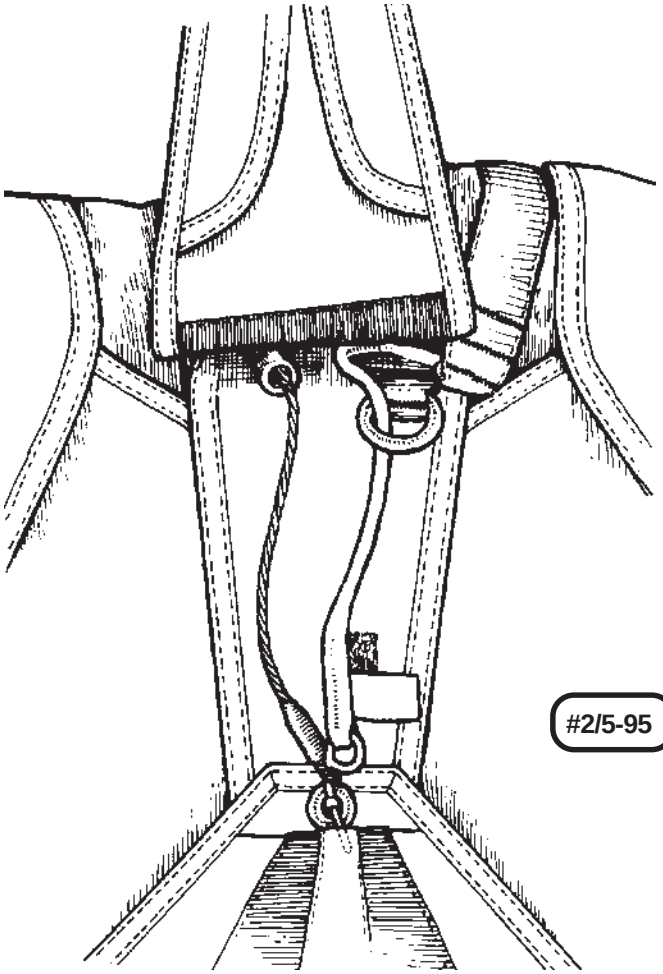
#2/5-93



31) Thread the pull-up cord through the bottom reserve flap (flap #6) and insert same temporary pin as shown in Illustration #2/5-94.

#2/5-94





#2/5-95

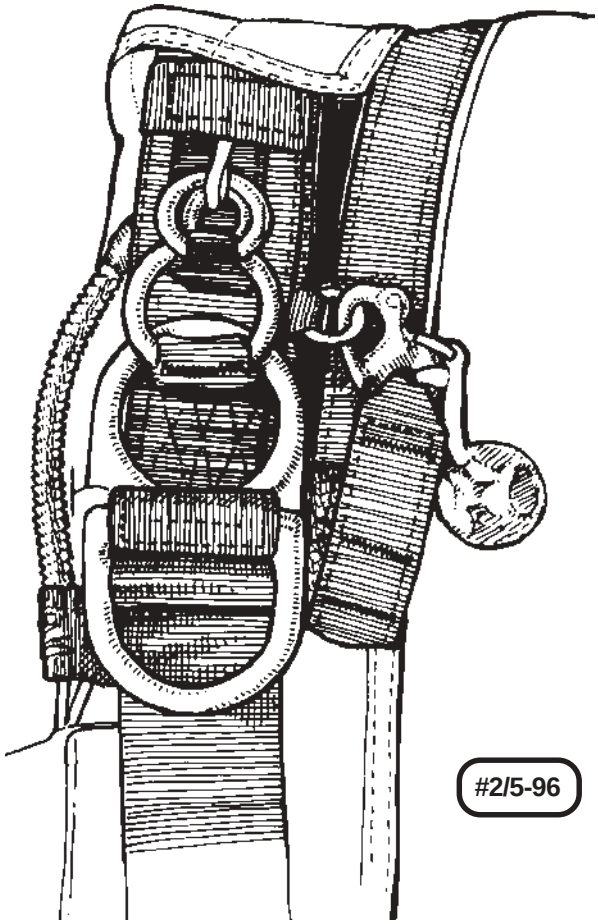
32) Check the container closing pin for damage. It should be curved from the eye to half way down its length. The rest of the pin should be straight.

33) Be sure the container closing pin (on end of reserve static line) is threaded through the guide ring on flap #5, then through the loop on the end of the reserve ripcord and then through the container closing loop. (BE SURE TO REMOVE THE TEMPORARY CLOSING PIN). The end of the reserve pin should easily slide into the protective pocket on flap #6 as shown in Illustration #2/5-95.

34) Dress container, seal, sign, and log the pack job.

35) Count your tools.

36) Attach right main riser (the one with the RSL ring) to the right side harness ring. Attach the RSL snap shackle to the small RSL ring. Make sure the pile velcro on the lanyard is securely mated to the hook velcro on the comfort pad. Attach the yellow velcro tab to the backside of the RSL to properly position ball handle as shown in illustration #2/5-96.



#2/5-96

SECTION 3
INSTRUCTOR TECHNIQUES - NORMAL

This section will better prepare you for your role as the instructor. Your responsibilities will be presented in the following stages of the jump:

Preparation
In-aircraft and exits
Freefall/Drogue-Fall
Canopy control

CHAPTER 1: Preparation

This section will cover the following:

Criteria for jumping
Overview of jump
Fitting harness to student
Briefing the student
Pre-flight gear check

Criteria for jumping

The following is the minimum criteria to be followed and will be discussed under the headings of:
A. Personal
B. Geographical

A. Personal requirements:

Age
Physical condition
Weight
Size

Before any Tandem jump, it is important to determine that the student meets a few basic criteria. There are very few restrictions on who may jump, but the few guidelines put forth here must be followed carefully in order to protect yourself, the student, and the entire Tandem program. The four student requirements are:

1) Age: The student must be considered an "adult" in the jurisdiction in which the jump is being made. In other words, the student must be able to legally enter into a contract. In most cases, the age for this is 18. **Warning:** It is the responsibility of the drop zone and the Tandem Instructor to insure the student is of legal age.

2) Physical condition: There is very little that precludes someone making a Tandem jump. One of the great advantages of the Tandem program is that people who would never have been able to skydive may now enjoy the thrill of the sport. Basically, the student should be in fairly good shape, not be suffering from extreme frailty or extreme old age, and have no heart condition or other debilitating ailment.

3) Weight: This is an important consideration, and there are a number of factors to be considered. First, the total combined weight of the Tandem Instructor and the student (not including gear) should not exceed 425 lbs. Tandem Instructors should increase weights 15 pounds at a time while gaining experience.

4) Size: There are two considerations here; Instructor/student size ratio and the aircraft being used.

a) Instructor/student size ratio: Basic common sense dictates that a small Tandem Instructor should not take a large student. Follow these criteria when matching Tandem Instructor and student:

* Tandem Instructor must be able to "handle" the student he/she is jumping with. Consider the level of difficulty for the aircraft being used.

* The newly licensed Tandem Instructor should be equal to or greater than the student in size and strength, and must be able to steer and flare the canopy without the help of the student. Only after considerable experience should a Tandem Instructor attempt to take students larger than himself.

b) Aircraft: If a large Tandem Instructor is taking a large student, it may be almost impossible for them to comfortably get out of a Cessna. However, the same pair could exit easily out of a Skyvan, DC-3, or similar aircraft. Aircraft availability must be taken into consideration when deciding if a student may

jump.

B. Geographical requirements:
The following may play a part in how you decide who to take on a given day or at a specific location.
Weather
Terrain

1) Weather assessment:

a) Wind speeds:
For Tandem jumping, the optimum range for winds is 5 - 20 mph. All jumpers should realize that very high winds are unsafe to jump in. In the case of Tandem jumping, we need to realize that it may be equally unwise to jump in extremely low winds. It is a hard point to realize since sport jumping goes on in no wind conditions all the time, but it is a fact that Tandem jumping with heavy students in no wind conditions can produce final approach ground speeds which can make landings more difficult.

Heavy students with any physical malady which can prevent them from running or supporting their own weight should not be jumped in no-wind conditions.

b) Temperatures:
As the seasons change, the canopy's performance will vary as the air becomes cooler or warmer. Cooler air is always more stable and dense so the canopy's decent rate and flare performance is good. Warmer air is thinner and you may find that landings become harder. This can be noticeable even during the course of a day as the temperature rises on a hot summer day. The warmer air actually provides an effect in which the field elevation can be thought of as being barometrically higher than its geographical elevation. This effect is referred to as "density altitude". The hotter the day, the thinner the air, and the higher the density altitude, in other words, on a hot humid day, the canopy may land as if the field is at perhaps 6,000' rather than sea level - a BIG difference! On a very hot day, with a heavy student, density altitude is a factor you must take into account. Common sense, good judgment, and caution is often called for.

2) Terrain assessment:

a) Landing area selection:
If you are planning a Tandem jump at an unfamiliar spot, check the area before you jump. Note where the obstacles are, and keep track of other large open alternate landing areas. Turbulence can effect canopy flight as much as 1/4 mile away from tall obstacles. Keep these things in mind when making a note of wind direction and spotting. Think ahead and plan carefully!

b) Altitude:
When jumping at locations well above sea level, you must also take into account that the higher the ground elevation, the less effective your flare will be. If you find yourself making Tandem jumps at high field altitudes, choose lighter students till you have a good feel for the different flare characteristics the canopy will have at that location.

Overview of the jump
A) synopsis of the jump
B) video and assumption of risk agreement

A) Synopsis of the jump:
Before the first jump, it is important that the student understand what the jump will be like, and what is expected of him or her. Before the first jump, the student should have the Tandem concept explained by video, still photos, or direct observation. Inform them of the entire sequence and what to expect at each stage of the jump. Information such as exit altitude, length of freefall delay, and length of canopy ride are all motivating points of interest.

B) Video and assumption of risk agreement:
The student must view the waiver video and sign the waiver. Be careful to abide by all provisions in the exemption, such as student's age, etc... If the video machine is out-of-order or the tape is lost, it is the same as if the aircraft is inoperative. NO ONE may make a Tandem jump without seeing the waiver video and signing the waiver.

In the United States, Tandem jumping is now permitted under exemption #4047, #4047A, #4046B,

#4047C, #4047D and #4943 to FAA part 105, for the purpose of determining the benefits of Tandem jumping to the general public. You must explain the experimental nature of this program to all students before allowing them to jump. Other countries treat Tandem jumping differently. Take these differences into consideration when briefing the student.

Fit harness to passenger

1) Pre-size harness

Pre-adjust the harness so you will only have to tighten each adjustment point several inches after putting it on the student. With a little experience, it's easy to figure about how tight to make the harness before putting it on. If the student is a small woman, then all adjustment points will need to be taken in to shorten the harness. If the student is a large man, then loosen the adjustment points accordingly.

2) Position upper attachment points:

For the average size student, the harness should be adjusted so the upper attachment snaps are 1- 3 inches (3 - 8 cm) behind the centerline of the student's shoulders. During all phases of harness adjustment, always refer back to the correct position of the upper snaps.

Larger students with hefty chest dimensions may require the upper snaps to be moved further behind the centerline of the shoulder. Sometimes as much as 4-6 inches (10 - 15 cm). By moving the snaps further back, less pressure will be exerted over the main lift web during the canopy flight. If the snaps are positioned too close to the centerline, the force of the overly tight MLW can cause some students to temporarily pass out. The MLW, in this scenario, is putting pressure on blood circulation points which supply blood to the brain. If this happens to your student, reach around front and loosen the chest strap adjustment.

When snugged down, your fist should fit between the student and the chest strap. Remind student not to over-tighten anything on harness.

3) Placement of leg pads

When adjusting the leg pads, make sure they cover the inside of the thigh. One theory suggests that some students feel sick during Tandem jumps because blood circulation is cut off at the inside of the thigh (the Femoral artery). Careful adjustment of the leg pads can help alleviate this problem.

4) Chest strap adjust

Do not over tighten the chest strap. When snugged down, you should still be able to put a fist between the chest strap and the student. Also, remind the student not to tighten the chest strap or anything else on the harness while in the aircraft. When sitting down, the harness will seem looser, and the student will have the urge to make the chest strap very tight. A chest strap that's too tight will make the student very uncomfortable after the canopy is open.

Briefing the student (for the first Tandem jump):

One great advantage of Tandem first jumps is that the student does not need to know nearly as much as when making the first solo jump. The student can therefore relax and enjoy the jump rather than worry about forgetting the hundreds of facts necessary to make a jump on his own. With the student more relaxed, her mind will be free to absorb the experience and pick up specific skills impossible to teach effectively in a classroom. If a picture is worth a thousand words, a Tandem jump is worth hours of classroom instruction. In other words it is possible to over train a student before a first Tandem jump. Emphasis should be on safety and awareness.

This section is broken into two sub-sections:

A. Conducting a skills practice
B. Briefing checklist

On subsequent Tandem jumps more time can be spent in preparation for the jump and the student can be given more technical training under canopy. Remember, under this program, Tandem jumping is to be used as a student training aid, NOT for the purpose of giving "joy rides" to the general public.

A. Conducting a skills practice:

Your preparation of the student will make a great difference in how successful the jump is both in skill, performance and enjoyment. A well conducted practice will help the student in the following ways:
* Eliminate confusion, make the program clear. This will make the experience an enjoyable one.
* Increase the students confidence in the equipment, and in you, the Tandem Instructor.

Take note of the following tips. These will ensure that the practice is effective:
* Clearly explain what will happen.
* Practice with realism.
* Repetition of skills results in instinctive performance of skills.

Practice the entire hook-up and exit sequence at the aircraft.

* Obtain feedback from your student. This will let you know if further explanation is needed, and whether they are actually learning.
* Practice until perfect, and remember:
* What is performed on the ground will almost certainly be performed in the air.

B. Briefing checklist:

When performing a Tandem jump, your passenger must know the following information and drills prior to disembarking on their first jump. Complete details of these topics and more can be found in Section 5 under Student Briefing. The following will include a summarized list of key points:

Freefall body position drill
Exit practice and hookup procedures
Sit back drill
Steering and flaring the canopy
Landing practice

1) Freefall body position drill
- Have student lie down to practice realistically.
- Have the student grasp the harness in the elbows back position.
- The student's feet should be together with knees bent at 90 degrees.
- Practice arm extension, prone, if you intend your student to do it.
- Practice the signal, tap on the head, with the arm extension drill.
- **NEVER REACH AROUND IN FRONT OF THE STUDENT FOR ANY REASON**.

2) Exit practice and hookup procedures:
- Perform drill at the aircraft or aircraft mock-up.
- Practice the proper hand and foot placement and set up for the exit launch.
- Have student practice solo as well as hooked up for realism.
- Practice the whole sequence from exit.

3) Sit back drill: (For student comfort)
- This drill must be practiced on the ground
- Practice with the student's harness attached to your own to simulate tension.
- Have student slide the harness down toward the

knees 4-6 inches (10-15 cm).

4) Steering and flaring the canopy:

- Display steering toggles to your student so they understand what they are and how to grasp them. This would best be done prior to the jump.
- Explain how the canopy is steered. Explain how turns are initiated and stopped (no countering necessary), what position is full flight as well as what flaring is and how it is performed. This may be done during the canopy flight.

Practice proper hand and foot placement. Practice solo as well as hooked up for realism.

5) Landing practice:

- If the student is to assist with the landing flare, in-air practice is a must. We recommend at least three good repetitions.

Pre-flight gear check:

A. Student equipment.
B. Tandem Master harness and containers.

A. Student equipment:

Start by checking to see that your student has a proper, tight fitting jumpsuit and any other items they may need such as a leather helmet, goggles, altimeter and/or gloves. When selecting goggles make sure that they are adjusted to be very snug. As students tend to leave them looser than practical. Students wearing contact lenses should use goggles with as few air vents as possible.

Again, check the fitting of the students harness to make sure nothing has loosened off and that all webbing running ends are tucked in. Check in the following order.

- Upper snap position
- Chest strap tension
- Leg strap tension and dead-ends secured
- Proper staging of side quick ejectors

B. Tandem Instructor equipment:

Prior to checking the system, select your jumpsuit, altimeter, goggles and any other accessory items you may need. When selecting a jumpsuit pick one that is looser in the arms and legs to help give you extra drag. This will enhance stability with light passengers and help to eliminate rocking in droguefall. It is recommended that you use a wrist mount altimeter. Chest-mount altimeters positioned between you and the student will probably not give an accurate reading.

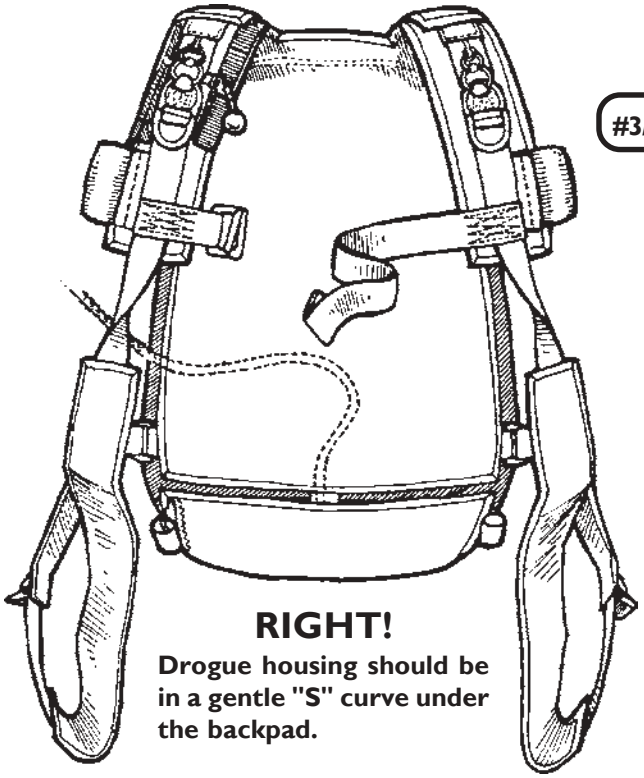
Before putting on the Tandem Vector, perform a thorough and systematic gear check. Always start your gear check at the same point and systematically move from item to item until completed. An example of this would be: start at the drogue pouch working up the back of the rig then down the front. When performing the check you should cover the following points:

Drogue handle/proper packing of drogue in pouch
Drogue 3-Ring attachment and release handle/handles
Main pin, closing loop and bridle routing
Reserve pins and closing loop, RSL routing
3 ring assemblies
Reserve static line shackle attachment
Cutaway and reserve handles
Main lift web adjustment and symmetry
Pin protection flaps and riser covers

1) Drogue handles:

Check to see that the drogue deployment and drogue release handles are easily accessible.

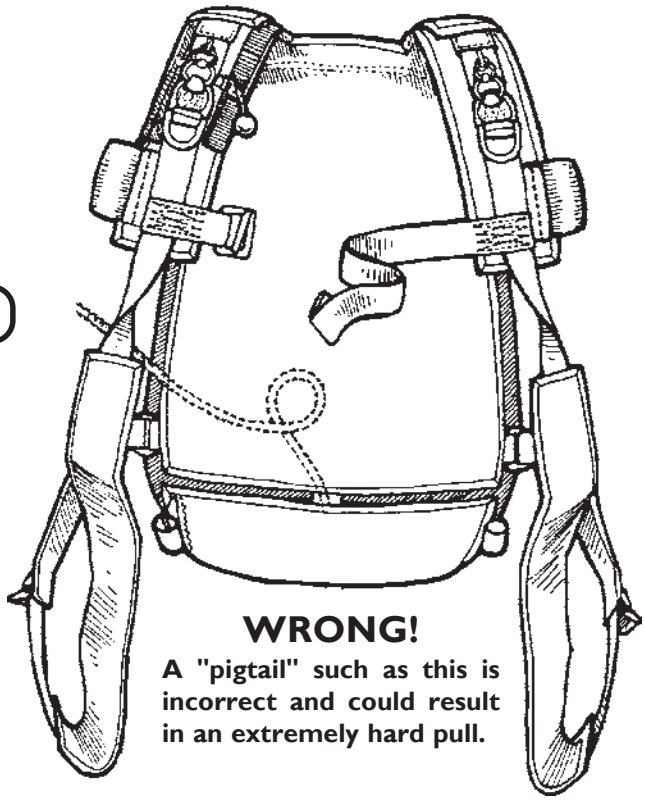
NOTE: If the secondary right hand drogue release handle is installed, be sure it it properly attached either to the student's harness or the Tandem Instructor's harness. **DO NOT LEAVE DAN-**



#3/1-97

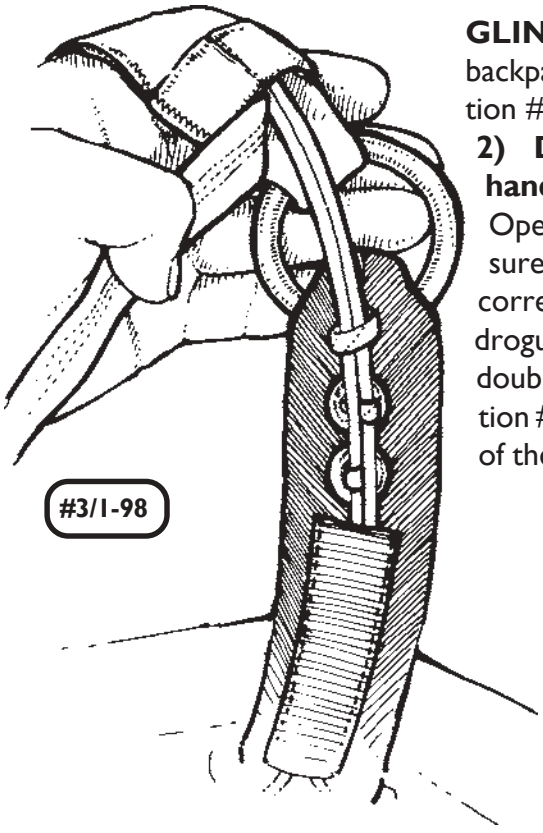
RIGHT!

Drogue housing should be in a gentle "S" curve under the backpad.



WRONG!

A "pigtail" such as this is incorrect and could result in an extremely hard pull.

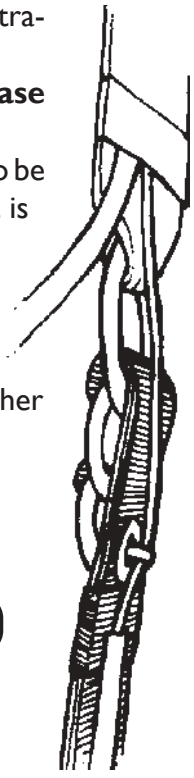


#3/1-98

GLING. Check the housing's position under the backpad for the "pig-tail" twist as shown in illustration #3/1-97.

2) Drogue 3-Ring attachment and release handle:

Open the back of the drogue pouch and check to be sure that the 3-Ring drogue bridle attachment is correctly secured. If you have the right-hand drogue release handle installed, note that the double cable set-up should look like Illustration #3/1-98, with one cable through one end of the loop, and the other cable through the other



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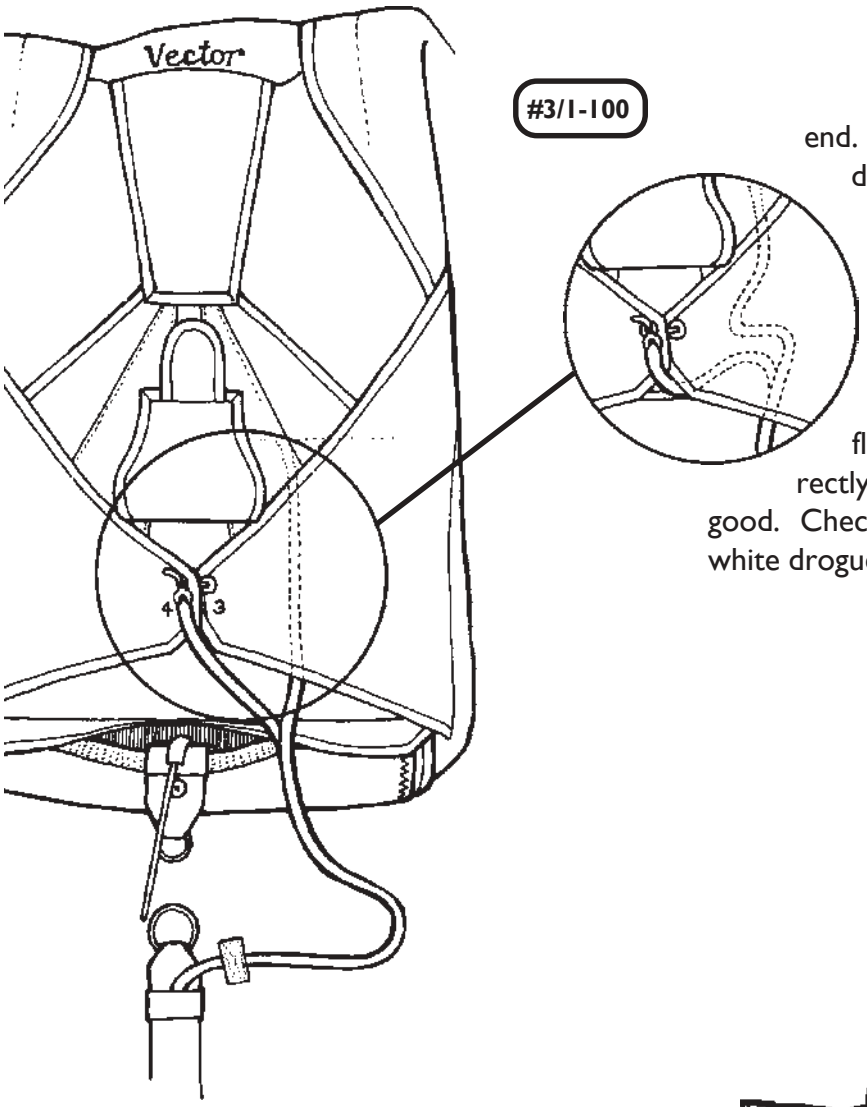


#3/1-100

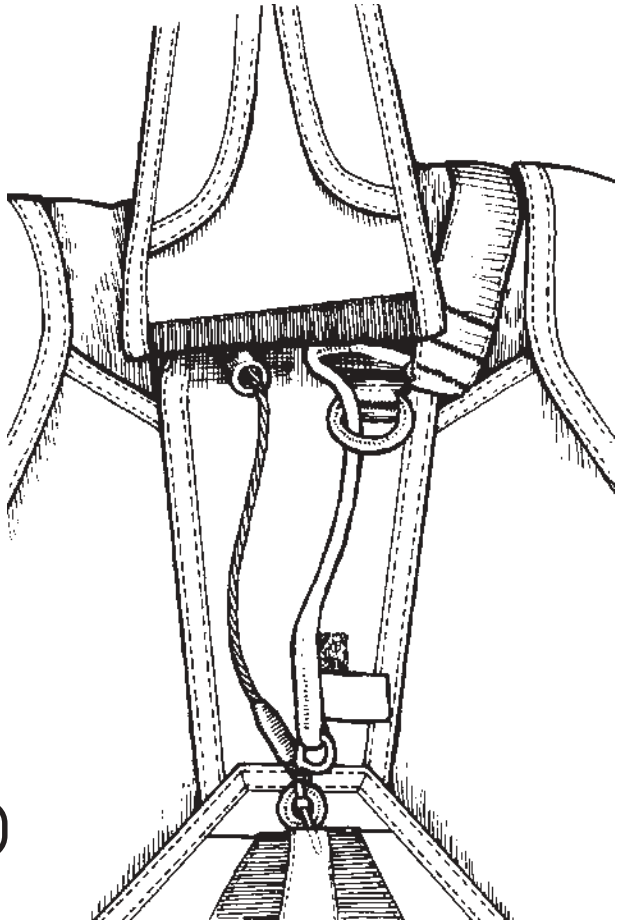
end. If your system has only the left-hand drogue release, the drogue riser should look like Illustration #3/1-99.

