Ram-Air Parachute

Owner's Manual

Consolidated Rigging, Inc.

1972 NE 3rd. St., No.187
Bend, OR 97701

+541 382 6361 +541 382 6359 fax
support@crmojo.com
www.crmojo.com

Fellow Jumper:

Thank you for purchasing a ***Consolidated Rigging*** parachute. It has been designed, tested and manufactured to the highest standards in the industry. We are confident you will be pleased with it's performance, durability and quality of manufacture.

With proper care and maintenance it will provide you with years of dependable service. If at any time you have questions or concerns about your canopy we encourage you to contact us directly.

Thanks again for choosing ***Consolidated Rigging***. See you at the exit point!

Sincerely,

Adam Filippino

President

Consolidated Rigging, Inc.
Base 205

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Revision History

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All information contained herein is current as of the above date. The most current revisions are always available at crmojo.com.

Disclaimer - No Warranty

All parachute jumping, especially BASE jumping, is hazardous and unproven. ***Consolidated Rigging, Incorporated*** and all of it's affiliates do not advocate anyone using this parachute without recognizing and accepting the possibility of serious injury or DEATH on each jump.

You may minimize your risk of injury or death by ensuring:

- That all assembly, inspection, packing and maintenance guidelines as set forth in this manual areaccurately followed and performed by qualified personnel.
- That you have adequate training, experience and currency in flying a Ram-Air parachute.
- Consider the consequences before each jump

Please be advised that parachute systems even when properly assembled, packed and used can malfunction or fail. Additionally, parachutes are hand-made and as such are subject to errors and defects of human cause. Therefore, the possibility that you may be injured or killed exists on every jump.

Consolidated Rigging, Inc. (CRI) makes no warranties expressed or implied as to the suitability or safety of any product it sells, manufactures or endorses. CRI also disclaims any liability in tort for damages, direct or consequential, including personal injuries resulting from a defect in design, material, workmanship or manufacturing whether caused by negligence on the part of the manufacturer or otherwise. By using this parachute assembly, or allowing it to be used by others, the user waives any liability of the manufacturer for personal injuries or other damages arising from such use.

If the buyer declines to waive liability on the part of the manufacturer, buyer may obtain a full refund of the purchase price by returning the parachute to the manufacturer before it is used and within 30 days from the date of the original purchase with a letter stating the reason for return.

Introduction

At Consolidated Rigging we have specialized in the design and manufacture of Fixed Object Jumping (BASE) specific parachutes and Harness / Container systems since 1989.

With advances in the design of BASE equipment, participation is now safer than ever. However, parachuting from low altitudes and close to solid objects was, is and always will be a hazardous endeavor. Although a parachute may be designed for use in the BASE environment, this is no substitute for proper training, preparation and judgment.

It is beyond the scope of this manual to teach the user to deploy, fly, land or control this or any parachute. It is intended only as a general guideline for proper inspection, packing and care. Please take the time to read the manual completely. It will provide insight and information that will help you get the most out of your new canopy.

It is important to thoroughly inspect your parachute before its initial use. Brief (field) inspections should be performed before each subsequent use and a thorough inspection should be performed at regular intervals.

Please take the time to review the contents of this manual. If any procedure or step is unclear to you, be sure to contact a properly rated rigger or the manufacturer for assistance. We have worked hard to ensure this manual is as complete and up to date as possible. If you find any flaws or would like further clarification of any point please feel free to contact us.

Although our products are intended for BASE jumping it is both safe and recommended that you jump your new canopy from an aircraft prior to using it on a BASE jump. Making one or more skydives with your new canopy will allow you to familiarize yourself with its opening, flight, and landing behavior before venturing into the unforgiving and compressed environment of a BASE jump.

We recommend several slow-speed “hop and pop” type skydives from a minimum of 5000’ AGL. The mesh slider supplied with the canopy will work well at subterminal speeds. However, for a softer opening or if you intend to deploy at or near terminal velocity use a sail (solid) slider designed for your canopy. Use the pilot chute, bridle and deployment bag that is compatible with the two-parachute container system chosen for the aircraft jumps.