3) Main pins, closing loop and bridle routing:

What is commonly called a pin check should actually be called a bridle routing check. Open the main pin flap and be sure the pin is seated correctly, and the condition of the main loop is good. Check the bridle routing by following the white drogue inner bridle from the ring assembly directly to the main pin. Illustration #3/1-100 shows the proper position for the pin and bridle.

4) Reserve pin, closing loop, and RSL routing:

Open the reserve flap and make sure the pin is properly seated and that the condition of the closing loop is good. Don't push the reserve pin too far down into the loop (this will cause it to twist, making the eyelet of the pin stick up instead of lying flat). Illustration #3/1-101 shows the pin correctly seated.



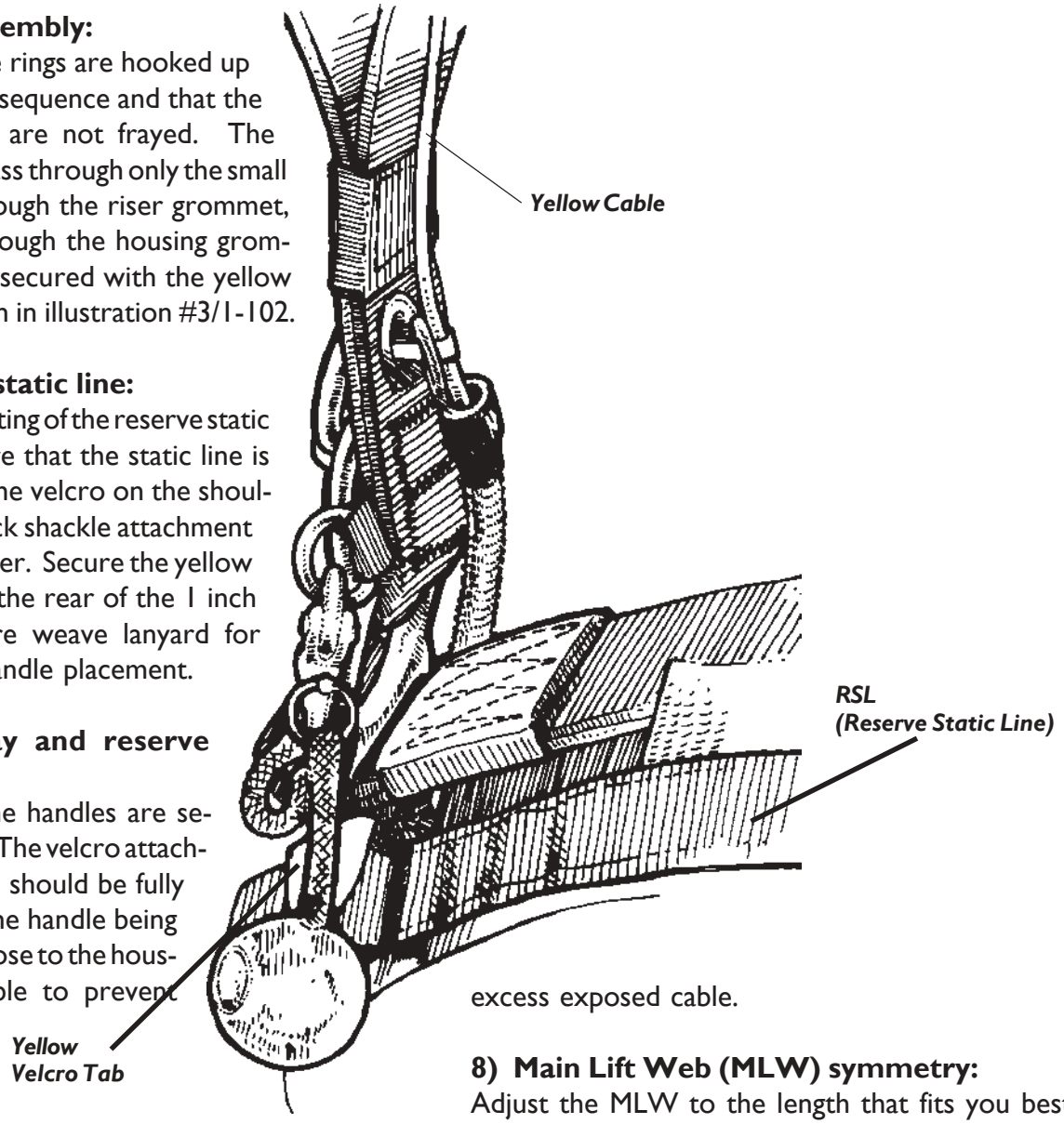
#3/1-101

Check the RSL routing to be sure it passes through the guide ring on flap #5.

5) 3 ring assembly:
Make sure the rings are hooked up in the proper sequence and that the locking loops are not frayed. The loop should pass through only the small ring, then through the riser grommet, and finally through the housing grommet, which is secured with the yellow cable as shown in illustration #3/1-102.

6) Reserve static line:
Check the routing of the reserve static line and ensure that the static line is mated up to the velcro on the shoulder pad. Check shackle attachment to the main riser. Secure the yellow velcro tab to the rear of the 1 inch (2.5cm) square weave lanyard for proper ball-handle placement.

7) Cutaway and reserve handles:
Check that the handles are securely placed. The velcro attaching the handle should be fully mated, with the handle being placed up as close to the housings as possible to prevent excess exposed cable.



#3/1-102

8) Main Lift Web (MLW) symmetry:
Adjust the MLW to the length that fits you best. Check both sides for symmetry.

9) Secure pin protector flaps on the main and reserve. Inspect the riser covers for proper velcro mating.

WARNING: Riser covers perform a vital job. Leaving the risers unprotected could result in a main/reserve canopy entanglement if improper emergency procedures are used during a total malfunction. Unprotected risers can also be a danger when moving around the cabin of small aircraft.

Chapter 2: In-aircraft and exits

In-aircraft gear check
Exits

In-aircraft gear check:
This section is split into areas of safety checks:

A. Pre-exit preparation
B. Pre-exit gear check
C. Drogue handle check

A. Pre-exit preparation:
While in the aircraft (before jump altitude is reached), verbally acknowledge the hookup of each top snap as it is clicked into place and locking pins inserted. Make sure the waist attachment straps are secure and are comfortably tight. Make sure that student's chest strap is not overly tight.

B. Pre-exit gear check:
Plan ahead of time and brief someone on your load to do the final pin checks for main and reserve. Before exit, the Tandem Instructor should physically check the following items:

1) All snaps and locking pins
2) All handles in order of use
3) Reserve static line
4) Student's chest strap, helmet, and goggles.

C. Drogue handle check:
Because the drogue release handle is located on the bottom left corner of the rig, it can be dislodged by movement in the aircraft or during exit as you pass through the door. It is therefore recommended that the Tandem Instructor check the security of the handle just before exit and then again just after drogue deployment on every jump. It is better to realize you have a floating handle at 10,000' rather than 5,500'.

Always follow this process:
1) Check security of all handles.
2) Move to exit position.
3) Re-check security of the drogue, and drogue release handles.

Exits
Exact exit procedure varies with different aircraft, but the basics remain the same: you must maintain total control of the student during exit and freefall. This section will deal with:

A. Exit techniques(2)
B. Exit tips
C. Exiting different aircraft

A. Exit techniques (2):
Two exit procedures are shown in this manual. The first, a poised exit, allows total control of the student body position during exit because the student assumes the correct freefall body position prior to exit. All the student has to do is stay put and you get a good exit almost every time. This poised exit can vary with different aircraft and door types. The similarity is that you will leave in a head high position after leaving the aircraft whether you are exiting in a crouched or backed-out standing position. This position can be done from a wheel-strut (C-182), tailgate (Casa), or a side door (DC-3).

The second procedure is a diving type exit. This requires the student to change body position immediately upon exit. If the student cooperates, then the Tandem Instructor's job is much easier. If the student gets into a less-than-ideal body position, then the Tandem Instructor will have to work harder to maintain stability. This exit can be done from kneeling, sitting or standing positions.

1) Poised Exit: Cessna with Strut

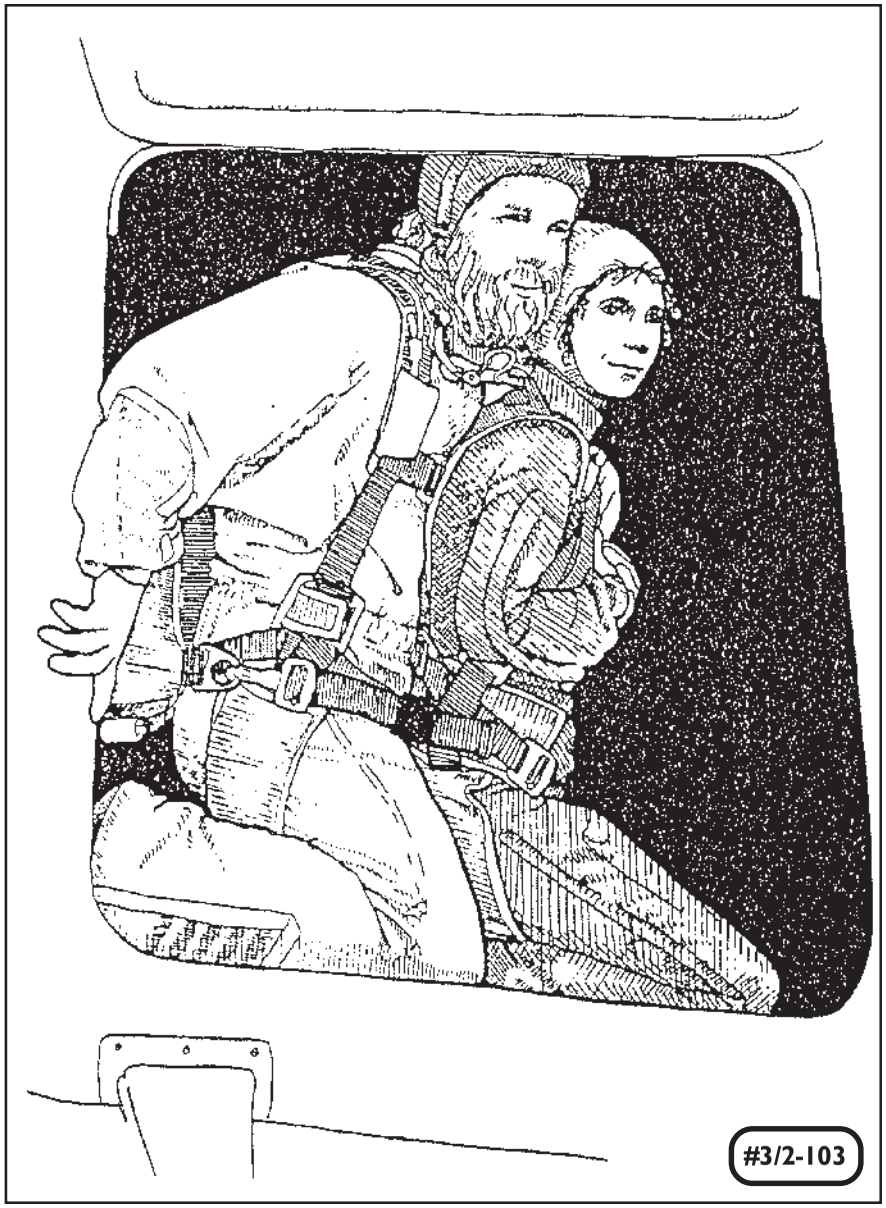


FIGURE 1. Hook up in kneeling position before moving toward or opening door. Move forward in the door until both legs will fit through door. (Illustration #3/2-103)

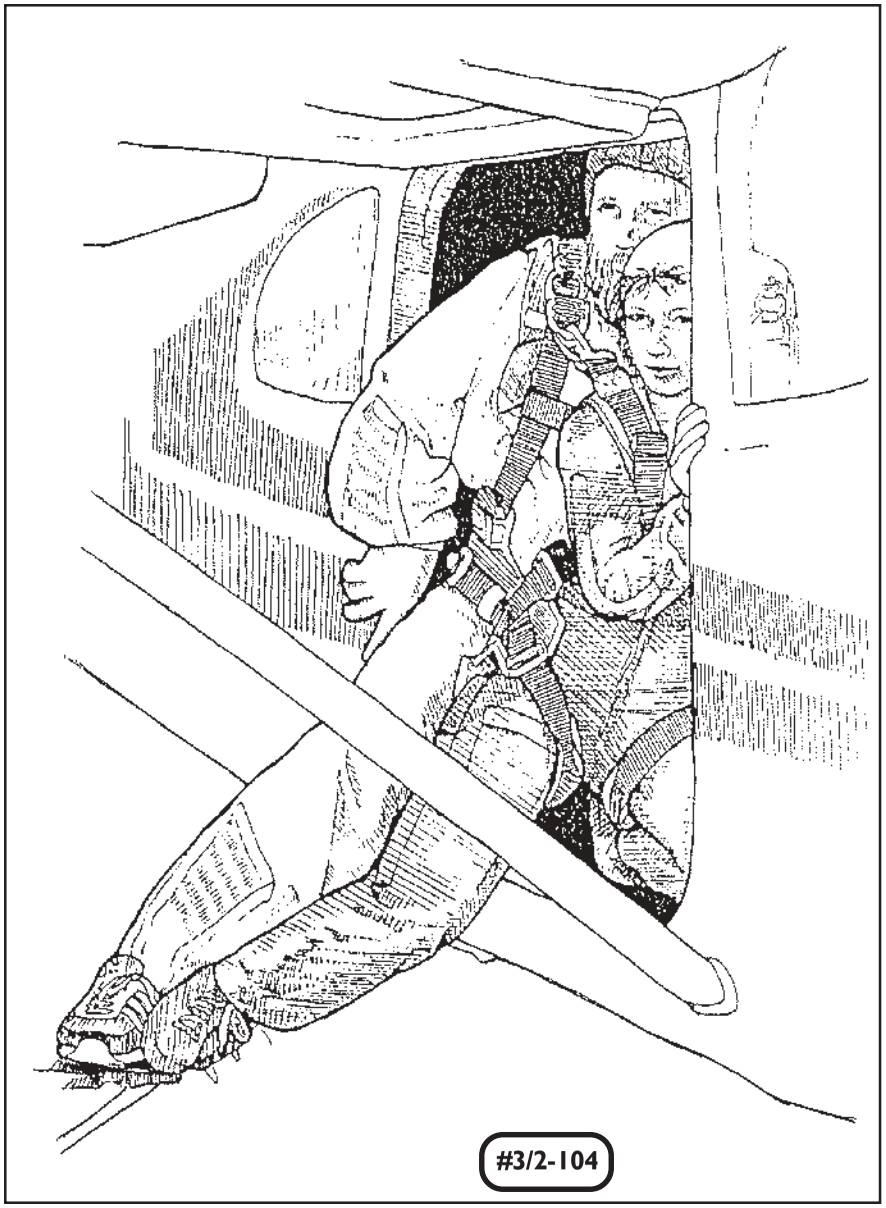


FIGURE 2. Place both right feet on step, with student's foot to the inside. (Illustration #3/2-104)

FIGURE 3. With student assisting, climb out onto step into poised position, with student's feet together and in between the Tandem Instructor's feet. The student's head is back. (Illustration #3/2-105)

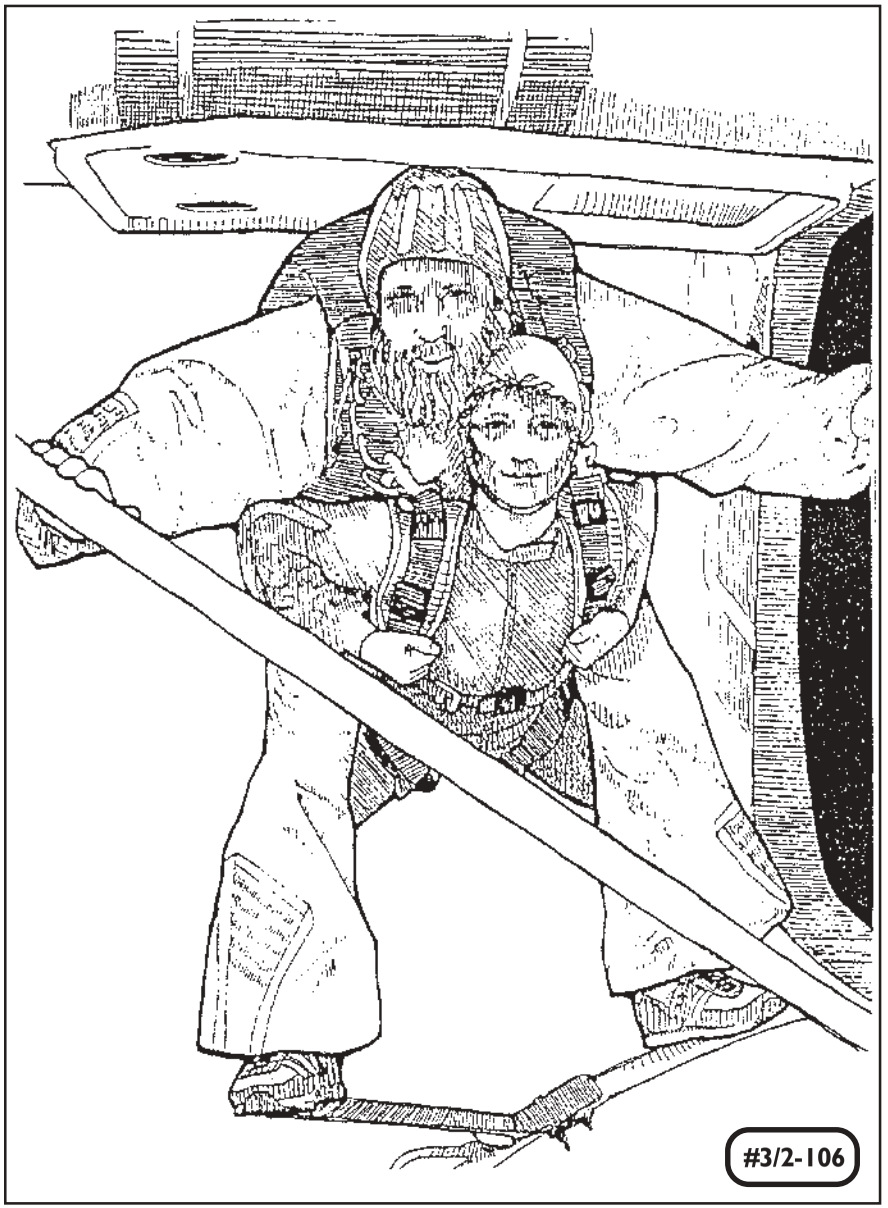


FIGURE 4. On Tandem Instructor's command, student lifts feet from step, arches body (feet together, knees bent), and then removes hands from strut, grasping main lift webs. (Illustration #3/2-106)

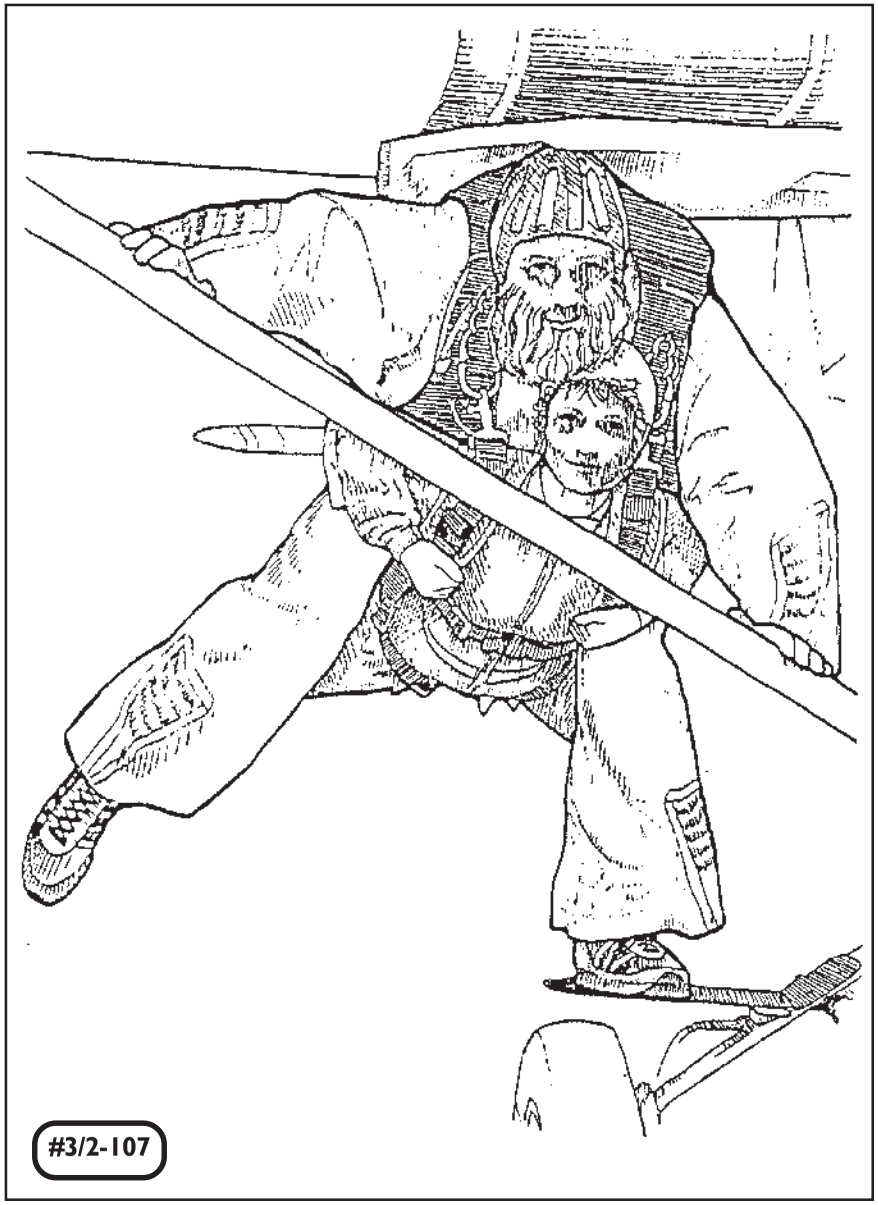


FIGURE 5. Tandem Instructor moves outboard and hangs one leg. Exit requires only a slight sideways motion. Fall away head high, on aircraft heading. It helps to look back into aircraft on exit. Student maintains this body position, including hand grips, until after canopy opening unless otherwise instructed by the Tandem Instructor. (Illustration #3/2-107)

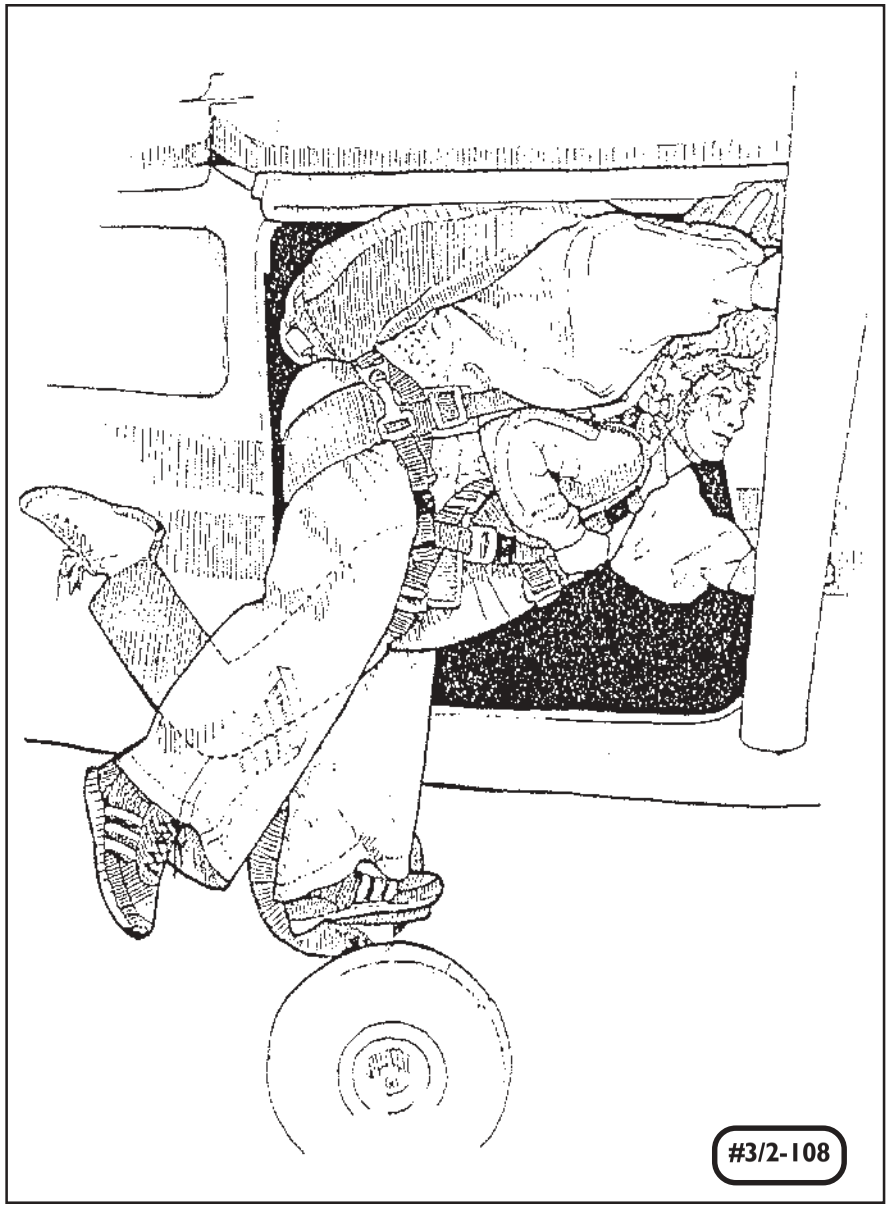


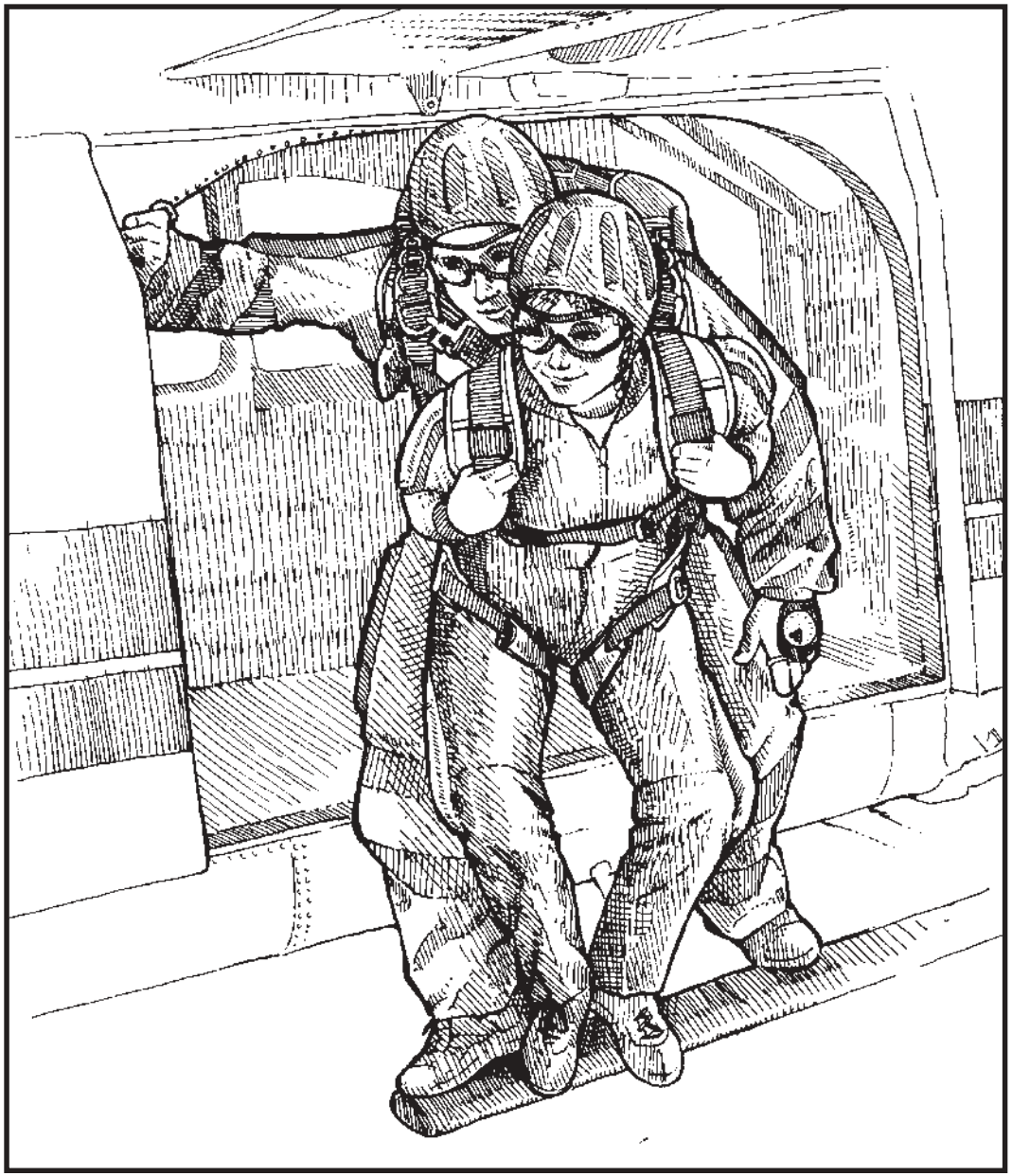
FIGURE 6. Side view of Figure 5. Note student's leg position. (Illustration #3/2-108)

2) Diving Tandem Exit

2) Diving exit:
This technique, for many aircraft, is most preferred as it limits the amount of time the Tandem pair spends at the open doorway, or hanging outside the aircraft. There have been many accidental deployments in the past due to student interference during climbout for poised or backout exits.

The diving exit will require a more intense arch by the Tandem Instructor to maintain stability. It's recommended that you spend a few extra minutes on the ground working on the student's body position as well. Generally, the student is walking out the door with you and is supporting most of his own weight during the exit. This means the student will have to transition to the freefall body position immediately after the exit.

Illustration #3/2-109 shows the Tandem pair sitting at the door edge of a Pilatus Porter with feet on the step, just prior to diving out.



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3) Backing Out Tandem Exit

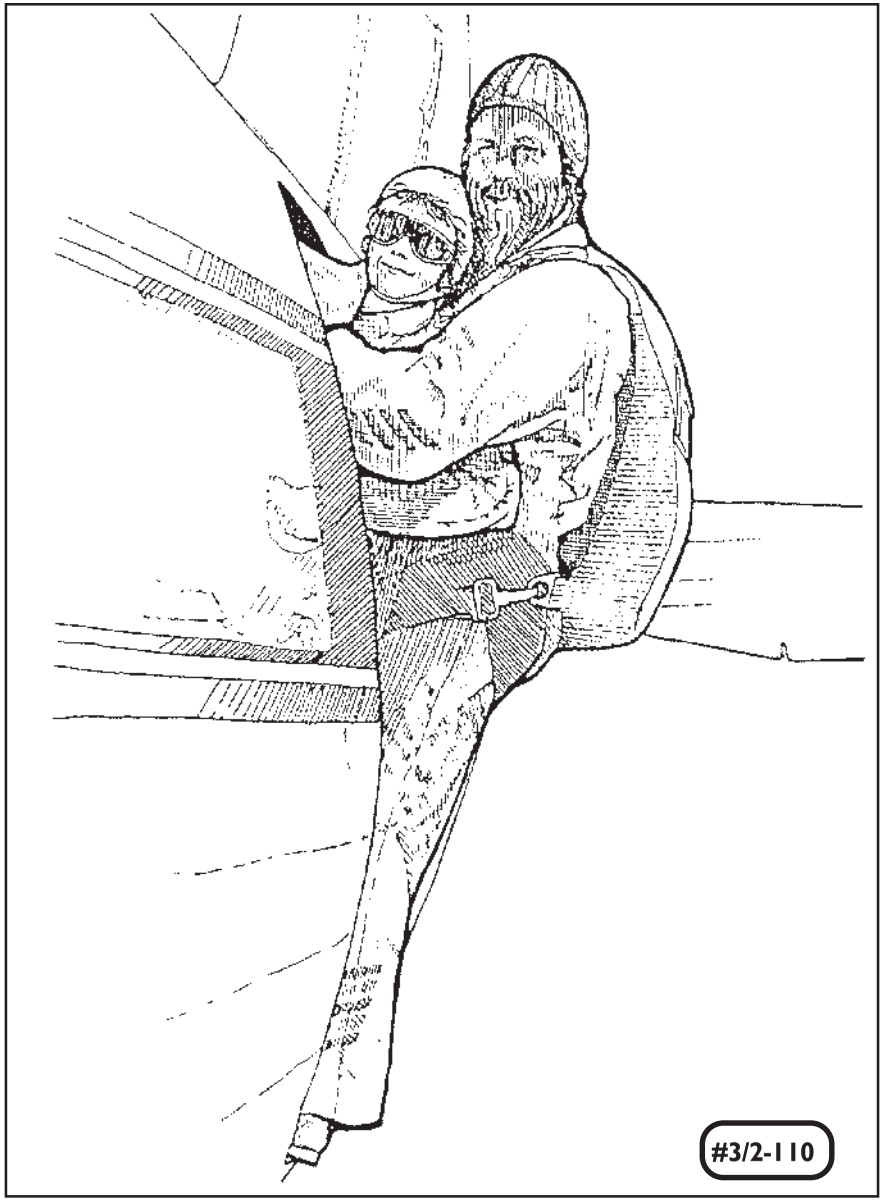


FIGURE 1. Hook up and have student grasp main lift webs before approaching door. Grip top of door, turn around, and back out into the position shown in Illustration #3/2-110. Student's feet are together, between Tandem Instructor's, and on door lip. Be careful to stay low enough so that the student's head does not strike the top of the door.

FIGURE 2. On Tandem Instructor's command, student lifts feet from door lip and arches body (head back, feet together, knees bent). Tandem Instructor then hangs the foot (the upwind side) and rotates body toward aircraft flight direction as far as possible, without releasing either door grip as shown in Illustration #3/2-111.

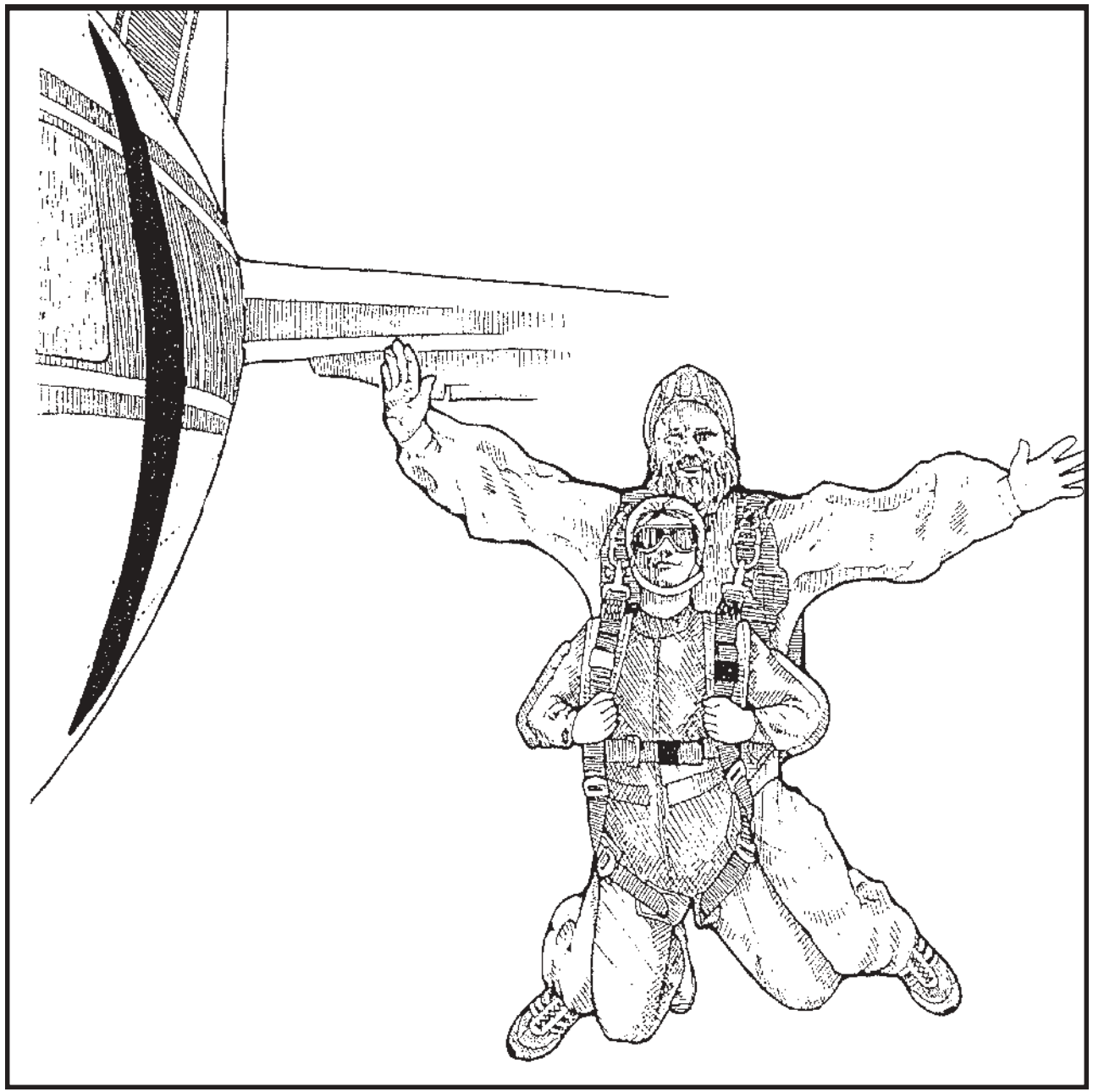


FIGURE 3. At this point, exit requires little more than simply letting go. Rotate into propwash after letting go. (Illustration #3/2-112) Fall away head high, on aircraft heading. It helps to look back into the aircraft on exit. Student maintains this body position, including hand grips, until after opening unless trained to do otherwise.

#3/2-112

B. Exit tips:

Ideally:

1) Spend as little time as possible while hanging onto the outside of the aircraft, or while near the door. The longer you spend there, the more you increase the chance of something going wrong.

2) The student must have a good grip on their own main lift web. A student with free hands can only get you into trouble.

3) The student's head should be back, body arched, feet together, and weight totally supported by you, before exit.

4) The actual exit should be so smooth that the student hardly notices the difference between hanging under you, outside the aircraft, or in freefall.

5) The fall away from the aircraft should be head high and very stable. The more unstable your exit and fall away, the more likely the student is to move, which will cause trouble.

6) If exiting from a small side door such as that found on Twin Beeches, Queen and King airs, etc... a kneeling, sitting or walkout exit is recommended. Do not use a standing back-out exit as the likelihood of an accidental activation is high.

The Student Briefing should include an exit practice at the aircraft, fully suited and hooked up

C. Exiting different aircraft

Five classes of aircraft come to mind.

1) Cessna with step and strut.

2) Cessna, Piper, or Beech with small cargo door (one in which you can't stand up - usually no outside step).

3) DC-3 or Twin Otter with large cargo door.

4) Skyvan, Casa, or other tailgate aircraft.

5) Helicopter with side door.

Before taking a student out of an unfamiliar aircraft the Tandem Instructor must first take an experienced jumper as passenger once or twice until he is comfortable with the climbout and exit from that aircraft.

It is difficult to over emphasize the importance of a stable exit on EVERY Tandem jump.

Note: A Tandem jump does not proceed directly from exit to drogue fall. There is freefall in between the time you leave the aircraft and the time the drogue deploys. This is where stability is gained from freefall body position and easily maintained without the drogue. Do not use the drogue to gain stability. Documented proof that a Tandem Instructor routinely uses the drogue to gain stability will quickly result in his rating being suspended.

Chapter 3: Freefall & Droguefall

This section will cover the following areas:

Altitude recommendations
Stability control
Deployment of drogue
Droguefall control
Arm extension
Drogue release

Altitude and time recommendations:

When performing tandem jumps the following altitude recommendations apply:

A. Exit above 7,500 AGL.
B. Deploy drogue within 5 seconds after exit.
C. Minimum exit altitude is 4,500 AGL (not applicable during training or probationary jumps).
D. Minimum main deployment altitude is 4,000 AGL.
E. Reserve initiation altitude is 2,500 AGL.

A. Exit aircraft above 7500 AGL:

It is important to exit with sufficient altitude to respond to a variety of situations.
The speed and altitude lost during unstable freefall without the drogue is hard to imagine for the uninitiated Tandem Instructor candidate. Unusual situations such as a collapsed drogue, or drogue in tow will eat up your altitude faster than you can imagine. Refer to Section 4: Emergencies and Malfunctions, for details on the possible problems you may encounter.

B. Deploy drogue within 5 seconds after exit:

This gives the Tandem Instructor time to gain stability, but is before terminal velocity, saving wear and tear on the parachute system.

If the drogue is deployed during Tandem terminal (170+MPH), and functions properly it will take approximately 10 seconds to reduce your terminal velocity to normal (120 mph). Therefore, you should wait at least 10 seconds after deploying the drogue in this situation before you deploy the main by pulling the drogue release handle.

In other words, if you want to deploy the drogue after Tandem terminal is reached, you must allow two thousand feet after deploying the drogue for deceleration before pulling the drogue release handle and deploying the main. This is not to say that the system will not work if you release the drogue immediately after deploying it at Tandem terminal. It is to say that the faster you go, the harder the openings, which will surely reduce the life of the parachute system.

Lastly, deploying the drogue approximately 5 seconds after exit will allow you time to assess a drogue malfunction situation, thus giving you ample time to deploy the reserve before Tandem terminal has been reached.

C. Minimum exit altitude is 4500 AGL:

For the same reasons stated in (A), this is the absolute lowest you should exit. If you experienced any problem from this altitude you would have to respond quickly and decisively to get the situation under control and still leave sufficient time to respond to malfunction situations. These lower exit altitudes should only be reserved for the most experienced Tandem Instructors.

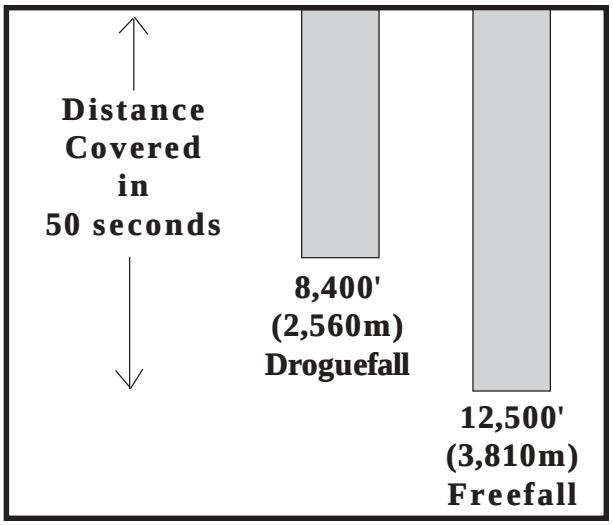
D. Minimum main deployment altitude is 4,000 AGL

This is a recommendation that should be taken very seriously. The added complexities of performing emergency actions as well as the speed with which you will pass through the remaining 4000 feet leave little time to deal with any other problem which may arise, such as passenger interference. The Tandem pair should always exit last due to this higher planned opening altitude. This will help prevent any traffic problems with other jumpers.

E. Reserve initiation altitude is 2,500 AGL

For all the reasons mentioned above, do not delay the execution of reserve procedures. If the situation calls for it, make a decision and carry it out.

The following chart (3/3-113) shows the difference between freefall and drogue fall. Notice the increase in speed and the decrease in available time.



#3/3-113

Stability control:
A. Arch
B. Anticipation
C. Manipulation

A. Arch:
What the Tandem Instructor does is more important than what the student does. The Tandem Instructor should concentrate on good training for the student in the proper body position, and then on his own body position on the exit. If the Tandem Instructor attains a good arch right out the door, then chances are the pair will gain stability easily.

Incredibly enough, many instability problems are caused by a bad Tandem Instructor body position. Specifically, many problems start because the Tandem Instructor fails to throw a hard arch on exit.

While a poor exit resulting in instability is not inherently dangerous (except when it leads to unstable drogue deployment), it is nonetheless unnecessary and unacceptable. A poor exit is defined as any exit creating a combination of uncontrolled loops or rolls immediately after exit. It is not acceptable to loop an AFF exit, nor is it acceptable to loop an airplane on takeoff with a first time student, and Tandem is no different. While everyone will "blow" an exit every now and then, it should be the rare exception, and not the norm.

Ironically, the smallest students can be the most difficult to control.

Example: When you hit a badminton birdie, the weighted end always ends up below. The same can hold with a Tandem pair. If a large Tandem Instructor makes a poor exit with a small student, it is very possible for them to end up back to earth (with the heavier of the pair below).

B. Anticipation:
The key to keeping in control is being able to recognize a potential problem prior to it becoming a real problem. Students sometimes do crazy things during the first few seconds after exit. Usually, after the initial shock of freefall their eyes will reopen and they will attain their body position assisting stability. Immediately following the exit launch, assess the student's body position as you arch to maintain stability. If the student remains in the folded de-arch position of the diving exit or attains a de-arched position after the exit launch, you may have to apply additional control techniques to maintain heading and stability.

C. Manipulation:
One such control technique is to physically manipulate the students body into an arch. To do this reach around with your arms and/or legs and pull him back into the correct position. Grab the arms only between the elbow and the wrist. This makes it hard for the student to then grab you. Hold this interlocked or bodylocked position until you have ensured or regained stability. Manipulation should only be used as a last resort if the Tandem Instructors hard arch is ineffective.

This technique must be used with caution as it increases the possibility that the student will grab your arms and prevent you from pulling. There is simply no telling what a student might do if presented with an "earth-sky-earth-sky" situation on his first jump.

Deploy drogue:
The drogue may be deployed at any point during a freefall, from soon after exit to after Tandem terminal velocity (170 mph) is reached. It is recommended that if stable, the drogue be deployed in the first 5 seconds of freefall.

Recommended drogue jump scenario:
A. Exit aircraft above 7500' (2500m) AGL.
B. Ensure stability prior to deployment.
C. Drogue deployment.

A. Exit aircraft above 7,500' (2500m) AGL:
It is important to exit with sufficient altitude to deal with any potential problem ensuring main deployment by 4,500' (1500m) AGL.

B. Ensure stability prior to deployment:
Be stable and face to earth. Be sure that the student's body position is good enough to allow you to reach in and grab the drogue without losing stability. If the student's body position remains so bad that it causes a problem, FIX IT before throwing the drogue.

We cannot emphasize this point enough: **DO NOT USE THE DROGUE TO GAIN STABILITY.** Be stable before the drogue is thrown (unless there is no other alternative and altitude is getting low).

Using the drogue to get stable should be used only as a last resort since it is better than pulling the reserve while unstable.

NOTE: It is very important to retain stability throughout the exit sequence of every Tandem jump. In the past few years of the Tandem program, disturbing stories have come forth of Tandem Instructors having difficulty making stable exits or of keeping drogue fall smooth. There are even cases of the Tandem Instructor routinely using the drogue to gain stability after exit. The fact is, the ability to make a stable exit should be a very basic one for every Tandem Instructor.

Therefore, any Tandem Instructor who throws the drogue before being stable and face to earth should be immediately grounded. This is a potentially dangerous practice which cannot be tolerated. Likewise, anyone who witnesses such practices should immediately report the Tandem Instructor to the Relative Workshop.

C. Drogue deployment:
As practiced in the equipment operations section of this manual follow these steps:
1) Locate drogue handle and grasp firmly using proper technique.
2) Pull drogue from pouch and throw to your side at full arm extension.
3) Release immediately once forward of the line of your shoulders.
4) Watch drogue inflate.
5) Once drogue is inflated immediately check the drogue release, both primary and secondary, and reserve handle position.

"If the Tandem Instructor attains a good hard arch right out the door, then chances are the pair will gain stability easily"

You may or may not feel the drogue deploy. We recommend you glance over your shoulder just after you've thrown it so you'll know it has deployed and inflated correctly.

Drogue fall control techniques:
The drag of the drogue on your harness will place your body in a certain attitude in freefall. The drogue will resist your efforts to change this attitude. If you try to change your pitch attitude (head high/head low) too much, you will rock up and down. Excessive rocking may be uncomfortable, unnecessary, and if it becomes extreme, can actually open the main container while the drogue is still attached. It can also cause the passenger's feet to become entangled with the drogue bridle.

There are four things you can do to minimize rocking:

1. Tandem Instructor corrects body position. The best way to stop rocking is for the Tandem Instructor to simply relax and lie still in freefall not moving the legs back and forth.

2. Teach the student correct body position on the ground (head back, hands on harness, back arched from shoulders to knees, and feet tucked up).

3. Wear a big, baggy jumpsuit and put a tight suit on your students. The air hits the student first. If the body position is not perfect, you cannot adequately control exit or drogue fall unless you wear a big suit. As you gain experience, suit size is much less critical.

4. Snug down the hip straps so they are comfortably tight. Straps that are too tight or too loose can cause the rocking action as well.

Arm extension: (Optional)
Once the drogue is deployed, tap the student's head or shoulder to indicate it is time for him to put his arms out in normal freefall position. DO NOT reach around and pull the students arms into position, as this would give the student a chance to grab your arms.

Drogue release:
The drogue may be released at any time during "drogue fall." To release the drogue (thus deploying the main canopy), simply pull the orange drogue release handle located at the bottom left-hand corner of the main container. A pull of approximately 6 inches will release the drogue, though it is mandatory to pull the handle completely.

WARNING: If your rig is equipped with the secondary right hand drogue release handle, pulling either handle alone SHOULD release the drogue. If it does not, pull the other handle before doing anything else.

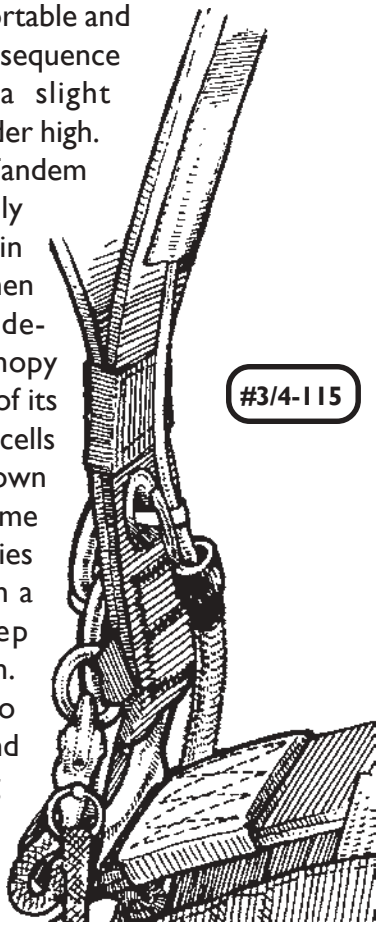
Note: If the exit is to be lower than 7500' (2500m) AGL do not pre-pull the drogue release handle prior to the deployment of the drogue. The handles, drogue and drogue release, must be pulled in the proper sequence to ensure a proper deployment.

When you pull the drogue release handle, you will feel an immediate trap door effect. Meaning you will accelerate momentarily until the main canopy starts to inflate. The now partially collapsed drogue acts as a pilot chute and pulls your canopy to line stretch in about half a second. The canopy will streamer for a second or two and then open slowly. (If you pull the release handle completely and do not feel this sensation, your drogue has failed
to release.)

This is a critical time for awareness. If anything major goes wrong, such as a partially collapsed drogue in tow, a bag lock or streamer, your speed will pickup quickly. Maintain altitude awareness and exercise emergency procedures promptly.