For these aircraft jumps it is recommended that you use the packing techniques outlined in this manual. Doing so will provide a reference for what to expect on higher speed BASE jumps.

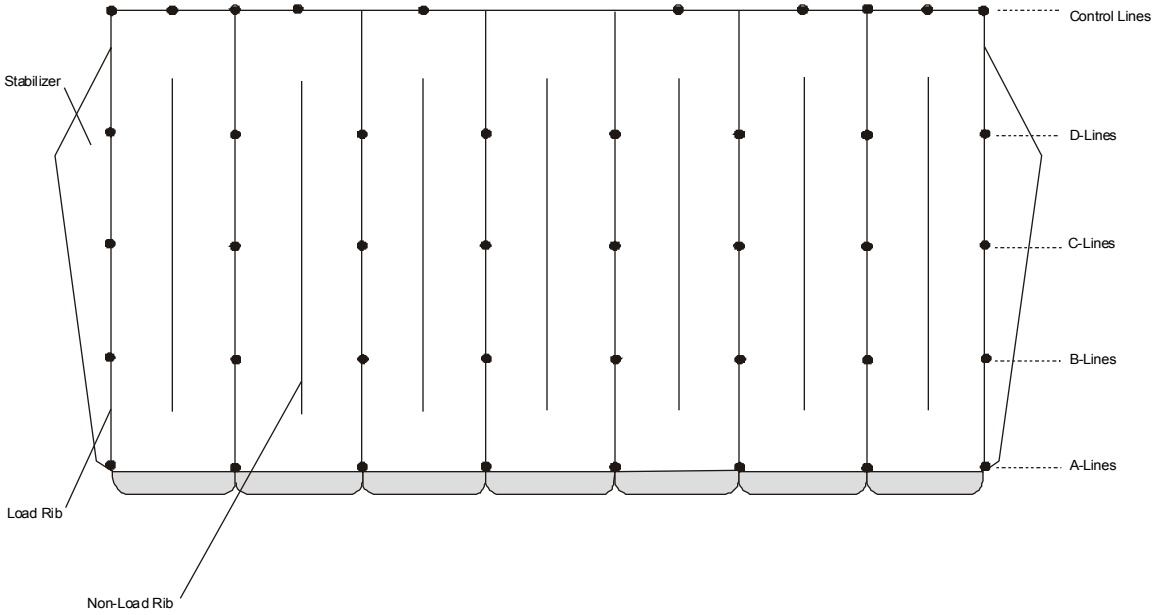
Consolidated Rigging, Inc.

2945 Bell Road, No.151
Auburn, CA 95603

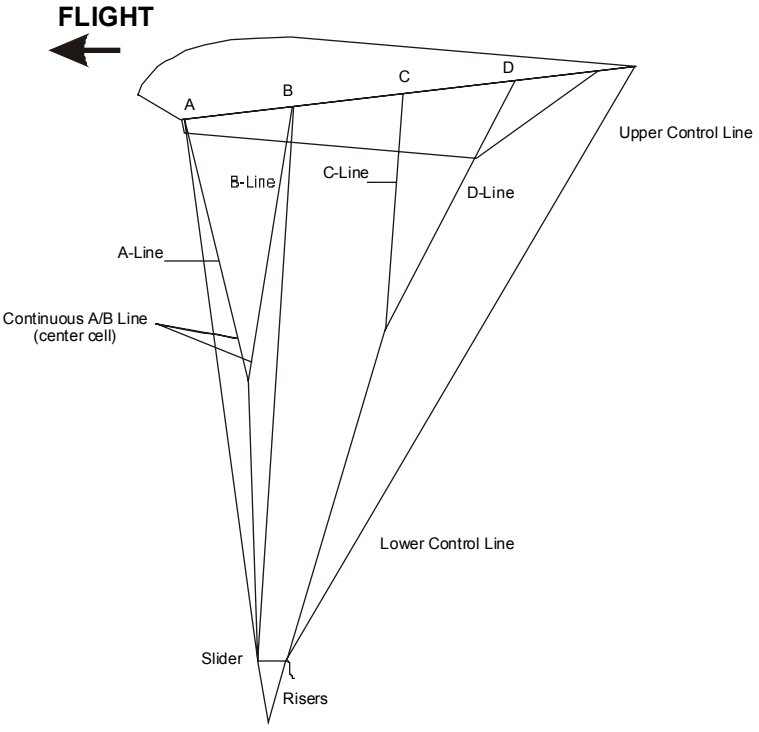
Phone: +530 889-1917
Fax: +530 889-1871
Email: support@crmojo.com
Web Page: www.crmojo.com