Chapter 4: Canopy control

Tandem canopy openings are generally quite comfortable and smooth. The opening sequence usually begins as a slight streamer with the slider high. The fall rate of the Tandem pair decreases steadily for several seconds in this configuration. Then the slider quickly descends and the canopy opens to about 90% of its normal size, with end cells open and the slider down almost to the links. Some Tandem main canopies are set up to open in a steady-state, deep brakes configuration. Others are adjusted to open in a "rock and roll" mode, meaning the brakes must be released to produce stable gliding flight. Canopy control will be covered as follows:


#3/4-115

Upon opening
Steering the canopy
Landings

Upon opening:
A. Canopy check.
B. Release toggles.
C. Stow drogue release handle and check emergency handles and harness.
D. Instruct student to sit back in the harness.

A. Perform canopy check:

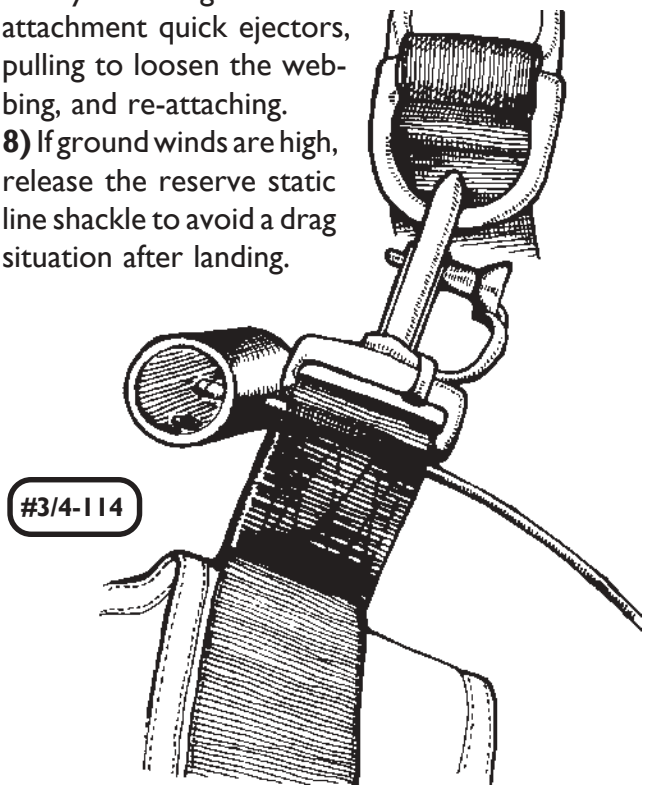
Watch the opening. Check canopy condition while locating the toggles. Release brakes using the lower student toggles.

B. Release toggles:

Using the student toggle position, hand the student the steering toggles while saying "grab the toggles the same way I have them." After the student has placed their hands in the toggle loop, remove your hands and pump down the slider and tell student to check the canopy. (Tandem Instructor is checking sky for other canopies at this time.)

C. Stow and check handles and harness.

1) Stow the drogue release handle as shown in illustration 3/4-114.
2) Check the cutaway and reserve handles (touch them to reinforce their location and security).
3) Look at the back of the main riser and check to see that the cables are routed properly and that they continue into the channel for a few inches as shown in illustration #3/4-115.
4) Check the top student attachment snaps.
5) Check the student harness for comfort.
6) Loosen the student's chest strap if it is too tight.
7) Tell the student you will make the harness more comfortable. Do not tell them that you accomplish this by releasing the lower attachment quick ejectors, pulling to loosen the webbing, and re-attaching.
8) If ground winds are high, release the reserve static line shackle to avoid a drag situation after landing.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D. Instruct student to sit back in the harness.

Have student perform the sit back in harness drill as described in student briefing in Section 5 of this manual. Student should lift each leg and slide the leg strap and pad forward several inches (6-10cm) to alleviate the pressure on the inside of the thigh. If

student complains about an overly tight main lift web, push down on the MLW adjusters and the harness will easily loosen.

Steering the canopy:

A Tandem system is the ultimate suspended harness. With it you can give the student actual hands on experience controlling a ram-air canopy. How much can be accomplished depends on the student's aptitude and previous training or experience. Not everything can be covered on the first jump. Learning points that would be covered on the first jump are listed in the first jump briefing in Section 5 of this manual.

Once the student has a firm grip on the toggles, provide commands as to the direction that you would like them to steer. Encourage them to pull down part way initiating a slow flat turn and to pull down all the way performing a full bank turn.

Demonstrate forward flight with hands all the way up (this can be a difficult position for the student). As you set up for final approach explain what you are doing with reference to the target. If you plan to have the student flare for landing then have the student perform 3-5 practice flares while at altitude with feedback of their technique and overall performance.

NOTE: If student reports nausea at any time, keep turns to a minimum and tell student to look at the horizon and breath normally. Have student adjust leg pads or perform sit back in harness drill again. If student's fingers start to tingle, have him release toggles and drop hands to side. An overly tight MLW will restrict upward arm and shoulder movement. Full flight arm position can be very tiring and difficult for the student.

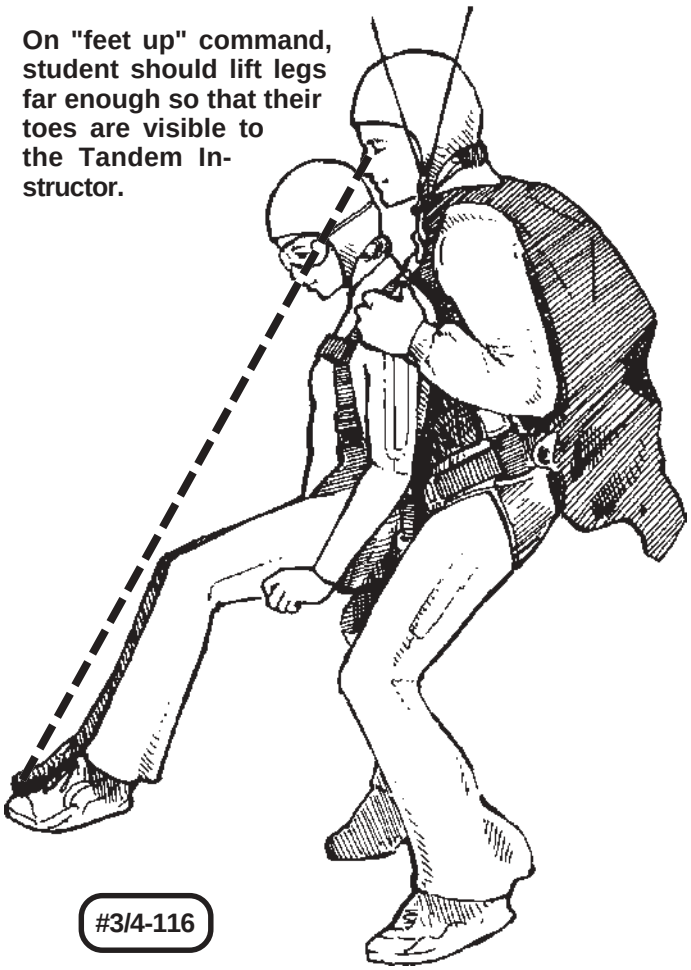
Landing:

In this section you will cover:

A. Prepare for landing
B. Landing
C. After landing

A. Prepare for landing:

1) Landing position:
At about 3,000', remind student about landing body position and leg tension as shown in illustration #3/4-116. Emphasize that the feet and knees should be together unless instructed otherwise.



2) Enter landing approach pattern:
At about 1,000', enter down wind leg of pattern. Assess the surface winds as you fly past the target area to make final alterations to your final approach set up. Be on the wind line high enough to make corrections to your approach if you've mis-read the winds. Hold the wind line to landing making whatever glide angle adjustments are necessary. Try not to sit in a braked position for any length of time as it will tire your arms out for the flare.

If the winds are high and there is no catcher present, it is permissible to release the reserve static line at a low altitude. With the reserve static line detached,

you may cutaway the main after landing if you're being dragged without activating the reserve.

3) Flare canopy:
First-time students can cause a lot of trouble unless they are well prepared and rehearsed. DO NOT allow an untrained student to assist in the flare.
* If student has received adequate ground training and is well rehearsed in the air, have him assist you as you turn base and final and assist the flare on your command. A good command to use would be "Hands up, feet up and FLARE."

Note: Do not depend on the student to help with, or have the strength to assist with the flare. Always count on doing the flare yourself. If the student has problems with the in -air flare practice DO NOT let them help with the flare.

B. Landings:
There are three kinds of Tandem landings:

1. Stand Up
2. Running
3. Sliding

1. Stand up
When the wind is over 10 mph, a proper flare should yield a no forward speed stand up landing. All a student has to do is keep enough leg tension to support his or her own weight.

When the wind is high, have a canopy catcher waiting for you at the landing area. Hand ONE toggle to the catcher at touchdown and have him run into the wind with it to collapse the canopy. Remind the student to let go of the toggle immediately after touchdown so that the catcher can do his job. This is one of the things you should rehearse with the student during flare practice under canopy.

2. Running landing
When the wind is more than 5, but less than 10 mph, both Tandem Instructor and student must take a few steps after touchdown. If the student does not have proper leg tension or does not take those few steps, he or she will fall down and pull the Tandem Instructor down with them. This kind of landing is actually the most difficult and takes considerable student preparation. The lighter the wind, the more the student must raise the legs up and forward prior to touchdown. The Tandem Instructor must be able to see the feet and knees when looking over the students shoulder. The Tandem Instructor can also use his feet to coax the student's feet into the proper position.

3. Sliding landing:
When the wind is less than 5 mph, the day hot, the student heavy, and/or the field altitude high, a sliding landing is probably the best choice. To prepare for a sliding landing, the student must lift his or her legs and put them well out in front prior to touch down. A good slide requires a good flare to almost zero rate of descent. The Tandem Instructor sits back in his harness (thus pulling the student back as well) and is prepared to take the landing on his feet, but continues to sit back after initial ground contact to a slide on his butt with the student literally sitting in his lap. It is important that the Tandem Instructor sit back on landing so the student will not have a tendency to lean forward at touchdown (which can cause the Tandem Instructor to roll over on top of the student.) Never try to take any vertical force on your butt. Serious injury could result.

So, JUST before landing, remind the student about leg tension, make your decision about which landing you are going to use based on ground speed and shout "stand-up" or "run" or "feet-up" into the student's ear.

C. After landing:
1) If using secondary drogue release handle, detach it from the student's harness prior to releasing the student attachment points. Immediately attach the secondary drogue handle to your harness to secure it. Failure to do so may create deployment problems on the next jump.
2) Release the student.
3) After release,walk over and pick up the drogue. Don't drag it towards you by the bridle or you'll risk tearing it.

SECTION 4 MALFUNCTIONS & EMERGENCIES

Malfunction and emergency situations which require your immediate attention can occur at any time throughout the jump sequence. For this reason we will present them in this order:

Reserve procedures
In-aircraft
Freefall
Canopy control

Chapter 1: Reserve procedures
Emergency response sequence
Reserve procedures
Reserve canopy procedures
Malfunction chart

Emergency response sequence:
It is very important to take the time to think out and rehearse how you would respond to different situations before you are ever faced with them. Always read the Tandem accident and incident reports to learn from the mistake of others. Study this information as if your life depends on it, because it does!

Unusual or emergency situations while performing Tandem jumps require quick assessment and decision making with the proper reactions. You must be familiar with all options available for both right and left hand response. It is equally important to have a complete understanding of the proper sequence of actions needed should you experience a situation that you do not fully understand. The addition of the drogue system adds extra procedures which are different than those you would perform when jumping solo. Refer to Malfunction Tree charts on pages 80-81.

A. Reserve procedures:
Out-of sequence deployments
Total malfunctions
Partial malfunctions
Canopy transfers

1) Out-of-sequence deployments:
In the event of an out of sequence deployment or something occurring that you have not seen before, follow your normal sequence of deployment prior to second guessing what the problem may be. That sequence is:

* deploy the drogue
* pull either the primary or secondary drogue release handles, or both.
* assess main canopy condition and cutaway
* pull one of the reserve deployment systems (either the reserve ripcord or the ball handle on the RSL.)

2) Total malfunctions:
Do not deviate from this sequence unless you can clearly identify a problem that has not been covered by this manual.

* deploy the drogue
* pull the primary and the secondary drogue release handles
* pull one of the reserve deployment systems

3) Partial malfunctions:
* Ask student to assume freefall position. (Hands on harness, feet together, knees bent at 90 degrees and body arched.)
* Scissors students legs between yours.
* PULL THE GREEN HANDLE (BREAKAWAY) with right hand. Insure a clean breakaway. PULL THE RED RESERVE RIPCORD with the left hand. **REMEMBER - GREEN FOR GO...RED FOR STOP.**

NOTE: The reserve static line should pull the reserve pin, but never rely on it. It is possible to release the reserve static line before breaking away. This will enable you to go back into freefall without activating your reserve. As soon as you regain stability (no more than 5 seconds), **PULL THE RED HANDLE**. This procedure is rarely if ever indicated.

4) Canopy transfers:
A canopy transfer, where the reserve is deployed without first jettisoning the main, is not recommended with a ram-air reserve under normal circumstances, nor is it recommended with Tandem. The reserve pilot chute may not have enough drag to extract the reserve freebag from its container. If it does, the resulting deployment will be unpredictable.

Reserve canopy procedures

Steering the reserve parachute:
The reserve is set up exactly the same as the main, except the toggles do not have the double loop for student assistance, but are set up for Tandem Instructor solo control.

Chapter 2: In-aircraft

Aircraft emergencies
Student refusal

Aircraft emergencies:
A. 1500 Feet, engine out (500m)
B. 1500 Feet, catastrophic airframe failure (500m)
C. 1500 - 2500 Feet>> (500m-900m)
D. 2500 - 4000 Feet>> (900m-1200m)

PROBLEM: Aircraft emergency requiring exit at lower altitude than planned.

REACTION: Because of the steps required to deploy the drogue correctly, it may be better to pull your reserve ripcord in the event of a low-altitude emergency exit. Each Tandem Instructor should develop his own emergency exit procedures designed for the aircraft he jumps from.

ANALYSIS: Due to the high freefall velocities that must be dealt with in Tandem, the Relative Workshop's Tandem canopies open a little slower than most square reserves. Otherwise, non-drogue Tandem terminal openings (160-180 MPH or 300kph) would be hard and uncomfortable. It is recommended therefore, that no emergency exits from disabled aircraft be made below 1500' AGL (500m).

There are different recommended procedures for different altitudes. These guidelines are:

A. Below 1,500' or 500m (aircraft engine out):
If the aircraft is stable and gliding, then stay with the aircraft. (This would be in the case of an engine out.) When the aircraft has descended through 500 feet (150m), unhook your student and instruct them to put on a seat belt. Doing this will facilitate the climb out after a bad landing.

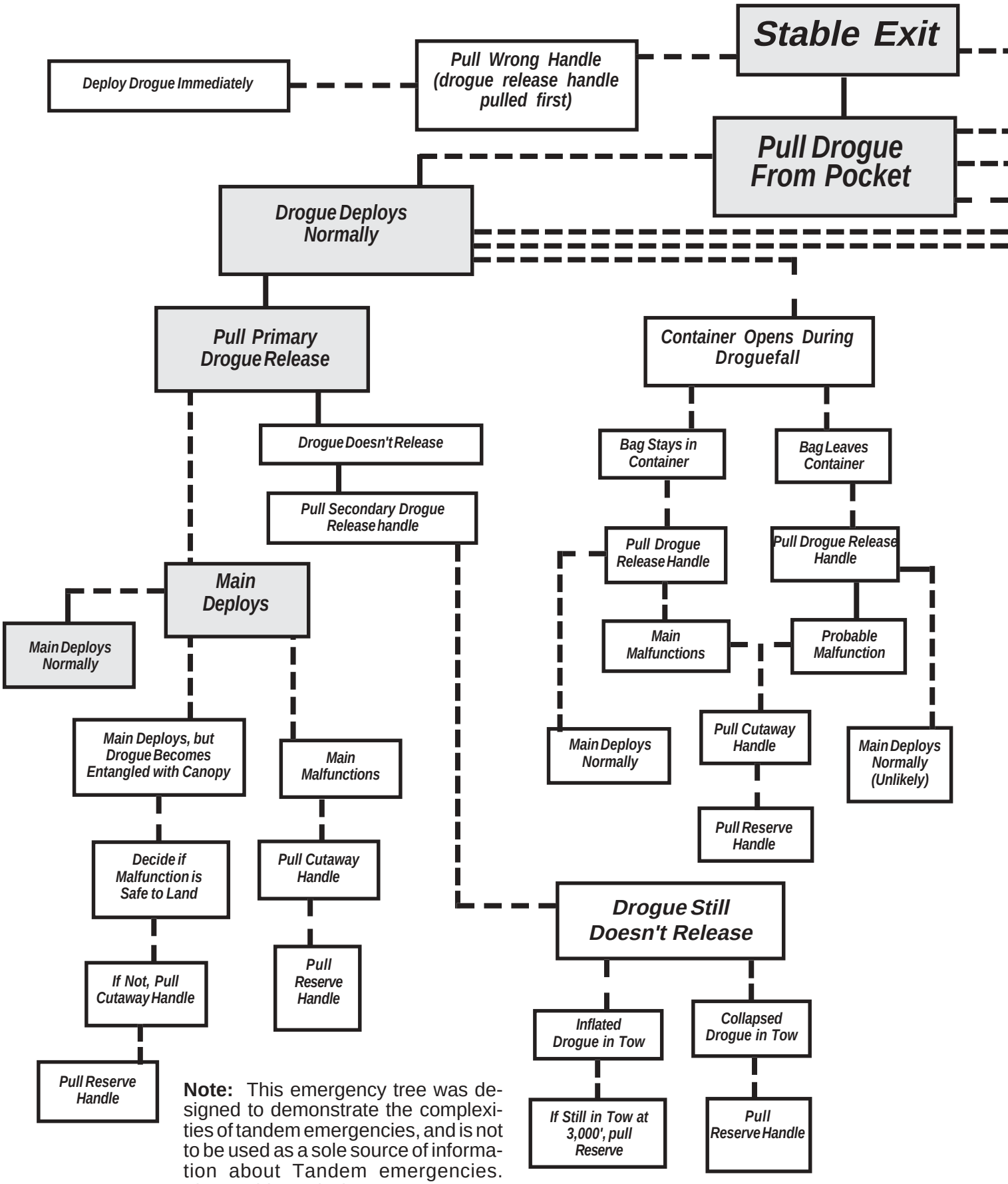
B. Below 1,500' or 500m (catastrophic aircraft failure):
If the aircraft is on fire, or in a spin, or if the wing or some other large control surface has come off, get out and pull the reserve ripcord. If death is assured by staying in the aircraft, then leave. Some chance at survival is better than none.

C. 1,500' - 4,000': (500m-1200m)
Exit the aircraft and pull the reserve ripcord.

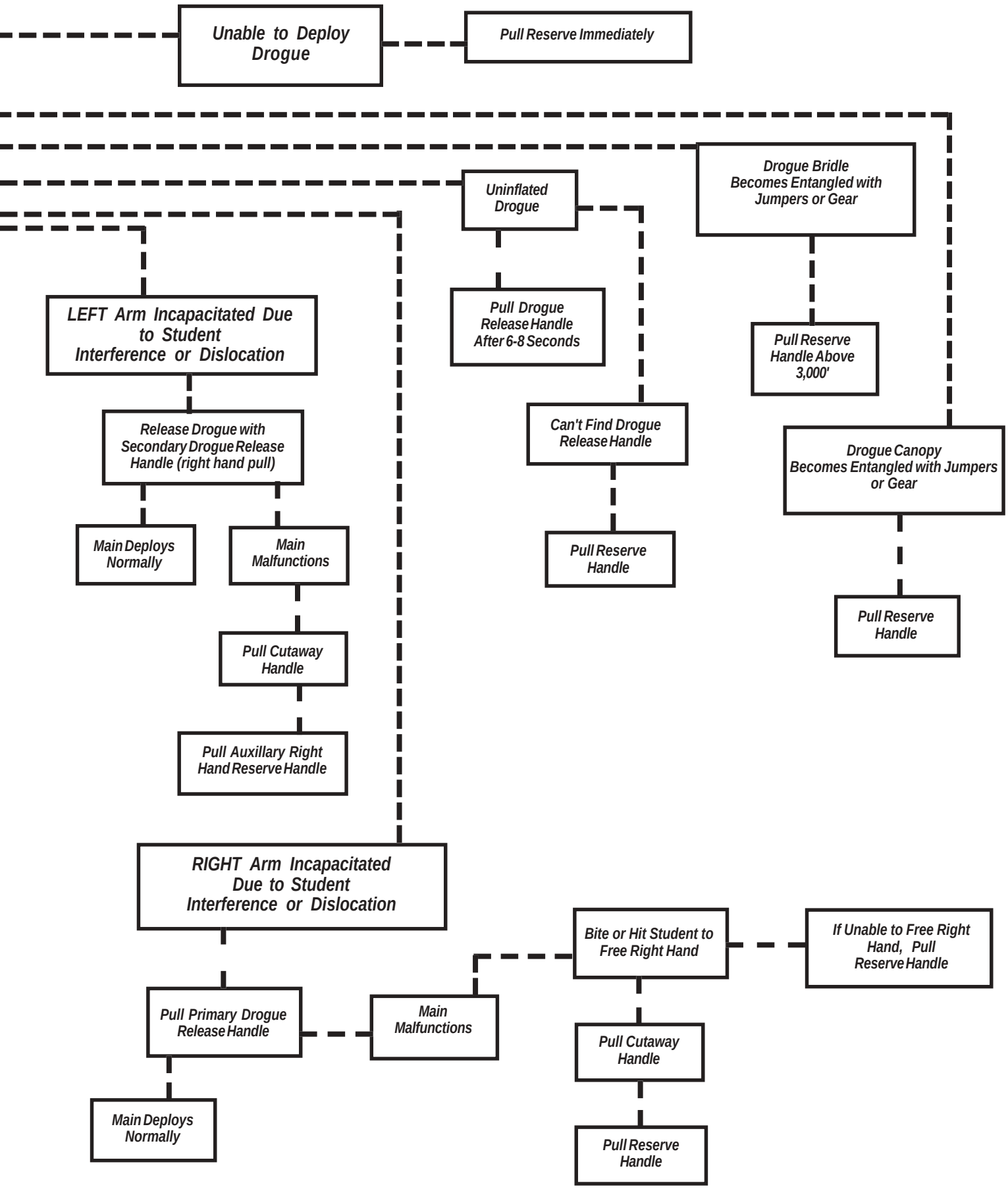
D. Above 4,000': (above 1200m)
Exit the aircraft, deploy the drogue, pull drogue release handle at appropriate altitude. It is important to note here that not all Tandem systems work the same way. On the Tandem Vector, the drogue will not fully inflate if the release handle is pulled first. In fact, if the drogue release handle is pulled first, and then the drogue thrown, a 10 second main canopy deployment can be expected. Not a good idea if you're low. The correct procedure is to throw the drogue, wait for it to inflate (1-2 seconds) and then immediately pull the drogue release handle.

The obvious advantage here? No mind games to play, no tricky scenarios that require out-of-sequence handle pulling. You must always operate the handles in the same order each and every jump. No matter what the circumstance, pull the operating handles in the same order.

Student refusal:
There are two different situations which may arise, these are: 1) The student refuses while still in the aircraft, or; 2) The student refuses once on the strut



Note: This emergency tree was designed to demonstrate the complexities of tandem emergencies, and is not to be used as a sole source of information about Tandem emergencies. Thoroughly study the emergency procedures found on pages 78-87 for complete information.


Unable to Deploy Drogue
Pull Reserve Immediately
Drogue Bridle Becomes Entangled with Jumpers or Gear
Uninflated Drogue
LEFT Arm Incapacitated Due to Student Interference or Dislocation
Pull Drogue Release Handle After 6-8 Seconds
Pull Reserve Handle Above 3,000'
Release Drogue with Secondary Drogue Release Handle (right hand pull)
Can't Find Drogue Release Handle
Drogue Canopy Becomes Entangled with Jumpers or Gear
Main Deploys Normally
Main Malfunctions
Pull Reserve Handle
Pull Reserve Handle
Pull Cutaway Handle
Pull Auxillary Right Hand Reserve Handle
RIGHT Arm Incapacitated Due to Student Interference or Dislocation
Bite or Hit Student to Free Right Hand
If Unable to Free Right Hand, Pull Reserve Handle
Pull Primary Drogue Release Handle
Main Malfunctions
Pull Cutaway Handle
Main Deploys Normally
Pull Reserve Handle

or outside of the aircraft. Follow the procedures below:

1. If the student verbally lets you know they do not want to jump then you must bring them back into the aircraft unless the aircraft door is restrictive in a way that it would be dangerous to re-enter the aircraft(accidental deployment of either parachute system).

2. Once back into the aircraft get student comfortable and ask what the problem is. Do not assume that it is fright, as it could be some physical discomfort.

3. Once you have established the problem decide on whether to make another attempt or not. If it seems to be a psychological problem, re-assure the student of the ease of tasks and reliability of doing Tandem jumps. If they still do not want to jump, descend with the aircraft, accompanying them to the ground.

Being a Tandem Instructor is rarely dull.

Chapter 3: Freefall:

Accidental deployments

Rapid drogue throw
Untimely pulls
Freefall control problems
Drogue deployment problems
Malfunctions

Accidental deployments:

Rapid drogue throw:

It is not necessary to deploy the drogue immediately upon exit. As a matter of fact, throwing the drogue too soon after exit can be dangerous. There have been cases of Tandem Instructors throwing the drogue directly into the tail of the aircraft. (Obviously a dangerous situation since the drogue could entangle with the aircraft - it has happened). Therefore: Exit, gain stability, and then throw the drogue.

Untimely pulls:

A. High
B. Low

A. High pull:

Problem: Here is the scenario for the most common complication that arises on Tandem jumps where the student has the handle within reach: The Tandem pair exits the aircraft. The student panics and immediately pulls the drogue release handle. The Tandem Instructor deploys the drogue and the main deploys instantly.

This can endanger anyone exiting with the pair, above and in line with the relative wind, such as a cameraman, since he may inadvertently be directly over the pair as the main deploys unexpectedly.

B. Low pull:

Problem: This situation may occur when the student is assigned to pull the secondary drogue release. Following the pull signal the student gropes and has difficulty in finding the secondary drogue release handle. Meanwhile, the Tandem Instructor reaches back for the drogue release handle, but thinks that if they both pull their handles, he'll lose the closing loop; and perhaps does not have another. So he waits, sure that the student will get it any second. Meanwhile, the delay causes the pair to open below the planned altitude.

In the very worst case scenario, the Tandem Instructor reaches back for the primary drogue release handle but cannot find it. He then deploys the reserve - just as the student finally finds the handle and deploys the main....

REACTION: On every jump, and especially when the secondary handle is installed, the Tandem Instructor should throw the drogue and perform practice pulls to both drogue release handles, as well as the reserve ripcord. This simple exercise can eliminate the above mentioned scenario.

ANALYSIS: Needless to say, when the secondary drogue release handle is to be used, the student must have sufficient ground training prior to the jump. Do not give the student the right-hand drogue release handle after a mere 15 minute briefing on their first jump.

Freefall control problems:

PROBLEM: Instability following exit.

REACTION: Upon exit, the Tandem Instructor must assume the hard arch position, with arms and legs fully extended.

ANALYSIS: If the student has the hands on the harness, and the legs are bent at the knees with an arched body position, the Tandem pair will be stable almost instantly. If the Tandem Instructor fails to arch and the student's arms are out with poor lower body control, the pair might never gain stability. A good body position from the Tandem Instructor will almost always overcome the shortcomings of the student's body position.

PROBLEM: Student grabs the Tandem Instructor's right arm and is holding on tight.

REACTION: If he has the right arm, simply use the left to release the drogue.

PROBLEM: Left arm is held.

REACTION: If he has your left arm, hit him on the side of his head as hard as you can; he'll probably let go. If you cannot free your left arm, pull the auxiliary reserve ripcord/reserve static line ball handle with your free right hand. (If you have a secondary right hand drogue release ripcord installed and a student has your left arm, reach under the student's arm and pull with your right hand.)

PROBLEM: Both arms are held.

REACTION: If a student gets both arms, a quick, rearward extraction movement of both hands can generally free you at once. If unsuccessful, you still have your voice, your head, your teeth and your knees to work with.

ANALYSIS: A student that panics is apt to do almost anything. This type of incident has been reported enough times for us to know that it can and will happen again. The best course of action is a preventative one. Keep your arms away from the student in the first place.

NEVER PUT A WRIST MOUNTED ALTIMETER IN FRONT OF A STUDENTS FACE. This is an engraved invitation to grab your arm! (See fatality report #6.)

Always tell the student during the pre-jump briefing not to grab your arms at any time during the jump. Make it clear what the consequences might be. Tell the student that you will both die an ugly death by

"sudden impact trauma" if he does interfere with your ability to pull the operating handles.

Drogue deployment and release problems:

A. Pulling the wrong handle
B. Unable to extract drogue from pouch
C. Un-inflated drogue
D. Entanglement with drogue
E. Entanglement with the drogue bridle
F. Non-collapsed drogue
G. Drogue in Tow
H. Drogue does not release when first handle pulled.

A. Pulling the wrong handle:

PROBLEM: You have pulled the drogue release handle before deploying the drogue.

REACTION: Deploy the drogue immediately. This will produce a slow, but otherwise normal main canopy deployment.

ANALYSIS: If you don't deploy the drogue promptly, you will of course continue to accelerate towards 170 mph. Since pulling the release handle turns the drogue into a pilot chute, main canopy deployment follows immediately upon drogue deployment. Therefore, the longer you wait, the higher your velocity will be when the main deploys.

B. Unable to extract drogue from pouch:

PROBLEM: You are unable to locate the drogue deployment handle or are unable to extract the drogue completely from its pouch.

REACTION: Pull the reserve ripcord.

ANALYSIS: It is not necessary to pull either the drogue release handle or the breakaway handle first. In this situation, the reserve ripcord should be pulled promptly, before your velocity builds up. The longer you wait, the greater the reserve opening shock.

This malfunction can usually be avoided by packing the drogue correctly and by practicing drogue deployment on the ground.

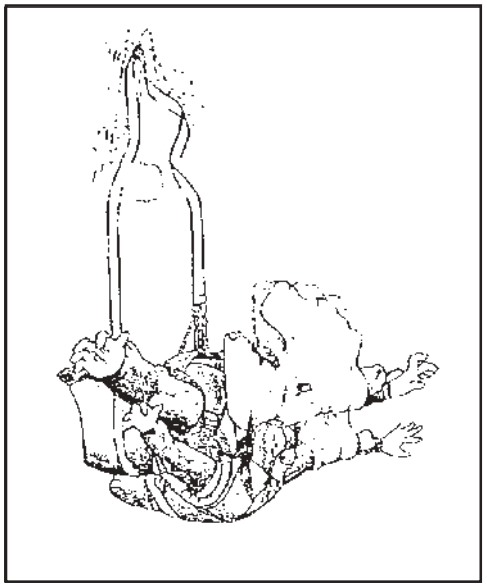
C. Un-inflated drogue:

PROBLEM: Drogue has been deployed and is partially or completely uninflated.

REACTION: If the drogue does not inflate within six to eight seconds, pull one of the drogue release handles to initiate main canopy deployment.

ANALYSIS: An uninflated drogue has enough drag to deploy the main canopy although it will take longer than normal to do so. If you wait longer, your velocity will increase. Higher velocities may produce a higher opening shock.

D. Entanglement with drogue:(#4/3-117)



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PROBLEM: The drogue canopy becomes entangled with you, your passenger or your gear, and does NOT inflate.

REACTION: Spend only a few seconds trying to clear the entangled drogue canopy before pulling the reserve ripcord.

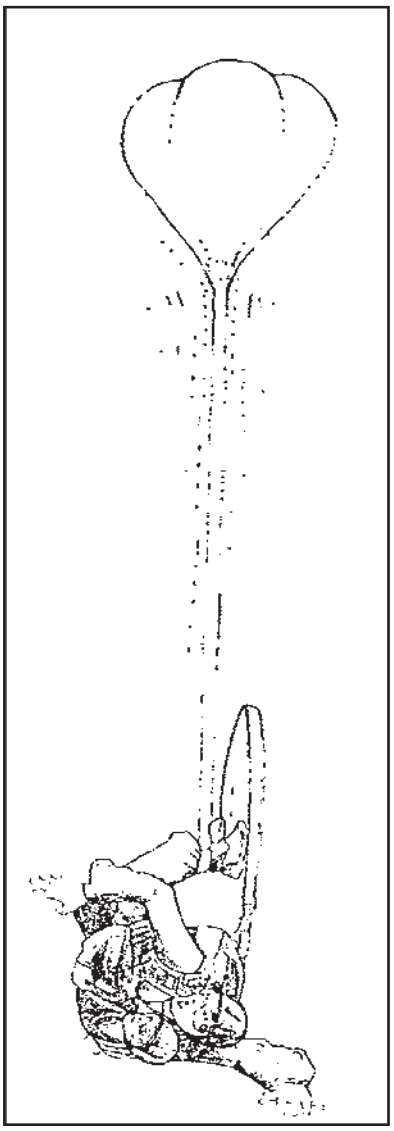
ANALYSIS: In this situation, your velocity will increase to 170 mph in about 18 seconds. The longer you wait to deploy the reserve, the higher the reserve opening shock will be.

E. Entanglement with drogue bridle:
(#4/3-118)

PROBLEM: The drogue bridle becomes entangled with the jumpers or their gear, and the drogue is fully inflated.

REACTION: If you suspect that the drogue bridle is entangled with either person or the gear, do NOT pull the drogue release handle. Instead, deploy the reserve by pulling the reserve ripcord to full extension.

ANALYSIS: Velocity will not exceed approximately 120 mph, giving the Tandem Instructor additional time to analyze and correct the problem. The force of the inflated drogue may or may not clear the entanglement.



#4/3-118

F. Non collapsed drogue:

PROBLEM: You pull the drogue handle, but drogue does not collapse. The main canopy will probably open very hard.

REACTION: Ascertain whether the main canopy has been damaged by opening shock. If it has, decide whether is it controllable and safe to land.

ANALYSIS: If the drogue is still attached and trailing behind the canopy (it will still be inflated), there is probably minimal damage to the top of the canopy. A fully inflated drogue is not a problem, it just adds extra drag, slowing your forward speed.

G. Drogue in tow:

PROBLEM: Drogue release handle is pulled, but the main does not deploy, even after a few extra seconds (the time it would take for an uninflated drogue to deploy the main).

REACTION: For the complete release of the drogue to occur, two things must happen: 1) The 3-ring must release the kevlar outer bridle when the drogue release handle is pulled. 2) The tubular inner bridle must in turn pull the container locking pin out, open the container and lift the bag.

ANALYSIS: If step number one fails to occur, you will have an INFLATED DROGUE IN TOW. You will notice no trap door effect after you pull the drogue release handle.

In this case, if the drogue is still in tow at 3,000 ft. AGL, pull the reserve ripcord. It is not necessary to first pull the main cutaway handle.

If step one occurs, but step 2 fails to occur, you will have a COLLAPSED DROGUE IN TOW. In this case, the 3-ring will have released, but something (probably incorrect tubular bridle routing) has stopped the container closing pin from being pulled.

In this case, you will feel the normal trap door effect when you pull the drogue release handle, but the main won't come out. Instead, you'll keep accelerating towards 170 mph.

A collapsed drogue in tow is potentially more

dangerous than an inflated drogue in tow because the increased freefall velocity gives you less time to pull your reserve ripcord and subjects your reserve canopy to a higher opening speed. With a collapsed drogue in tow, time is of the essence. At 170 mph (tandem terminal, no drogue) 1,000' goes by in only four seconds instead of the six seconds it takes to fall 1000' at 120 mph (normal terminal, inflated drogue). **PULL THE RESERVE RIPCORD QUICKLY.**

A collapsed drogue in tow can almost always be avoided by following the packing instructions correctly.

Do not confuse this malfunction with a simple uninflated drogue which can be remedied by simply pulling the drogue release handle.

Once the reserve is open and you're heading towards the landing area, reach back and reel in the trailing drogue if altitude permits. If the main canopy should begin to deploy, release the main risers by pulling the breakaway handle.

H) Drogue does not release when first handle pulled:

PROBLEM: Primary drogue release handle is pulled, but drogue does not release. This malfunction is usually due to improper assembly of the doubled-ended white closing loop when attaching and setting the drogue during packing.

REACTION: Pull the secondary drogue release handle. If the main still does not deploy, pull the reserve ripcord.

ANALYSIS: This malfunction is usually due to improper assembly of the doubled-ended white closing loop when attaching and setting the drogue during packing. This problem can be avoided by performing a simple check of the cable/loop set-up. Look for "one cable, one loop," "one cable, one loop."

I) Hard or impossible pull on one or both drogue release handles:

PROBLEM: The drogue had been deployed but the drogue release handles cannot be pulled.

REACTION: Pull the reserve ripcord or pull the ball handle on the RSL to activate the reserve.

ANALYSIS: This malfunction is due to improper rigging of the 3-Ring assembly on the drogue release riser. Assembly of the rings in a configuration other than their intended configuration may result in heavy loads placed on the loop and cable assemblies. Such a load can pull the release cables into the grommets of the release riser and create an impossible pull.

Chapter 4: Canopy Control

Malfunctions:

A. Drogue entanglement with main
B. Drogue detaches from main
C. Horseshoe malfunction, drogue cannot be pulled
D. Horseshoe malfunction, drogue can be pulled

A. Drogue entanglement with the main:

PROBLEM: The drogue becomes entangled with the inflated main canopy. This may or may not create a problem.

REACTION: Ask yourself two questions: 1) Can I control the canopy? and 2) can we land safely without injury? If you answer "No" to either question, then perform a breakaway by 2500 feet (750 meters).

ANALYSIS: If your main canopy opens in very deep brakes, or opens in a near-stall configuration, there is always the chance the deflated drogue canopy will be thrown forward of the canopy's nose and fall into the suspension lines. This problem rarely calls for a breakaway because the deflated drogue creates very little drag.

B. Drogue detaches when release handle is pulled:

PROBLEM: Drogue canopy detaches when drogue release handle is pulled. The main may or may not deploy.

REACTION: If the main does not deploy, pull the reserve. The main will almost surely then be released and may deploy fully. As soon as the reserve is fully open, cutaway the main.

ANALYSIS: This can happen when the inner white tubular bridle on the drogue assembly breaks. This break will occur either at the top of the canopy or at a section of the tubular 6'-9' above the closing pin. These two spots have proven to be points of noticeable wear. (Refer to Drogue Inspection procedures, Section 2, middle, page 21).

C. Horseshoe malfunction, drogue cannot be pulled.

PROBLEM: The main bag, for whatever reason, has deployed before the drogue has been thrown. Bag and lines are out.

REACTION: Immediately throw the drogue and pull one of the drogue release handles. The main may or may not deploy normally. If not, proceed with emergency procedures. Be aware of your altitude.

ANALYSIS: Study tandem fatality #10. Always operate the handles in the proper order.

D. Horseshoe malfunction, drogue cannot be pulled

PROBLEM: The main bag has somehow been deployed from the container prior to the drogue being thrown. The drogue however, cannot be thrown for whatever reason.

REACTION: Release the RSL shackle and pull the breakaway handle. You may have to give the main risers a tug to assist their release. Then pull the reserve ripcord.

ANALYSIS: Either the main container closing pin was accidentally dislodged, or the main closing loop broke. Care should be taken when moving around inside any aircraft to protect the handles and the closing pins.

Closing loops should be checked every jump. If their condition is suspect, then change them immediately. (Refer to fatality report #10).

NOTE: Do not pull the reserve prior to getting the risers released. The horseshoe malfunction can cause the risers to cross over the reserve container inhibiting the launch of the reserve pilot chute. The RSL must be released prior to breakaway otherwise the right main riser may interfere with the reserve deployment.

Student feels sick under the canopy:

PROBLEM: One theory suggests that the reason some Tandem students get sick or pass out under canopy is that blood circulation is cut off at the inner thighs and the shoulders by the harness.

REACTION: Loosen the chest strap to alleviate the problem, and have the student sit back in the harness and slide both leg pads forward several inches for comfort.

NOTE: Students who are very nervous or frail are usually those who will feel sick. Very slim frail people have very little insulation of any kind on the inside of the thigh to shield the arteries from the pressure of the harness. When you get a student who fits this description, consider being open at 4,000' instead of 5,000'. The canopy ride is what makes students ill, so keep spirals to a minimum and make all turns as gentle as possible.

Top hook positioning is crucial for maximum student comfort. The farther behind the shoulder center line the hooks are placed, the less the front main lift web will be pressing against the student's chest. Refer to the section on student harness adjustment.

SECTION 5
STUDENT TECHNIQUES AND ACTIVITIES

Student skills for the first jump
Progression skills
Other activities

Chapter 1: Student skills for the first jump

The following briefing points will be presented in logical order as they would happen on a jump. The briefing points listed here are the minimum points to be briefed. You may chose to include a few extra points from the progression list to fulfill your targeted learning objectives for freefall transition.

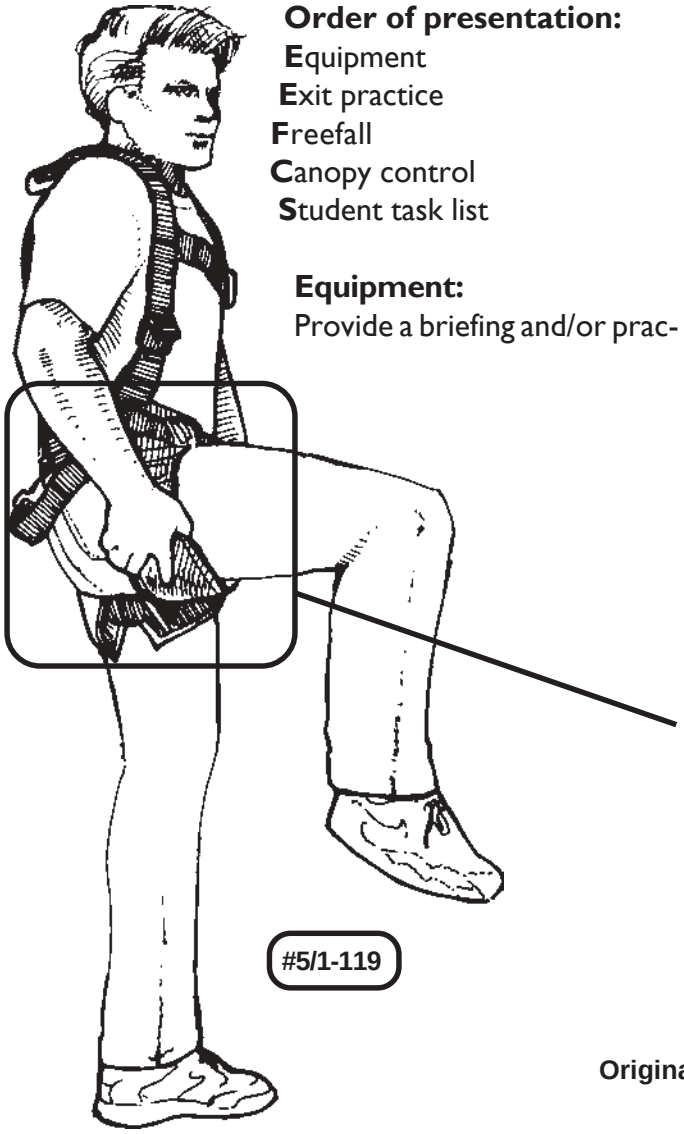
Order of presentation:
Equipment
Exit practice
Freefall
Canopy control
Student task list

Equipment:
Provide a briefing and/or practice on the following three items:
A. Student accessories
B. Student harness
C. Sit back drill

A. Student accessories: retrieve and display the following items prior to gearing up: altimeter (optional), jumpsuit, soft helmet, and goggles are a must. Select a tight suit. This will reduce extra drag from your student, aiding stability after exit. A soft helmet is recommended as it is less of a risk if the Tandem Instructor were to strike the student's head during the jump.

B. Student harness: Due to the complexity of properly adjusting the student harness, never allow the student to adjust their harness entirely on their own. They certainly may step into the harness and fasten the chest strap, but the remainder of the adjusting should be done by the Tandem Instructor. Explain the problem of the blood flow being reduced at the legs and the shoulders and the importance of proper harness adjustment. It is practically impossible for the student to do a good job adjusting the harness on his own.

C. Sit back drill: After harness is on the student, have them lift one knee up to the waist, and using both hands, slide that leg strap forward 2-4 inches (5-10cm) . Repeat on the other side. There is almost no chance a student will be willing or able to do this under canopy unless they have practiced it first on the ground.



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Exit practice:
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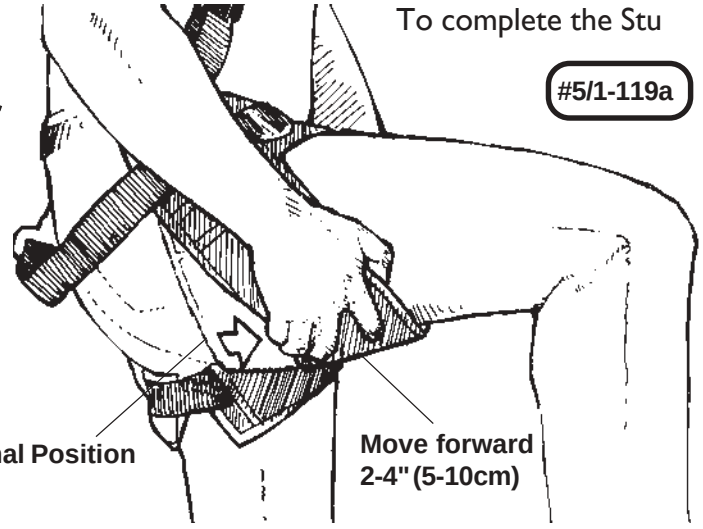

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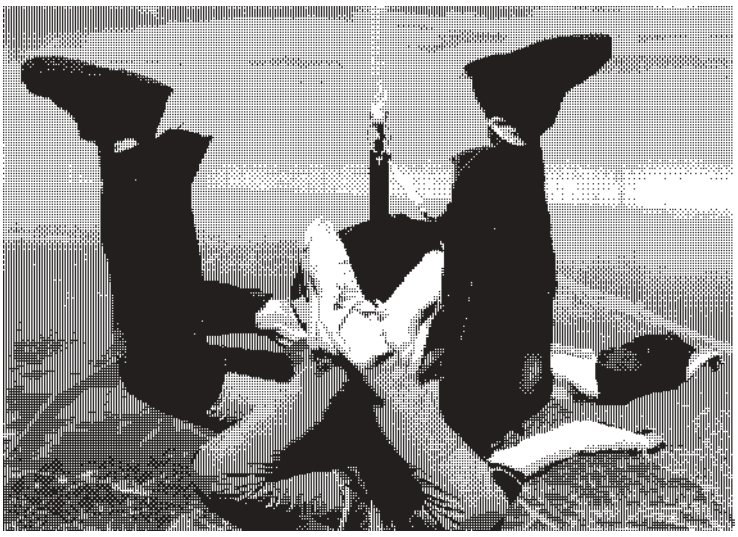
dent Briefing, go to the plane early, and practice inflight procedures. The inflight briefing should include: climbing into the aircraft and seating position, what to do on the way to altitude, the hook-up procedures and the climb out and launch from the airplane. To practice, get into the plane and run through the whole jump sequence once or twice, including an exit with the student's harness attached and tightened down to yourself. Review the body position the student should assume for the exit launch and freefall.

Freefall:
A. Droguefall positions
B. Arm extension

A. Droguefall position: Start by deciding on which exit position the student will use on the jump. Demonstrate and explain the proper body position for exit and freefall to your student. Every stable exit and drogue deployment begins on the ground with thorough training of the student in the proper body position. Have the student lie down and practice the correct freefall position. Several minutes of practice here will make all the difference on exit and freefall. Exit requirements from aircraft to aircraft may cause a variance in the position but the basics remain the same.



A student position of crossed legs and arm extension during extended drogue fall provides stability

Here are two common freefall positions:

1) Arms crossed: head back, arched torso, feet crossed, and arms crossed in the front and holding onto their own harness.

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2) Elbows back: head back, torso arched, feet together, and hands holding onto the same side of harness, elbows back. This last position is

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recommended but remember to emphasize the importance of keeping the arms IN on exit to reduce the likelihood of door contact.

With arms crossed, students sometimes stick their elbows straight down, causing rocking. This may also tend to inhibit the arch. On the other hand, if the student does not put their

elbows back, they might block the exit, or be injured while exiting out of certain small door aircraft. In the final analysis, whether the student crosses the arms or not depends on the size of the student, your size, and the aircraft being jumped.

Remember that it is far easier to control a student whose arms are close to the body. If the student hits a hard reverse arch, with arms and legs out, while you are on your back, it may be difficult or impossible to turn back over and get stable.

B. Arm extension:
This is simply a regular RW box body position with the arms out and comfortably bent. It should also be practiced in the prone position including the signal you intend to give for release and attaining this position. The signal will be a tap on the head, and/or a shout in the ear. NEVER reach around in front of the student for any reason. Reaching around in front of the student could give him the chance to grab your arms. (see fatality reports).

At some point during the briefing, tell the student never to grab your arms at any time during the jump. To drive the point home, explain the importance of you having both arms free, and end by saying that you will both die if your arms are hindered.

Canopy control:
A. Location of steering toggles
B. Steering the canopy
C. Flaring the canopy
D. Landing approach

A. Location of steering toggles:

After opening have the student look up to the risers and visually locate the steering toggles. Demonstrate the release of the brakes with mention of the increasing wind speed as the canopy approaches full flight. The Tandem Instructor should use the student toggle position to release the brakes. Have the student slip their hands into the toggle and grasp firmly. Advise them to follow your commands and assist in control maneuvers.

B. Steering the canopy:

While the student is assisting in controlling the canopy, have them perform and identify the following flight modes:

1) Full flight: Most students tend to pull on the toggles all the time. They must be taught to consciously leave the hands all the way up for full flight.

2) Turns: Have the student look in direction of the intended turn, checking for other canopies, and then pick out a ground heading to turn to. Practice turns in both directions. The student should try both flat and spiral turns to recognize the difference in speed and descent of the canopy. Inform the student that no countering is necessary to stop a turn, simply return

the toggle to the same level as the opposite one and wait for the turn to settle.

3) Braking: Have the student pull down on both toggles from full flight position. Student should listen and feel the change in wind speed and noise. Mention that the canopy will slow down a lot and that is why braking is done on landing. Explain to the student the difference in braking and flaring the canopy for landing. Gradual braking slows the canopy but with an increase in descent, while flaring slows the canopy with an increase in lift.

Any cameraman accompanying a Tandem pair must meet all the qualifications for Relative Work, plus have at least 100 camera jumps

C. Flaring the canopy: Practice performed at 4000' - 1500'.
Have the student practice flaring the canopy upon your command. The student should follow these steps in flaring;
- Have both arm raised all the way up in the full flight position.
- Start flare immediately upon Tandem Instructor's command.
- Flare symmetrically and fully in one smooth motion.
- Flare by depressing the toggles to full arm extension.
- Hold flare position until landing or commanded otherwise.

This flare drill should be practiced 3-4 times to enable the student to get a good feel for it. You should inform the student to remain relaxed, yet ready to respond to the flare commands you will be giving upon the landing approach. Let the student know that the approach speed may seem quick and reassure them that the canopy will slow down when flared.

D. Landing approach:
Discuss canopy approach to the landing area, point out the pattern or flight path you intend to take and at what altitude you plan to be at each turning point. Point out the direction of the wind and the expected landing point.

Student task list(first jump):
- Get into harness with assistance.
- Perform climbout with Tandem Instructor attached.
- Attain the droguefall position prior to exit.
- Perform arm extension upon Tandem Instructor's command.
- Grasp steering toggles upon command.
- Perform turns, braking, full flight and perhaps flaring upon Instructors command.
- Prepare for landing on Tandem Instructor's command.

Chapter 2: Progression

Progression guidelines are set out by the various National Aero Clubs of each country and should be followed. There are some useful opportunities in which skills can be developed. It should be known, however, that Tandem jumps and training do not fully replace the content and training of either the First Jump or Accelerated Freefall ground school. The Relative Workshop recommends that at least one Tandem jump be done and that as many as 3 Tandem jumps could be of benefit towards first jump and freefall training. Skills which can be presented and trained with Tandem will be listed under the following headings:

Preparation
In-aircraft
Freefall
Canopy control
Unusual situations

Preparation (Instructor supervised)

A. Put on and adjust own harness
B. Put on and set own altimeter

A. Put on and adjust own harness:

After one Tandem jump the student should put on and adjust his own harness. The steps in doing this are:
- Straighten the harness out by holding the top shoulder snaps, then straightening any twists in the main lift webs or leg straps.
- Loosen the leg straps if not already done.
- Insert telescopic leg pads.
- Slip legs into the harness.
- Slip harness over the shoulders.
- Loosen main lift webs if harness is too short.
- Tighten the main lift webs until the snaps are located just low of center on the back of the shoulder and the lift web - leg strap junction is at the hip joint.
- Tighten the leg straps.
- Do up the chest strap tightening to the point of pulling the main lift webs in line with the shoulders.
- Tuck in all loose ends.

B. Put on and set own altimeter

On your second jump the student should start to use an altimeter if not already doing so.
- Have the student slip the altimeter onto the chest strap or wrist and secure strap.
- Have student zero the altimeter prior to boarding the aircraft.
- Inform student of the limitations of the instrument such as lagging when in a burble, etc....

In-aircraft

A. Assist spotting
B. Spotting

A. Assist spotting

Starting with jump number two get the student involved with spotting. Have your student follow these simple steps:
- Have the student assist by getting their head out and looking straight down out of the aircraft. Have the student take a horizon reference to judge how to determine straight down. Also have your student try to judge where the aircraft is headed. To allow time for this exercise inform the pilot that you would like a longer jumprun.
- On jump three, have your student line up the aircraft as well as give an OK for the exit when overtop. You will assist them in giving confirmation of corrections and decisions to exit. Spotter - pilot signals should be introduced for this jump so your student can apply them. Introduce the signal for right and left heading corrections, straight ahead or hold heading, and the signal and command for cutting the engine and locking the wheel brake.

B. Spotting:

- On jump number three, have your student spot on their own giving correction signals directly to the pilot. You should intervene only if the student's spot is taking you outside of the spotting envelope.

Freefall

A. Perform and improve main activation technique
B. Monitor altitude with altimeter
C. Transition requirements for freefall training

A. Perform and improve main activation technique

Training pulls:
Training pulls can be introduced on the second jump. Practice on the ground with a real dummy ripcord so that the student will know exactly how the handle will feel in the palm of his or her hand, and what it will feel like to pull. Use 10-12 repetitions at least in order to eliminate confusion in handle location and pull technique during in air practice and pull time. Teach the training pulls with this sequence:
- Visually identify the handle by looking down side.
- Reach for handle with right hand while countering with left arm out in front.
- Positively grasp the handle.
- pull the handle while simultaneously and symmetrically returning to the arm extension position.
- Relax a moment then repeat.

The student must be given a specific altitude at which to pull. There should also be a signal from the Tandem Instructor to the student when it is time to pull. The Tandem Instructor can either tap the student on the head, and/or yell into their ear "pull, pull, pull".

When the student has access to the secondary drogue release handle, it is important that the Tandem Instructor set rigid parameters for altitude. A student is likely to grope for the handle on the first try, and may take some time before pulling, or may never find it.

Training pulls can be introduced on the second jump. Use 10-12 practice repetitions.

Give the signal to the student early, so that they may have some time to fumble. As soon as the "pull" signal is given to the student, the Tandem Instructor should put his hand back on the drogue release handle and look at his altimeter. At the set altitude (between 4,000' - 5,000'), the Tandem Instructor should pull the drogue release handle.

B. Monitor altitude with altimeter

Altimeter operation:
The use of the altimeter can begin on the first or second jump. Whether the altimeter is mounted on the student's wrist or chest strap, specifically run through the motions he or she must go through to look at it. Discuss when the student should look the altimeter, whether on a signal from the Tandem Instructor, or on their own cue. Since to keep chest mount altimeters visible would require an overtight chest strap.

During the flight up note how altimeter indicates altitude as you ascend. Have the student periodically check and read the altimeter on the way up. This will get the student comfortable with the workings of the altimeter.

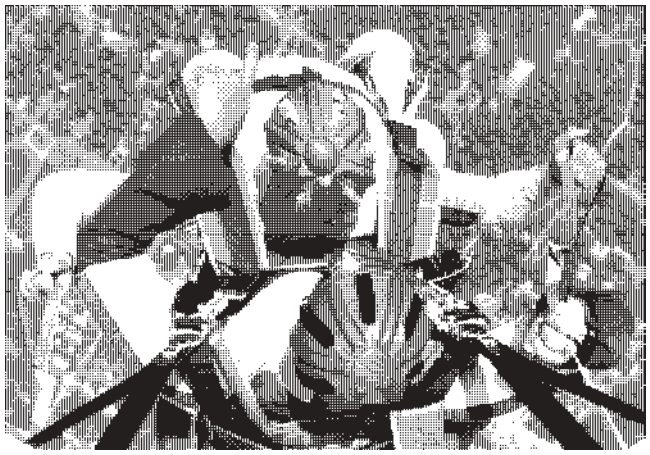
C. Transition requirements for freefall training:
Regardless of the accumulated freefall experience, brief the student thoroughly on the pull technique, freefall count, solo sensations as well as all possible freefall emergency scenario's. Rules such as "Never sacrifice altitude for stability", "When in doubt, get it out", and Try two times only, then go for the reserve", should all be emphasized. It's better to take nothing for granted on the transition to "solo" freefall.

Solo: must complete a first jump (s/l) course prior to exiting the aircraft unassisted.
AFF: must enter the program no later than Level 3 utilizing two instructors. The Relative Workshop recommends that at least one Tandem jump be made prior to participating in the AFF program and that as many as three Tandem jumps could be of benefit.

Canopy control

A. Perform canopy inspection
B. Perform turns and spirals
C. Perform stalls and recovery
D. Identify running, holding, crabbing, and wind line
E. Assess wind directions and strength
F. Fly a pattern to set up for a landing approach
G. Picking up gear

A. Perform canopy inspection:
Canopy inspection can be introduced at the same time as the training pulls or actual pull. The key points of inspection should be discussed on the ground with the aid of actual canopies in flight or the use of pictures and diagrams. The key points are: rectangular shape, straight orderly lines, and slider. An explanation of line twists, collapsed end cells, and slider up situations and solutions should also be discussed. Once the inspection has been completed in the air, the student should follow it up with a canopy flight check. The flight check should consist of flaring once followed by a turn in either direction. The check is simply answering the following questions; "Can I flare the canopy?", and "Can I turn the canopy?". Your student should verbally explain to you what they are checking as they do it.



"Identify crabbing, holding and the wind line"

B. Perform turns and spirals:
Turning the canopy begins with the first jump and every jump after. Spiraling the canopy might be something that is left till the second jump when you know how your student will react. Have the student initiate the spiral by starting with a slow turn from a full flight position then depressing the toggle to full arms length making a spiral turn.

C. Perform stalls and recovery:
This in-air task is a second or third jump drill. It is very important if the student is assisting or actually landing the canopy. Begin by explaining the concept of a stall to the student prior to the jump. Once in the air have the student gently pull the toggles all the way down, letting the canopy stall for several seconds. Gently let the toggles up so the canopy recovers slowly. Explain to the student the danger of stalling the canopy upon landing approach. This is a good time for the student to practice their stall recovery techniques for landing. The student should recognize the feeling of the canopy entering a stall and return the toggles up no more than several inches for a recovery with minimal surge.

D. Identify running, holding, crabbing, and the wind line:
On the second and third jumps, include explanations on the ground and during the canopy's flight on running, holding, crabbing and the wind line. Once under canopy, turn down wind and explain running. Ask student where he thinks you will land if you keep heading in this direction. Turn upwind and define holding. Ask the student for the probable landing area in present direction. Turn 90 degrees to the wind and define crabbing. Ask student for probable landing area if you keep heading in this direction. When flying the base leg have the student tell you where to turn onto the wind line for final approach.

E. Assess upper and ground wind directions and strength:
On the second and third jumps, point out ways to tell wind direction: how to read the wind sock, the location of flags, and the use of smoke, waves on water, cloud shadows etc... Under canopy have your student apply the information from these indicators to judge upper and ground wind directions. Combine this information with the use of crabbing in a braked configuration to assess wind speed to help decide how far back to turn onto the wind line for final.

F. Fly a pattern to set up for a landing approach:
On the third jump, explain and have the student fly a pattern to the landing area while performing upper drift assessments and ground wind assessments. Allow the student to decide how far back to turn onto the wind line for final.

G. Picking up gear:
After landing and student harness disconnection have the student pay attention to how the canopy should be picked up and carried back, not dragging any part of the system.

Unusual situations:
A. Respond to malfunction scenarios after opening

A. Respond to malfunction scenarios after opening:
Include this drill on the second and third jumps for realistic assessment and reaction to malfunction situations. Prior to having the student perform this drill in the air they should receive a thorough ground briefing on how to assess a malfunction situation and decide the correct follow-up action. Have the student perform ground drills and test their decision making ability prior to jumping. Remember, this may be the only emergency training they will receive for the rest of their skydiving career. If your student harness is equipped with dummy cutaway and reserve handles (they should match your student gear), you may wish to train your student to pull the cutaway followed by the reserve handle immediately after opening and checking the canopy. The transition from drogue fall to canopy opening is a stressful time for a student and this drill should give you a good idea of how the student would handle a real emergency. Keep in mind while attempting to clear a malfunction (hard pull or no pull) that they only try twice then must go for the reserve ripcord.

Chapter 3: Other activities

Relative work procedures

Participants qualifications
RW Tandem briefing
Briefing review

These guidelines are not optional. They must be followed, or the Tandem Instructor and Tandem rig owner will be in violation of the User Agreement under which Tandem jumping is operated and will consequently no longer be allowed to legally perform Tandem Tumps.

A. Participants qualifications
For any relative worker to accompany a Tandem pair, the following criteria must be met:

1) Relative worker must have a minimum of 500 relative work skydives; or

2) Relative worker must be either a current Tandem Instructor or a current AFF jumpmaster.

3) Relative worker must have made at least 100 relative work jumps in the last year.

4) Cameramen must meet all the above guidelines, and in addition, must have at least 100 camera jumps.

B. RW Tandem briefing

If the Tandem Instructor does decide to take a relative worker on a jump, a briefing must take place before the jump between Tandem Instructor and relative worker which covers these points:

1) No one should ever pass directly over or under the Tandem pair in freefall. On exit, the Tandem Instructor needs room to deploy the drogue, and at any time after that, the drogue could suddenly become a deploying main canopy.

2) Once under the drogue, the Tandem pair has very little ability to change drogue fall velocity or to move horizontally (track). This means they can't get out of the way of someone who is closing too fast or of someone sliding under them. Therefore, NEVER let anyone who is not a skilled relative worker accompany a Tandem pair on a dive (see fatality report section).

2B) If the grips are taken, take them on the passenger, not the Tandem Instructor.

3) Because the Tandem pair cannot track very effectively, they must obtain opening separation by opening higher than everyone else. Accompanying relative workers must not attempt to open their main canopies with the Tandem pair. A minimum of 1000' vertical separation is required - to avoid collision situations.

C. Briefing review

To review: when you dirt dive Tandem drogue relative work, tell the participants four things.

1) Give me room to deploy the drogue in the first five seconds after exit.

2) NEVER pass directly over or under us.

2B) Grip the passenger, NOT the Tandem Instructor.

3) Approach slowly and dock gently.

4) Let me pull first at 4,000' or above, and give us at least 1000' vertical separation.

REMEMBER: If you delay drogue deployment, you eat up altitude at a much faster rate than when the drogue is deployed. See Tandem freefall chart on page 72.

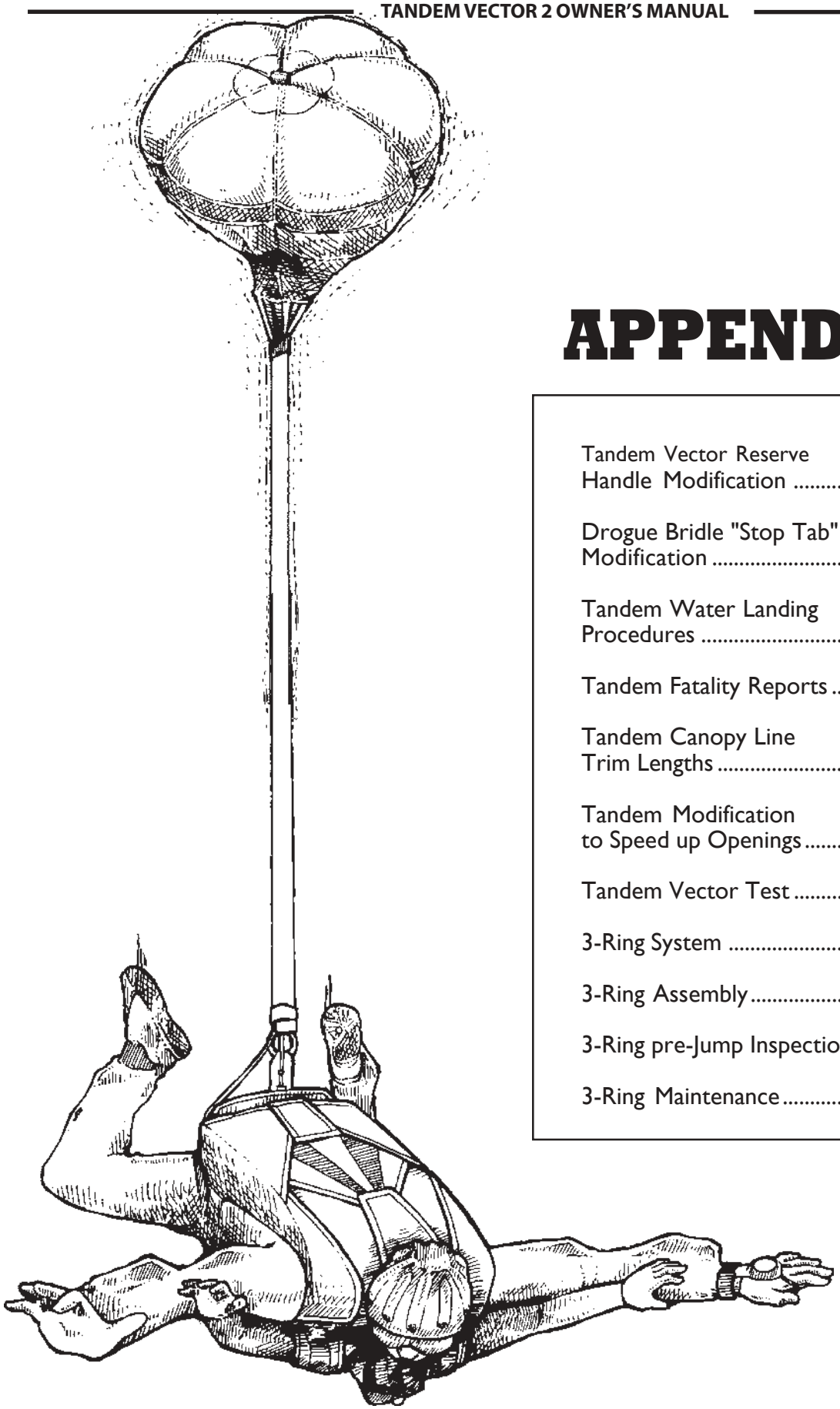
Relative work with Tandem increases the possibility of accident and injury. However, it can be done if approached with care. On every Tandem jump, the Tandem Instructor is in charge. If Relative Work is being contemplated, the Tandem Instructor should have personal knowledge of the relative worker and should feel confident in their abilities.

WARNING:

If the right hand drogue release handle is installed and is accessible to the student, then ALL RW IS POSITIVELY PROHIBITED. Here is what can happen: a solo jumper docks on a Tandem pair. The student then pulls the right hand drogue release handle prematurely. The Tandem pair drops sharply and the solo jumper is pulled down on top of them. As the canopy deploys, the Tandem pair is then hoisted up very quickly and knocks the solo jumper unconscious. There is also the obvious danger of the student pulling at any time during the jump. Anyone overhead would be in serious trouble. For this reason, any photographer accompanying a Tandem pair with this handle must plan the exit and dive so that he is NEVER above them.

CRW procedures

CRW IS POSITIVELY BANNED ON ALL TANDEM JUMPS UNDER ANY AND ALL CIRCUMSTANCES (see fatality section). This guideline is not optional. It must be followed or the Tandem Instructor and Tandem rig owner will be in violation of the User Agreement under which Tandem jumping is operated and will consequently no longer be allowed to legally perform tandem jumps.

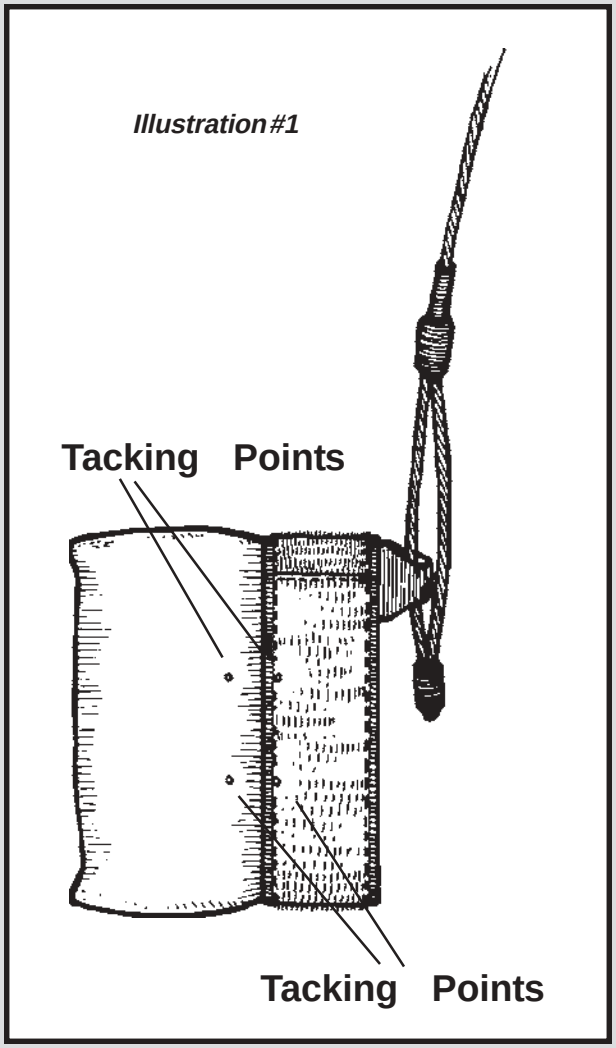


APPENDICES

TANDEM VECTOR RESERVE HANDLE MODIFICATION

Some Tandem Vector owners have suggested that they would prefer the soft reserve handle to "stick out" from the main lift web at a sharper angle than it does now. For those who would prefer the handle to have a more pronounced angle, these directions explain what to do. You will need waxed tacking cord and a needle. You need not remove the handle completely from the rig to perform this modification.

Lay the handle on a table so that the cable is on the right. Make two marks about an inch apart from each other in the center of the handle and about 1/4" from the edge of the velcro. The other tacking entry point will be just inside the edge of the velcro as shown in illustration #1.



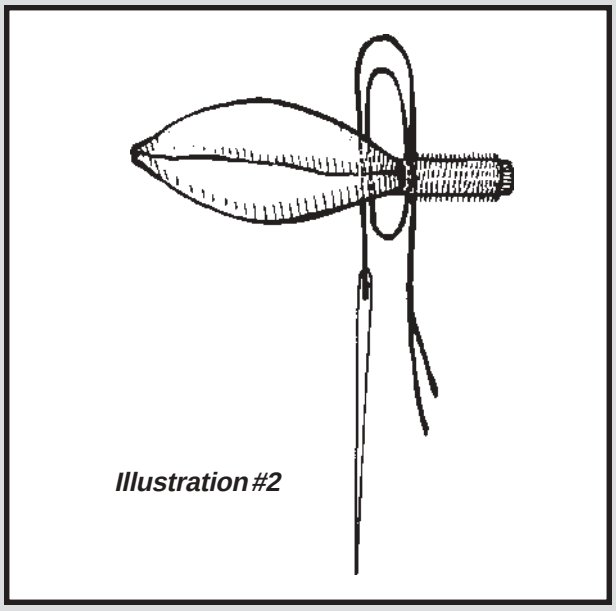


Illustration #2 shows the handle from on end. Sew twice through the tacking points with the entry and exit points on the back of the handle.

When you tighten the tacking cords, you'll force the handle to an angle as shown in illustration #3.

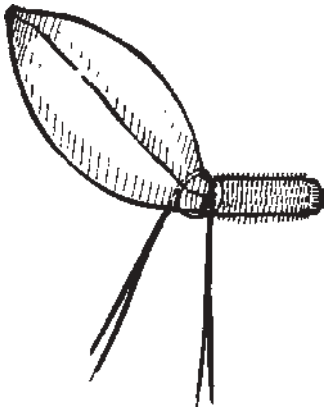
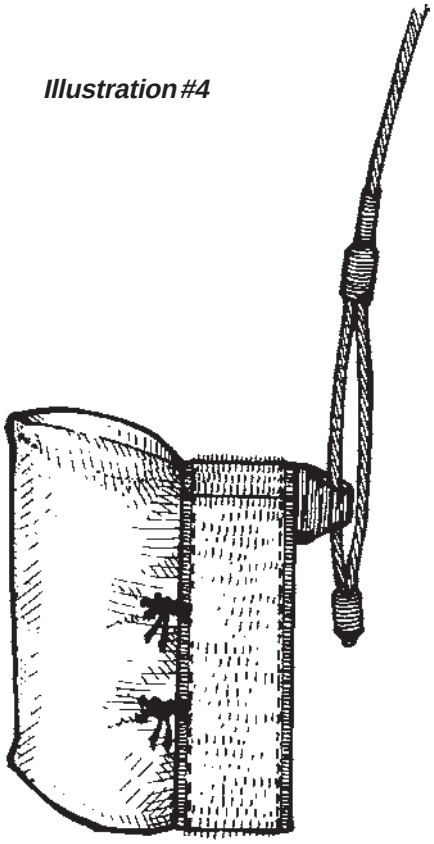


Illustration #3

Illustration #4



Secure the ends of the tacking cord with a surgeon's knot. Repeat the process through the other tacking marks and tie. When you're done, your handle should look like illustration #4, with two secure knots on the back of the handle. When reattached to your rig, the handle will stand out from the harness.

the uninsured
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Relative Workshop Tandem Vector
Drogue Bridle "Stop Tab" Modification

Recently we've seen videos showing Tandem main containers open in drogue fall. This seems to be a result of the white tubular bridle whipping back and forth inside the inflated drogue. Occasionally, this motion takes up all the slack between the bottom of the drogue bridle and the main pin - and every so often the main pin is pulled out of its loop as a result. In a great majority of cases, this causes no problem; the main stays in place and deploys normally when the drogue release handle is pulled. In fact, the Tandem Master feels nothing. Apparently the secure attachment of the drogue bridle prevents the bag from falling out of the container.

This whole scenario occurs very rarely. However, rare as it is, it COULD have serious consequences. Many options were researched, with the "stop tab" offering the best solution. It seems to eliminate the old problem without causing any new ones. We'd still like your input. Keep your eyes and video on it for awhile and report any problems to the Relative Workshop.

1) The drogue bridle has two components: a yellow kevlar outer bridle, and a white tubular inner piece. The white tubular should have a blue mark on it showing where it comes out of the yellow kevlar outer bridle. If your system does not have this mark on the white tubular, begin by attaching and "setting" drogue to its full extension

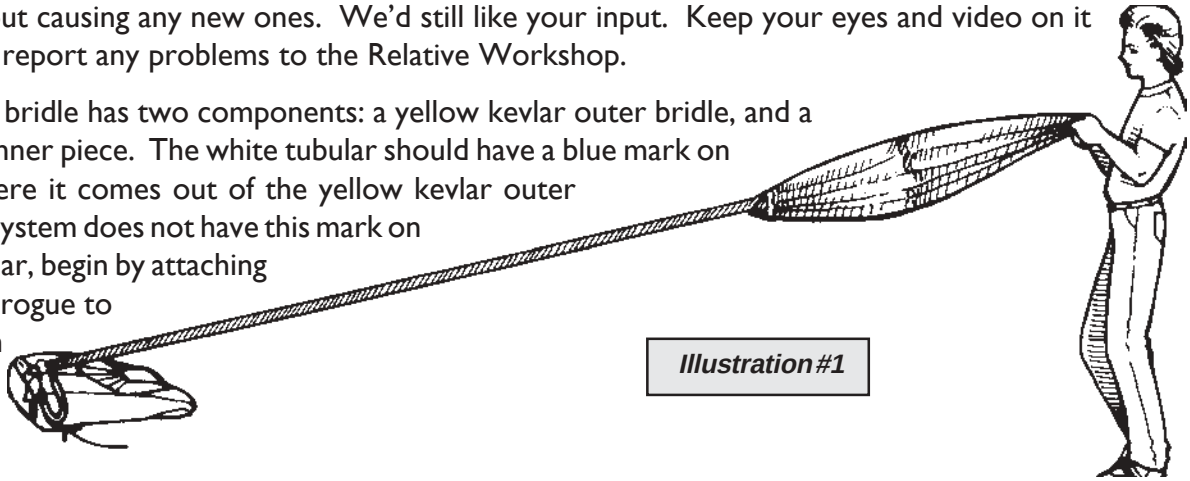


Illustration #1

as shown in illustration #1

2) When drogue is set, mark the white tubular with an indelible pen right where it comes out of the yellow kevlar. This will be called your **"SET"** mark

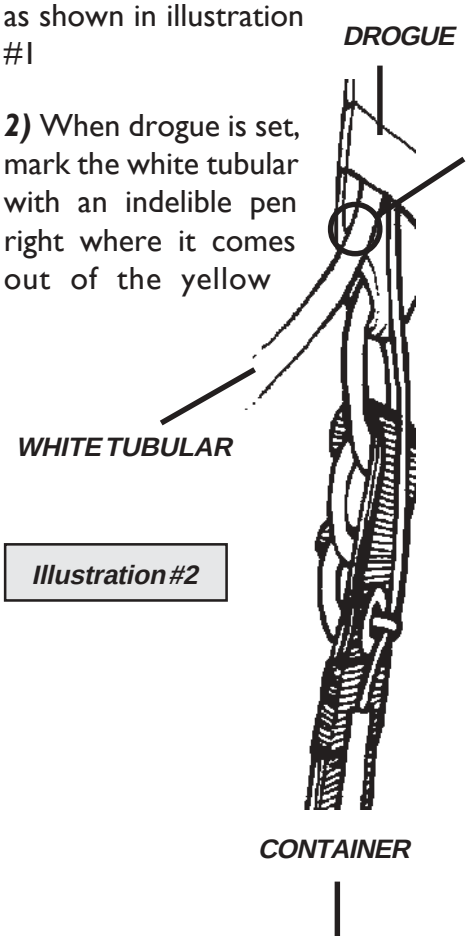


Illustration #2

3) One idea of this modification is to give a little extra slack in the white tubular between the main pin and the yellow kevlar bridle. To achieve this, make a **NEW** mark on the white tubular 3" TOWARDS the drogue as shown in illustration #3. This is where the new stop tab will be sewn.

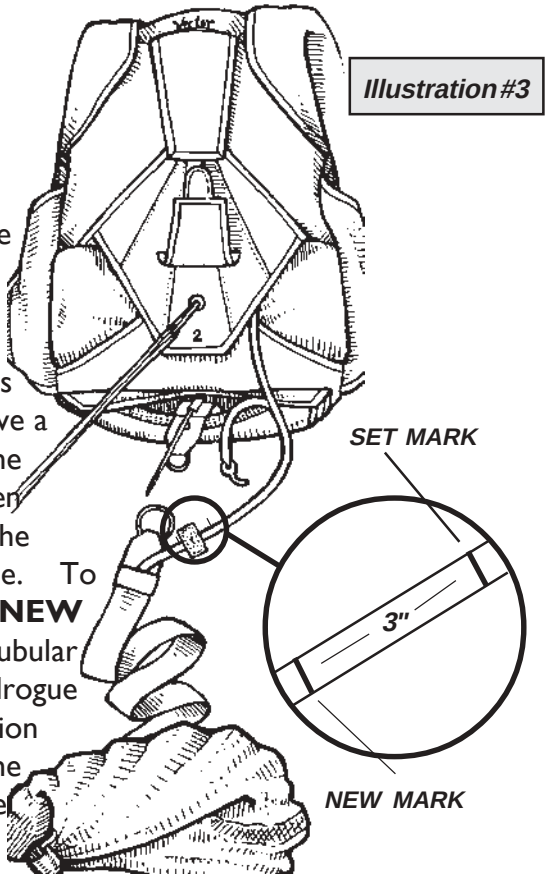
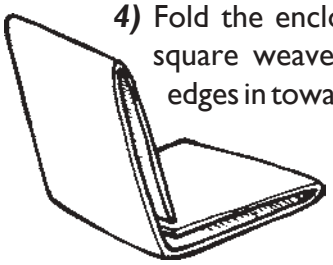


Illustration #3



4) Fold the enclosed 7" piece of white square weave in half, then fold the edges in towards the center as shown in illustration #4.

Illustration #4

5) Center the new stop tab on the bridle and secure with a four-point pattern as shown in illustration #5.

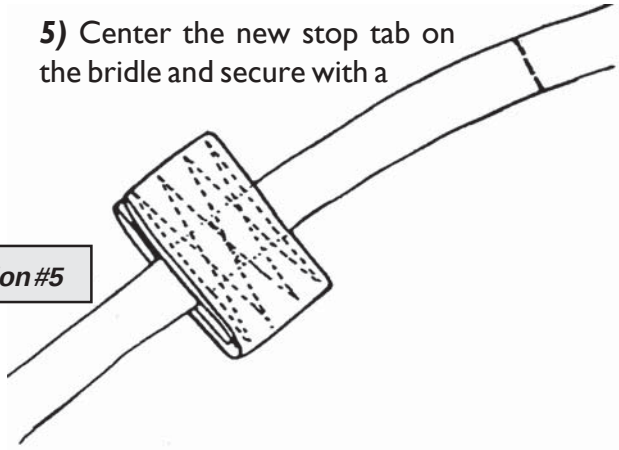
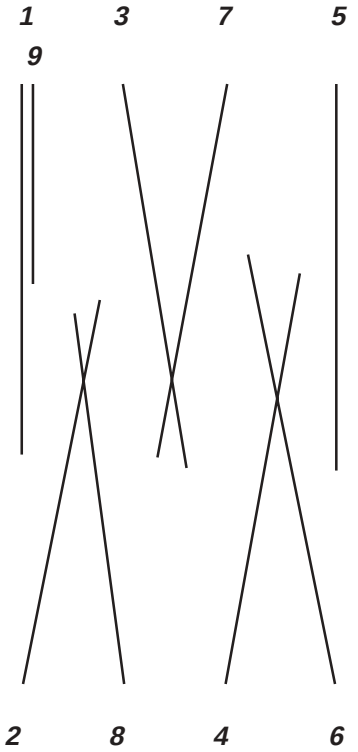
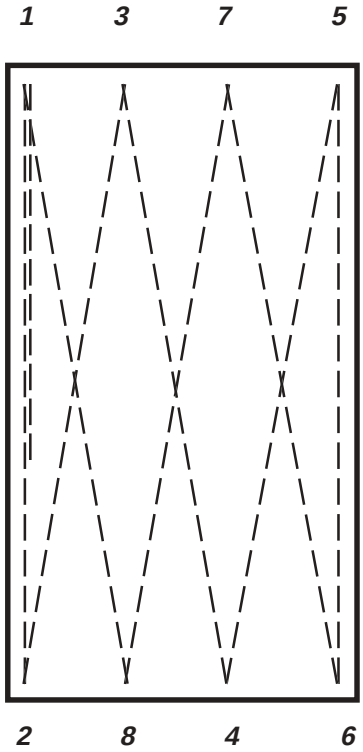


Illustration #5





NOTE: The four point pattern must be sewn the long way on the stop tab. Follow the pattern shown here.

NOTE: After installation, it is important that the drogue is set carefully so that the new stop tab is not damaged. Don't pull so hard on the orange handle that the tab is pulled up inside the yellow kevlar bridle or is damaged. This stop tab was chosen in part because it will probably never get in the way of the 3-Ring drogue release. If treated carefully, the new stop tab should last as long as the bridle.

Relative Workshop

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Tandem Water Landing Procedures

A water landing is not a likely scenario for a Tandem jump, but it is a possibility. Below is a list of procedures to follow for a Tandem water landing. Since it is best to be prepared for every eventuality, practice the sequence on the ground a few times to get used to the order of events.

On any skydive (whether Tandem or sport) made in the vicinity of water, water gear must be worn. If a Tandem jump is made near water, BOTH the Instructor and the student must wear approved water gear.

1) Release Reserve Static Line (RSL).

2) Disconnect student side attachment points.

3) Remove pins out of top student attachment points.

4) Have student inflate LPU water gear.

5) Tandem Instructor undoes chest strap.

6) Flare and land into the wind.

7) If there is a great deal of wind, release main.

8) Release student top snaps.

9) Push student away.

10) Tandem Instructor swims out of harness.

11) Tandem Instructor inflates LPU water gear.

TANDEM FATALITY REPORTS

#1 - Current Tandem Instructor
2,400 jumps total - 70 tandem jumps.
Exit Cessna 182, 6,000'. Tandem Instructor forgot to hook up right upper snap, and spent entire freefall trying to hook it up (his hands were on it at impact). Drogue was in pouch. Drogue release ripcord was in pocket as well as reserve ripcord.

#2 - Current Tandem Instructor
1349 jumps total - 62 tandem jumps.
Second Tandem of day for Tandem Instructor. Pair exited Cessna 182 at 8,500'. Normal opening at 4,000'. After opening, Tandem Instructor released both side connectors; released reserve static line (stevens system) and pulled out both upper snap safety pins. Then did CRW and had wrap at 3,000'. Other solo jumper cutaway - reserve OK. Tandem cutaway at 2,000'. Passenger and Tandem Master separated at lower connector points almost immediately and went violently unstable until impact. For first part of fall after cutaway, Tandem Master was attempting to grapple with passenger to gain control. During latter part of fall, Tandem Master stopped all activity as if trying to fall stable. No attempt to open reserve was observed.

#3 - Current Tandem Instructor
2000 jumps total - 70 Tandem jumps.
Pair exited Cessna 182 at 8,300'. Exit was stable and drogue was deployed. Solo jumper with 200 jumps followed Tandem pair and tracked into them about 10 seconds into the dive. Tandem Instructor and possibly the student were knocked unconscious. Tandem Instructor regained consciousness and pulled reserve at 200'. Reserve was pulling the pair upright on impact.

#4 - Current Tandem Instructor
1000 jumps total - 65 Tandem jumps.
Tandem Instructor had made one tandem jump the day before the accident, and one other on the day of the accident. Pair exited at 9,000'. Drogue was deployed. Drogue release handle was pulled at 4,000'. Packing error prevented the drogue from pulling pin and opening main container. Breakaway handle was pulled, wasting valuable time. Reserve handle was pulled one second before impact. 16-19 seconds had elapsed between drogue collapse (initial pulling of drogue release handle) and impact.

#5 - Non current Tandem Instructor
3750 jumps total - 10 tandem jumps.
(Last Tandem jump made one year before). Passenger had 2050 jumps. Tandem rig was received morning of fatality. Tandem Master realized he was required to make one solo jump followed by one jump with an experienced jumper as passenger to get recurrent. Jumper elected not to make solo jump because of high wind. Pair exited Twin Otter at 12,500', and Tandem Instructor deployed drogue. Other RW jumpers accompanying pair broke off at 5,000. At 4,000', Tandem Master reached in with RIGHT hand to release drogue (drogue release is on the LEFT side). Groped for 10 seconds, pulled breakaway handle and transferred to left hand. Returned to groping with right hand. Photographer opened at 1000'. Reserve was pulled below 100' by either Tandem Master or passenger.

#6 - Current Tandem Instructor
1800 jumps total - 650 Tandem jumps.
Pair exited Cessna 206 at 8,500'. Normal drogue fall to 4,000'. Tandem Instructor probably followed habit of showing the passenger his wrist mounted altimeter at 4,000'. Passenger apparently grabbed Tandem Master's arms. Tandem Master got free and pulled reserve at treetop level. Drogue release handle was still in pocket.

#7 - Current Tandem Instructor
1400 jumps total - 50+ Tandem jumps.
Pair exited Cessna 206 at 10,500' Pilot saw drogue deployment. No one observed rest of jump. Probable scenario is that Tandem Master could not locate drogue release handle. He pulled the reserve ripcord and his reserve pilot chute entangled with the trailing drogue. He then located the drogue release handle and pulled it - and then pulled the breakaway handle. The drogue inner tubular bridle was halfhitched around the reserve bag, preventing it from opening.

#8 - Current Tandem Instructor
560 jumps - 34 Tandem jumps.
Aircraft and exit altitudes unknown. Equipment check was performed on ground and in aircraft prior to exit by Tandem Instructor. Exit, drogue deployment and main canopy deployment were normal. Main canopy opened at approximately 3500'. Shortly after opening, the main canopy started a slow turn, then began to turn more rapidly. Breakaway from main canopy occurred at about 1000' - 1200' with no

reserve deployment. Post jump inspection showed that the RSL shackle had been released (though shackle was properly attached on the ground and in aircraft and was checked by another Tandem Instructor who accompanied the pair in the aircraft). The main canopy was found with one toggle released but the other still in the brake set position. Passenger was found with her hands still firmly grasping the main lift web of her harness.

NOTE: *Tandem Instructor's wife reported that her husband experienced a "sleepy" left arm and leg a week or two prior to the accident. Medical authorities performed a complete autopsy and determined that the Tandem Instructor had suffered a thrombosis.*

#9 - Current Tandem Instructor
5000+ jumps - 1100+ Tandem jumps.

A stable exit from a C-205 at 7000' and immediate drogue deployment were observed by aircraft passenger (the last eye witness in the case). 4000' was this Tandem Instructor's normal drogue release altitude, though unverified on this jump. Tandem Instructor pulled drogue release handle (drogue release handle was not found at the sight, indicating it was pulled at altitude). It is suspected that the drogue released, but did not open the main container due to improper routing of the inner tubular bridle (Tandem Instructor packed his own main canopy). Post accident investigation showed that the reserve handle was pulled just prior to impact. Because of the force with which the ripcord was pulled (indicated by damage to reserve pin), investigators suspect that the ripcord was pulled by a tree limb. Both the main and reserve bags were out of their containers.(Investigators suspect the bags were knocked out by the force of the impact.) No entanglement between the main and reserve was evident.

#10 - Current Tandem Instructor
2000+ jumps - 300+ Tandem jumps.

Upon climbing out of Cessna, the main closing loop broke, allowing the main bag to fall out. The main bag was hanging 6-8 feet (2-3m) below the Tandem par as they stood on the step. The Tandem Instructor conversed with the videoman (hanging on the strut) for 13 seconds prior to exit. (The only witness to this jump was the surviving video from the air to air videoman from which the following information was taken.) Following a stable exit, the drogue was deployed within three seconds. Tandem Instructor may have made an attempt to pull the primary drogue release handle, but the video is not clear on this point (though there was left arm movement). Primary drogue release handle was in Velcro pocket during droguefall. Video showed that it was unobstructed by flapping container side-flaps. No attempt to pull secondary drogue release handle was seen on video. Tandem Instructor eventually pulled the breakaway handle while still in droguefall. This caused the left and right main riser to release. When the right riser released, the RSL opened the reserve container. The reserve pilot chute popped out and entangled with the lines from the main canopy. At this point, the videoman flew in to assist the Tandem Instructor. His attempts to clear the entanglement were futile. Just prior to impact, the Videoman threw his hand deploy while grabbing the Tandem bridle in an attempt to decelerate the Tandem pair. The primary drogue release handle was pulled three seconds before impact by either the videoman or the Tandem Instructor.

#11 - Current German Tandem Master
Total Jumps - unknown, total Tandem jumps 30-60 unverified.
Aircraft: Dornier 27

TM and passenger exited at approximately 8500 feet. Shortly after exit, the main container opened allowing the main bag to fall out of the container. It is theorized that something on the door edge caught the exposed drogue kill line, which pulled the main closing pin on the drogue kill line. It is not known whether the drogue was deployed or not. No emergency procedures were carried out. It was reported that a similar problem occured several weeks earlier from the same aircraft. The DO-27 is not considered a safe aircraft for tandem use due to the door and seat configuration. The aircraft is acceptable when the interior is modified so the floor is the same height as the door edge.

#12 - Current Tandem Examiner
1800+ jumps - 280+ Tandem jumps

Stable exit from C-182 from 10,500 feet and drogue was deployed without incident and seen by witness. Ground observers say the tandem pair were turning in drogue-fall. No radical movements were observed. Neither main nor reserve canopies were deployed prior to impact. Examination of equipment showed several gear problems related to packing: 1) 3-Ring drogue riser was improperly assembled in such a way that the resulting Zero-Ring assembly created an impossible pull at both drogue release handles. 2) Main canopy was packed without a proper line check. One front-loop-twist was found in the suspension lines. 3) The reserve canopy's slider was improperly

stowed on the stabilizer "B" line, instead of the center "B" line. Only the right-hand drogue release hande showed any signs of being pulled. All other handles were found in their pockets. The Tandem Instructor did not pack his own system and the DZ had no way of knowing who packed it. It is clear the TI did an incomplete gear check and failed to carry out known emergency procedures. The autopsy was unable to determine if a heart attack or stroke were contributory.

#13 - Current Tandem master
1650 Jumps - 265 Tandem Jumps

Exited Cessna 10,200'. The Tandem Instructor jump mastered two students on the way up to altitude. The Tandem pair performed a dive exit and immediately went out of view from the pilot. No other witnesses were present. Post accident investigation showed: The Drogue was deployed, left hand Drogue release had been pulled, cutaway had been pulled, reserve ripcord still in its pocket, RSL shackle was broken, left side connector undone and damaged, right side connector was extremely loose. The main canopy had not deployed, container was open and the bag was found intact and several line stows had come undone. Only one post-accident ground witness (older, experienced jumper) was there at the scene prior to emergency personal. He stated that, "the Kevlar Drogue bridle was wrapped around the leg/foot of the student when I first arrived there. I saw one of the EMT personal grab the Drogue chute and pull the bridle off the leg of the student". The Kevlar bridle was carefully inspected. Traces of hair and skin were found six feet down from the Drogue canopy. Forensic investigators confirmed this finding. It is highly believed that a Drogue bridle entanglement caused this accident as the container was opened but the canopy did not deploy when the Drogue release was pulled. Whether the left side connector was hooked up in the A/C will never be known. The student was 6'5" tall, weighing 225 pounds. Tandem instructor was 6' weighing 190 pounds.

#14 - Current Tandem Master
Total number of jumps unknown (estimated at 500-700) - 15 Tandem Jumps

Aircraft: Cessna. While on the step of the Cessna, the Tandem instructor noticed the main container was open. He attempted to climb back into the A/C, but when he turned, the bagged main fell out of the container. He then exited quickly and cleanly deployed the Drogue. The pilot saw the first few seconds of the jump and that was the extent of an eyewitness account of this jump. Investigators found the reserve pilot chute and bridle entangled in the main; the main was still connected to the harness at the Drogue attachment point. The risers had been released and the reserve ripcord pulled. The bagged reserve was still in the pack tray. No evidence was found that an attempt was made to release the Drogue. The system was equipped with two drogue release handles. The right-hand Drogue release was attached to the student's main lift webbing. Neither handle appeared to have been pulled, and both were easily pulled on the ground.

#15 - Currency unknown (not rated by Relative Workshop)

Used a non-standard Drogue release handle. The cable's outer sheathing cracked and jammed the Drogue release. No reserve pull.

#16 - Currency unknown (not rated by Relative Workshop)

Exit with videoman at 8200'. Threw Drogue in stable position. Preformed a practice pull on drogue release handle. Appeared not to find the handle and got very nervous. (Video clearly shows the handle was in the correct location). Frantic arm movements began and he pulled main bridle with right hand and opened the main container; main bag came out. He then pulled cutaway handle and manually pulled both main risers off the rings. Then pulled the reserve ripcord. Reserve pilot chute and freebag entangled with main. Drogue release handle was found still in its place and could be easily removed during post-accident investigation.

Tandem Canopy Line Trim

PD-360 Line Trim (Cascaded)		
Total length A	**180"**	**(+-1")**
A>B	**2 1/2"**	**(+-1/2")**
A>C	**12"**	**(+-1")**
A>D	**22"**	**(+-1")**
A>tail, outboard brakes set (Primary)	**9" (1,3,5)**	**(+-1 1/2")**
A>tail, inboard brakes set (Secondary)	**9 3/4" (7)**	**(+-1 1/2")**
Brake to toggle, inboard & outboard	**23"**	

PD-360 Line Trim (Reserve)		
Total length A	**182 3/4"**	**(+-1")**
A>B	**4"**	**(+-1/2")**
A>C	**11"**	**(+-1")**
A>D	**20 5/8"**	**(+-1")**
A>tail, brakes set	**4 1/2"**	**(+-1 1/2")**
Brake to toggle	**28"**	

421 Line Trim (labeled VTC IIIA after 10/22/91, built with 3/8" (9.5mm) guage bottom seams, and 1/2" support tape on the nose.		
Total length A	**206 7/8"**	**(+-1")**
A>B	**2"**	**(+-1/2")**
A>C	**10"**	**(+-1")**
A>D	**27"**	**(+-1")**
A>tail, outboard brakes set (Primary)	**14 1/8" (1,3,5)**	**(+-1 1/2")**
A>tail, inboard brakes set (Secondary)	**13 1/8" (7)**	**(+-1 1/2")**
Brake to toggle, inboard & outboard	**19 3/4"**	

PD-421 Line Trim

(Labeled VTC III from 5/31/91 and 10/22/91, special trims used on canopies with 1/4" (6.35mm) guage bottom seams and 3/4" support tape on the nose, exhibiting end-cell tuck.)

Total length A	**209"**	**(+-1")**
A>B	**-1/8"**	**(+-1/2")**
A>C	**7 7/8"**	**(+-1")**
A>D	**24 7/8"**	**(+-1")**
A>tail, outboard brakes set (Primary)	**12 1/4" (1,3,5)**	**(+-1 1/2")**
A>tail, inboard brakes set (Secondary)	**12 1/8" (7)**	**(+-1 1/2")**
Brake to toggle, inboard & outboard	**19 3/4"**	

PD-421 Line Trim (Reserve)

Total length A	**206 7/8"**	**(+-1")**
A>B	**2"**	**(+-1/2")**
A>C	**10"**	**(+-1")**
A>D	**27"**	**(+-1")**
A>tail, outboard brakes set (Primary)	**14 1/4" (1,3,5,7)**	**(+-1 1/2")**
Brake to toggle, inboard & outboard	**19 3/4"**	

PD-500 Line Trim

Total length A (center 6 line groups)	**222"**	**(+-4")**
A>B (")	**2 1/4"**	**(+-1")**
A>C (")	**10 3/4"**	**(+-1")**
A>D (")	**28 1/4"**	**(+-1")**
A>tail, outboard brake set (Primary)	**17" (1,3,5,6)**	**(+-1 1/2")**
A>tail, inboard brake set (Secondary)	**16" (8)**	**(+-1 1/2")**
Brake to toggle, inboard & outboard	**19" 3/4"**	

NOTE: The center 6 line groups are shorter than the outer line groups because the wing span of the canopy is so great.

CONTINUED ON NEXT PAGE

PD-500 Continued

A center > A Outers +2 1/2"	**C center > C Outers + 1/2"**
B center > B Outers +1 1/2"	**D center > D Outers - 1/2"**

Please compare your canopy with these specifications. Notice that the overall A line length of 222" could be as short as 218" or as long as 226" Adjust the trim of your PD-500 accordingly

PD-500 Line Trim (change as of 05/31/91)

Total length A (center 6 line groups)	**222 3/8"**	**(+-1")**
A>B (")	**-1/8"**	**(+-1/2")**
A>C (")	**10 3/4"**	**(+-1")**
A>D (")	**28 7/8"**	**(+-1")**
A>tail, outboard brake set (Primary)	**17 1/2" (1,3,5,6)**	**(+-1 1/2")**
A>tail, inboard brake set (Secondary)	**16 1/2" (8)**	**(+-1 1/2")**
Brake to toggle, inboard & outboard	**19 3/4"**	

NOTE: The center 6 line groups are shorter than the outer line groups because the wing span of the canopy is so great.

A center > A Outers +2"	**C center > C Outers + 3/8"**
B center > B Outers +1 1/4"	**D center > D Outer - 1/2"**

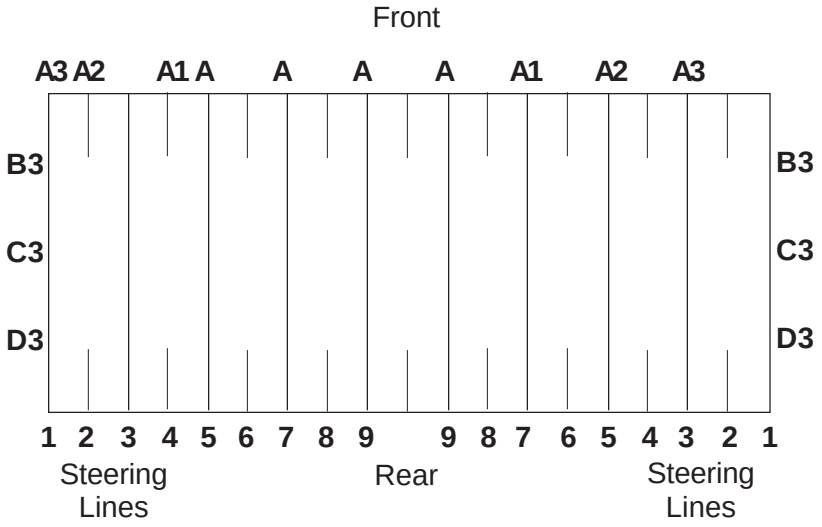
PD-500 Line Trim (Reserve)

Total length A	**223 1/4"**	**(+-1")**
A>B	**+ 1/8"**	**(+-1/2")**
A>C	**9 7/8"**	**(+-1")**
A>D	**28 1/4"**	**(+-1")**
A>tail, outboard brake set (Primary)	**18" (1,3,5,6)**	**(+-1 1/2")**
A>tail, inboard brake set (Secondary)	**16 3/4" (8)**	**(+-1 1/2")**
Brake to toggle, inboard & outboard	**19 3/4"**	

VS-384 Line Trim

NOTE: See diagram below. An A3 line would be outboard most line
A2 next cell inboard. A-lines being the center cells.

A3	190" (+/- 2")
A3-B3	3/8" (+/- 1/2")
A3-C3	10" (+/- 1")
A3-D3	20" (+/- 1")
A2	190 3/8" (+/- 2")
A2-B2	3" (+/- 1/2")
A2-C2	11 1/2" (+/- 1")
A2-D2	23 1/2" (+/- 1")
A1	190 5/8" (+/- 2")
A1-B1	3 1/4" (+/- 1/2")
A1-C1	12 3/4" (+/- 1")
A1-D1	25 7/8" (+/- 1")
A	190 3/4" (+/- 2")
A-B	3 1/2" (+/- 1/2")
A-C	13 7/8" (+/- 1")
A-D	27 1/2" (+/- 1")

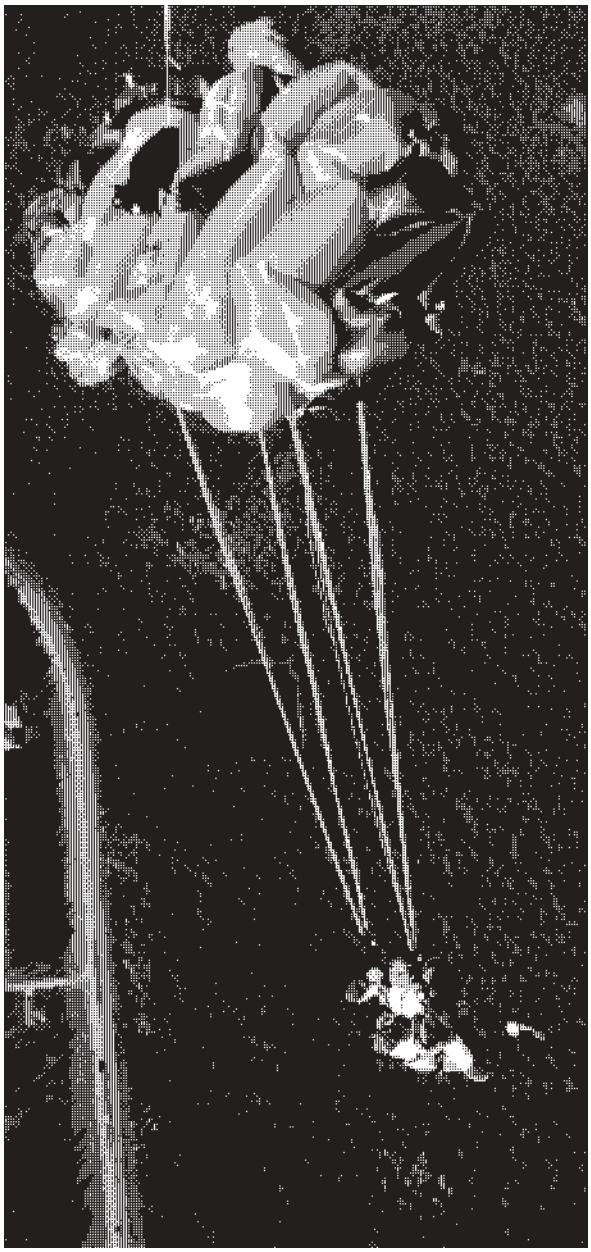


A3>tail - Primary (brake set)		
	1)	20 1/2" (+/- 1-1/2")
	2)	17 3/4" (+/- 1-1/2")
	3)	15 1/2" (+/- 1-1/2")
	4)	11 1/4" (+/- 1-1/2")
	5)	11 1/4" (+/- 1-1/2")
A3>tail - Secondary (brake set)		
	6)	15 3/4" (+/- 1-1/2")
	7)	19" (+/- 1-1/2")
Primary - brake to toggle - 21-1/2"		
Secondary - brake to toggle - 18"		

Tandem Canopy Modifications to Speed up Openings for the 360, 421 & 500

As Tandem canopies get older, they tend to open more slowly. Keep in mind that Tandem canopies are designed to open softly and withstand an unstable, Tandem terminal(180 mph+) opening with your grandmother as passenger! Naturally, as Tandem canopies get more jumps on them, they will tend to open a bit more slowly (as any canopy will). These recommended modifications should help restore the performance of the canopies to their prime.

1) Sew the stabilizers closed on both sides. Doing this will speed up opening times, and will make the canopy have a better landing flare.



NOTE: Do modification #1 first, and jump it several times before trying modification #2.

2) Cut a 6" hole in the slider. First, sew some Type 3 reinforcing tape around the center area where you will cut the hole. After the tape is sewn on, cut the hole. The hole may be square or round, and the size may be increased later if 6" is not enough.

TANDEM VECTOR TEST

Please write answers on a separate sheet of paper

1) The minimum opening altitude for Tandem jumps after probation is__ ft.

2) The minimum exit altitude for Tandem jumps after probation is __ ft.

3) Normal droguefall terminal velocity (340 lbs) is _____ mph.

4) Tandem freefall terminal velocity (340 lbs, NO drogue) is _____ mph.

5) The number of seconds to fall 1,000' at terminal velocity (340 lbs WITH drogue) is _____.

6) The number of seconds to fall 1,000' at terminal velocity (340 lbs WITHOUT drogue) is _____.

7) After opening a good canopy, what can be done to the student's harness to make him more comfortable?

8) Describe the correct breakaway procedure from a partial malfunction.

9) Describe the correct response to an inflated drogue in tow. What is your terminal velocity with this malfunction?

10) Describe the correct response to a collapsed drogue in tow. What is your terminal velocity with this malfunction?

11) Describe the correct aircraft emergency procedure below 1,500'.

12) Describe the correct aircraft emergency procedure between 1,500' and 2,500'.

13) Describe the correct aircraft emergency procedure above 2,500'.

14) You accidentally pull the drogue release handle before you deploy the drogue. What should you do next?

15) You can't get the drogue out of the pocket after several attempts. What should you do next?

16) You are tumbling when you deploy the drogue and the drogue bridle wraps around your legs. What should you do next? What is your terminal velocity with this malfunction?

17) You are tumbling when you deploy the drogue and the drogue canopy entangles with you. What should you do next? What is your terminal velocity with this malfunction?

18) The drogue is entangled with your fully open canopy. What should you do?

19) Under what circumstances is CRW permitted during Tandem jumps with students?

20) Who may do RW with a Tandem pair? What four things must you tell all relative workers.

21) What requirements must a photographer meet before he can film Tandem?

22) What is the purpose of the drogue in Tandem jumping?

23) When should the drogue be deployed on a normal Tandem jump?

24) If a drogue is deployed after 20 seconds of Tandem freefall, how long will it take to slow you down to 120 mph?

25) On a Tandem Vector, explain the sequence of events after the drogue release handle is pulled while trailing a normally inflated drogue.

26) Explain how to fold the nose of a Vector Tandem canopy during a pack job.

27) Explain the use of the double brake system on the Vector Tandem canopy.

28) What is proper student arm position on exit?

29) Why is it unwise to show a student your wrist mounted altimeter in freefall?

30) Explain the correct way to pull your reserve or breakaway handles free of their velcro pockets.

31) What would you do if your left shoulder was dislocated and you needed to pull your reserve on a Tandem Vector?

32) Explain the negative consequences of loose student waist straps.

33) Give three causes of an unstable exit.

34) If a student's knees are tucked up toward his chest in droguefall, what happens?

35) Why is it a bad idea to reach around in front of a student to bring his arms out into a correct freefall position?

36) What should you feel immediately upon pulling the drogue release handle?

37) Under what condition is use of a canopy catcher warranted?

38) When during the packing sequence is the 3-Ring drogue release hooked up on a Vector Tandem rig?

39) What might happen if you hook up the 3-Ring drogue release before closing the container?

40) How much white tubular nylon bridle is left between the locking pin and the Kevlar bridle of a properly set drogue?

41) What would happen if you deployed a drogue which had not been properly set during packing?

42) What might happen if you hold on to the drogue for a second after pulling it out of the pouch, instead of throwing it briskly to the side?

43) What is the minimum briefing you should give any student before a tandem jump?

44) What are some negative aspects of "over training" a Tandem student?

45) What circumstances warrant extra landing training for a student?

46) Why is a stable exit advisable on first Tandem jumps?

47) What is the minimum age for Tandem students?

48) Under the terms of the current Tandem waiver, what types of Tandem jumps are prohibited?

49) The current FAA Tandem waiver expires on what date?

50) List the causes of all Tandem fatalities to date.

51) What two administrative (non training) things does the Relative Workshop require be done before a first Tandem jump?

52) To renew a Tandem rating, an applicant must have made___ Tandem jumps within the last ___ months, of which ___ must have been made in the last three months.

53) Recurrent training consists of?

54) If a Tandem Instructor, after probation, has not made a Tandem jump in the preceding 90 days, he must do what?

55) If a Tandem Instructor, after probation, has not made a Tandem jump within the preceding 180 days he must do what?

56) To be eligible to become a Relative Workshop Tandem Instructor, an applicant must have made ___ ram-air jumps and possess 1)___, 2)___, 3)___.

57) The initial Relative Workshop Tandem Instructor training course includes _____ jumps.

58) After the training course, a new Tandem Instructor's next five jumps must be made with _____ as passengers.

59) Before receiving his Tandem Instructor card, a new Tandem Instructor must make _____ on probation, after initial training.

60) How many total Tandem jumps must a new Tandem Instructor make before a photographer is allowed on the load (including the five initial training jumps)?

61) What additional training must a student be given if the right hand drogue release (secondary handle) is attached to his harness?

62) If one handle is pulled and the drogue does not release, what should you do next?

63) What packing error would cause failure to release after one handle was pulled?

64) What are two hazards of leaving the right hand drogue release dangling when you put on the rig?

65) Under what circumstances is relative work permitted if the student has access to the drogue release handle?

The 3-Ring Release System

INTRODUCTION

The 3-Ring Release System was invented by the Relative Workshop in 1976. It was the first practical release that allowed parachutists to jettison their main canopy in one motion by simply pulling a single handle.

Not only is the 3-Ring easier to operate than previous canopy release systems, it is also more reliable.

Once the main is jettisoned, the only things left on he harness are two smooth rings that cannot snag a deploying reserve. Some other release systems can - and have - interfered with the deploying reserve.

MODIFYING THE 3-RING RELEASE

The great reliability of the 3-Ring system results from the proper functioning of its individual components. therefore, the owner should not modify the system in any way, nor should he replace genuine 3-Ring parts with others.

These modification (among others) may cause the system to not work properly:

o Substituting risers that don't have Type 2 sheathing for the locking loop. Do not use risers that have loops made of kevlar or solid cord.

o Not using a breakaway handle with cable with the special yellow coating. This Teflon-impregnated coating is important; other plastic coating may cause the cable to bind in the housing or loops. making it difficult or impossible to jettison the risers.

o Using a breakaway handle with cables of the wrong length. The length of the cables is critical to insure each riser releases in the proper sequence. Replacement handles are available from the Relative Workshop.

GETTING TO KNOW THE 3-RING

Knowing how the 3-Ring release works will help you assemble and inspect it properly.

Begin by peeling the release handle from the Velcro on the harness. Peeling rather than pulling, makes it easier to separate the handle from the webbing.

Look behind the risers near the harness and observe the movement of the yellow cable as you pull the handle. When the cable clears the white loop, the release is disengaged.

Now slowly pull one of the risers off the harness. As you pull, you'll notice that the white loop gets pulled through the grommet by the action of the smallest ring.

Each ring forms a lever with a ten-to-one mechanical advantage as it passes through the other. A force of 1,000 pounds on the large harness ring exerts a force of only 10 pounds on the white loop. (Opening shock usually totals about 1,000 pounds or 500 pounds on each riser.)

Because of the mechanical advantage provided by the 3-Ring design, only a force of approximately a pound on the top ring keeps the release together.

That is why it's important to keep foreign matter like bits of grass and sticks out of the 3-Ring assembly. A small stick in the white loop could prevent a riser from releasing.

It is also important to understand one of the properties of the nylon components of the system.

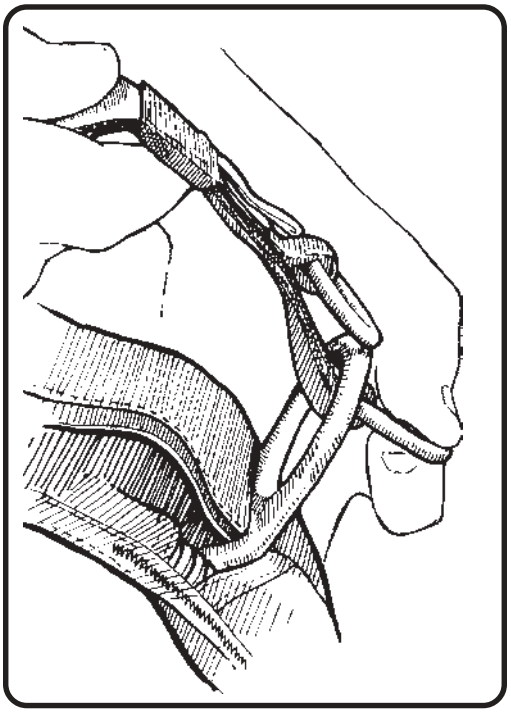
When nylon stays in the same position for a long time, it begins to conform to that position, or take a "set". If the 3-Ring release system stays assembled for too long, the nylon can become to stiff that the low drag from a malfunction (such as a streamer) won't pull the riser off the ring.

The 3-Ring Release system must be disassembled, flexed and inspected every month. Procedures for this are listed in the care and maintenance section

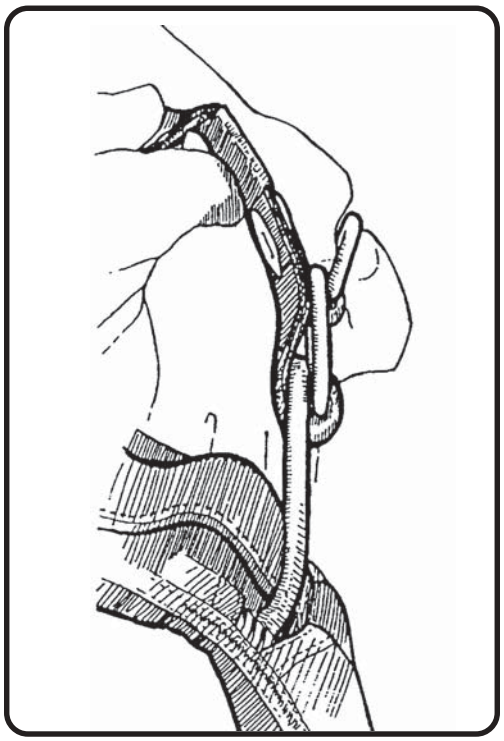
3-Ring Assembly

tioned as close to the ends of the housings as possible so that no cable is exposed.

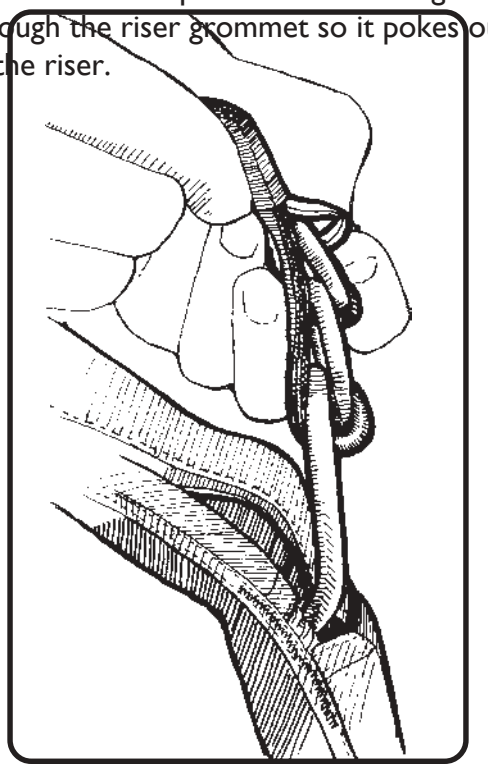
2) With the rings of the riser facing toward the floor, pass the middle ring on the end of the riser through the large harness ring from above. Fold it back towards the canopy and risers.



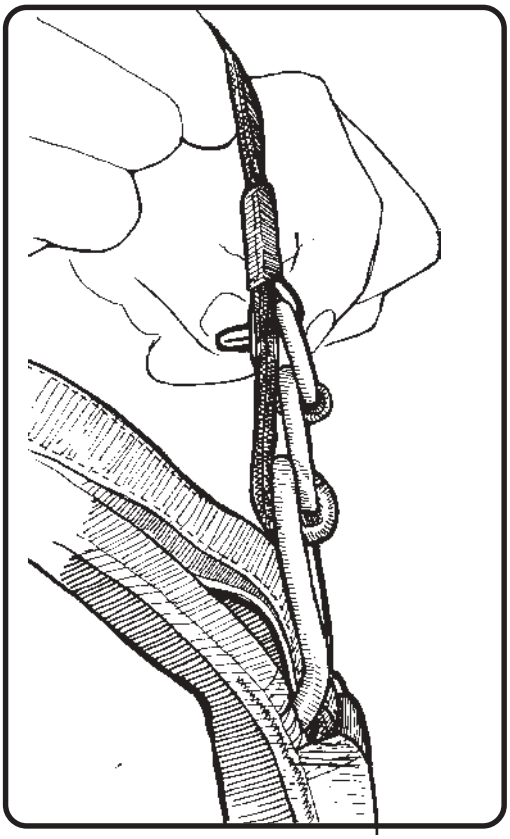
3) Thread the smallest ring through the middle ring in the same way, but make sure it does not pass through the large ring.

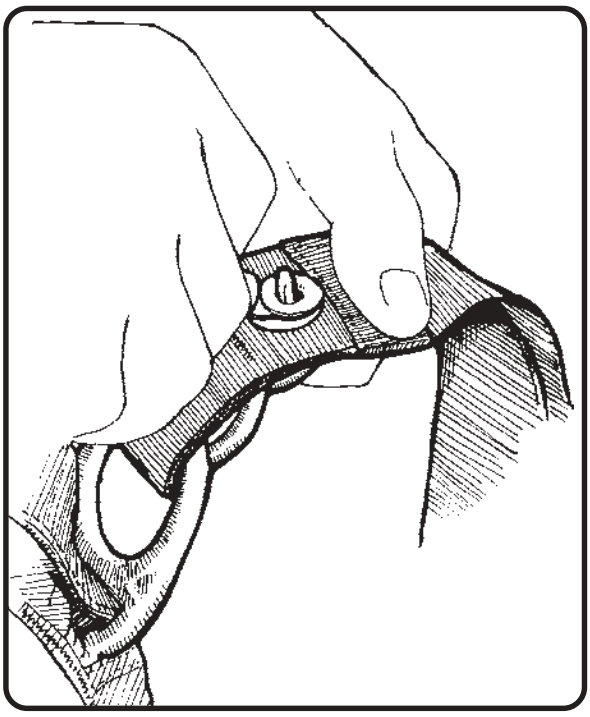


4) Bring the white loop over the small ring only and then through the riser grommet so it pokes out the back of the riser.



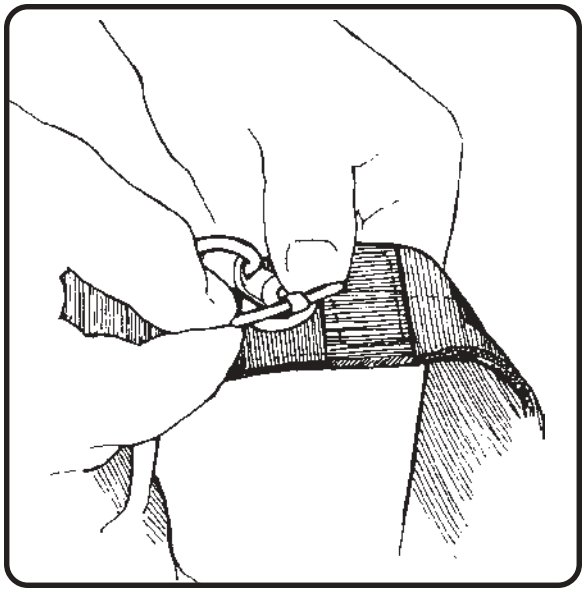
5) Continue threading the white loop through the grommet on the end of the cable housing. The flat side of the cable housing grommet

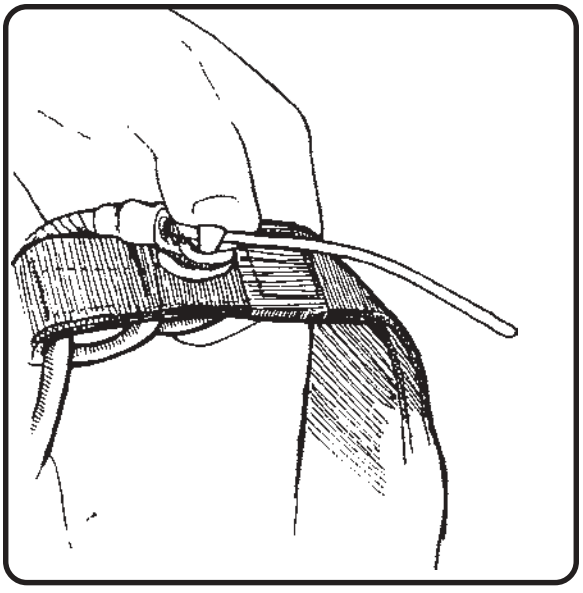




should be against the riser.

6) Thread the yellow cable through the white loop, making sure the loop isn't twisted. Be careful with the cable so you don't bend it too sharply or kink it. Insert the free end in the channel on the back of the riser.





3-Ring Pre Jump Inspection

Before jumping the Tandem Vector, check the 3-Ring release system for the following:

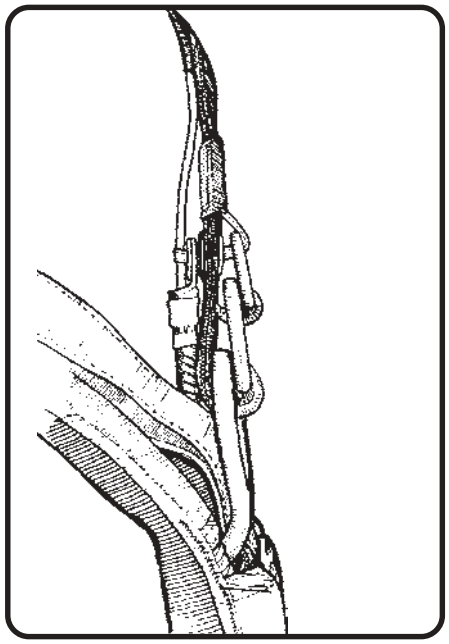
1) Each ring passes through only one other ring.

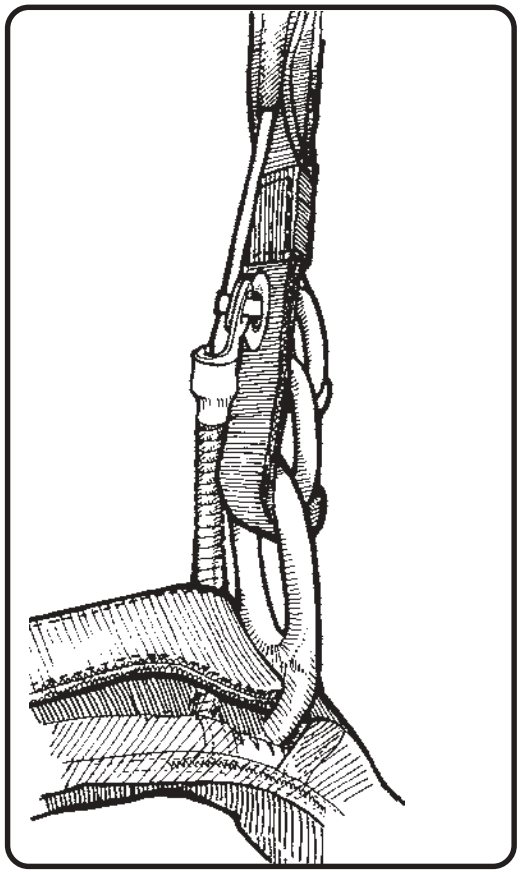
2) The white loop passes through only the small ring.

3) The white loop passes through the grommet on the end of the cable housing without twisting.

4) Nothing passes through the white loop except the yellow cable.

5) The 3-Ring release handle is securely stuck to the harness, and no cable is visible between the handle and the cable housing. If your release handle has a tendency to hide itself under your main lift web, undo the Velcro and twist the handle in a clock-wise rotation (when wearing rig) so the handle will stick out and slightly forward for a better grip.





NOTICE

If a Tandem Vector is fitted with 3-Ring risers that were not built by the Relative Workshop, it is important that they be checked for proper configuration. This side view above shows a correctly built 3-Ring riser attached to the harness ring and put under moderate tension. Note the following: (**1**) The rings overlap each other and maintain metal to metal contact between each other. (**2**) The rings are aligned in parallel planes. (**3**) the smallest ring is not pulled snug against the grommet; the white loop is long enough to give it some play. (**4**) The white locking loop goes straight through the center of the riser grommet on its way to the cable housing end fitting; it does not extend past the edge of the grommet hole and then turn back upwards towards the hole. If your riser configuration does not

Required Periodic Maintenance for the 3-Ring

The Booth 3-Ring Release System has been in use for many years with excellent results. Although the system is as durable as the rest of the harness/ container assembly, it requires periodic maintenance and inspection to ensure proper operation.

Generally, it is NOT recommended that the risers be attached to the harness when new and "forgotten". Like all skydiving gear, the 3-Ring Release should be carefully inspected and operated on a regular basis.

The procedures below should be done at least every month. This is especially important if the rig has not been used for a month or more, such as during the winter. Immediate inspection is required if it has been subjected to some abuse such as a drag across the runway, a water landing or exposure to a lot of dust or sand.

1) Every month, operate the 3-Ring Release System on the ground. Extract the cable completely from the housings and disconnect the risers.

2) While the system is disassembled, closely inspect it for wear. Check the white locking loops (the ones that pass over the smallest ring and through the grommet) to be sure they are not frayed.

3) Check the Velcro on the breakaway handle and main lift web to be sure it is clean and adequately holds the handle.

4) Check the cable ends for a smooth finish. The ends are finished at the factory to have a smooth tapered surface. This prevents the cable from hanging up in the loop. Check the cable ends and consult a rigger or the manufacturer if a burr or "hook" is present.

5) Check the stitching, including that which holds the large ring to the harness.

6) Pull downward on the housings. They should not move downwards more than 1/2 inch (+-1cm), but should be free to move upwards 1 to 2 inches (2.5 - 5cm).

7) As shown at right, take each riser and vigorously twist and flex the webbing near where it passes through each ring. The idea is to remove any set or deformation in the webbing. Do the same thing to the white loop.

8) Check the housings for dents or other obstructions. Use the cable to do this.

9) Clean and lubricate the release cable with a light oil such as "3-in-1" brand. Put a few drops on a paper towel and firmly wipe the cable a few times. A thin, invisible film should remain - too much oil will attract grit or dirt, or could become tacky in cold weather. Too much oil will cause more force to be used to extract the cable during a breakaway.

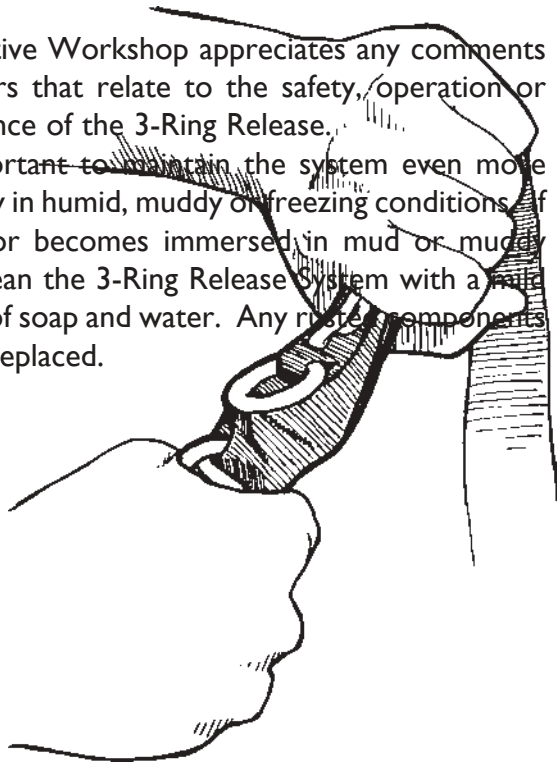
10) Inspect the fittings at the end of each housing. If one of these fittings were to come off the housing, a riser might release prematurely.

11) If any wear is found, consult the manufacturer or a rigger before using the Vector.

12) Reassemble the system. Double check it. Make sure the risers aren't reversed.

The Relative Workshop appreciates any comments from users that relate to the safety, operation or maintenance of the 3-Ring Release.

It is important to maintain the system even more frequently in humid, muddy or freezing conditions. If the Vector becomes immersed in mud or muddy water, clean the 3-Ring Release System with a mild solution of soap and water. Any rusted components must be replaced.



Recommended Replacement times on Tandem Components:

Relative Workshop has established a recommendation of the "lifetime" of Tandem main canopies and other components:

* Replace suspension lines every 200-300 jumps
* Replace canopy every 600 jumps
* Replace main risers every 600 jumps
* Replace drogue centerline every 300 jumps
* Replace drogue assembly every 600 jumps
* Harness/ container inspection every 200 jumps
* Reserve canopy limited to 20 uses

These recommendations are based on many years of observing Tandem malfunctions and equipment failures.

WARNING

Read this manual carefully and understand it completely. Any jump that utilizes the Tandem Vector System is considered a "tandem jump". Using this system outside the student/ Tandem Instructor training environment is considered a violation of federal law (FAA exemption No. 4943)

Examples of violations: demonstration jumps; stunt jumps; intentional water jumps; night jumps; jumping with any student less than 18 years of age; any tandem jump that takes place off of a designated dropzone. (These restrictions do not apply to military Tandem applications).

This manual belongs to:

_____

_____

_____

_____

_____

the uninsured
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