Parts List

Bottom View of Canopy from Jumper's Perspective



FLIGHT



Your canopy utilizes 7 cells. Each cell is defined by a pair of opposing load ribs. Each cell is partitioned with a non-load rib.

There are 4 suspension line groups: A, B, C and D.
For each line group there will be 4 LH lines and 4 RH lines.

There are 5 upper control lines per side.

All references to Left , Right , Front and Back are always from the jumper's perspective.

Assembly

Before using your new canopy for the first time it must be assembled onto the risers that came with your Harness and Container System. The pilot chute and bridle are also attached at this stage.

Your new canopy is delivered with a mesh slider installed. The following steps detail the initial assembly procedure utilizing the slider. It is recomended that the initial jumps be made from an aircraft utilizing a slider and a two-parachute system.
You may refer to this section for guidance when later reconfiguring your equipment for use without a slider.

Before you begin, be sure you have adequate clean workspace, proper lighting and enough time to perform the following steps uninterrupted.

If at any point you are unsure or have questions please be sure to consult a properly rated rigger or the manufacturer.

Assemble the Canopy to the Risers

Your new canopy is delivered with the connector links taped together in right and left hand groups. Right and left are identified. The process of attaching these to the corresponding riser leg is straight forward if you use the following references.

The links are arranged with the control line (red) on top of the bundle, the rear link below that and the front link below that. Another reference clue is that when the links are properly oriented, the link barrels will be inboard and thread up - toward the canopy.

It is best to attach the links to the risers in the following order: LH Front, LH Rear, RH Front and RH Rear. Using a preplanned order will minimize the chance of misrigging.

1) Lay-Out your Work

Carefully unfold the canopy laying it flat on it's right side. With all connector links in your hand, undo the chain knots and extend the lines being careful not to flip or twist the bundled group of connector links

2) Attach the Links to the Risers

Look for the orientation references mentioned above and when you are confident that there are no twists, remove the tape holding the left and right groups to each other and place each group adjacent to the corresponding riser legs.

Remove the tape holding the left hand group together. Move the control line to the outside and slide the silicone slider bumpers out of the way.
Unthread the link barrel on the front (lower) link and place this link onto the left front riser leg. Remember the barrel should be inboard and thread up towards the canopy. Tighten the link finger tight and repeat this process for the left rear link and riser.

Repeat this process for the right hand links.

Tighten all links using a 9mm open end or adjustable wrench. Turn the barrel until it comes to rest against the stop and then a 1/4 turn more. Do not over torque the link as this may crack the barrel and ruin the link.

Tip! Use a brightly colored nail polish to mark the barrels of the links so that any subsequent movement will be easy to see.

Pull the slider bumpers over the links until they just touch the riser.

3) Attach the Toggles to the Control Lines

Thread the lower control line through the guide ring on the riser. Be sure that the line is routed through the appropriate slider grommet and not braided around any line group.

The lower control line has a mark 10.0” (25.4cm) from the end. This mark represents where the line should enter the grommet on the toggle.

Tip! This toggle position is optimized for use with a slider. Attaching the toggle in a different location will noticeablyimpact the performance of your canopy and may make full-flight impossible to achieve when jumping with a slider.

- Place a single overhand knot in the steering line 2.625” (6.5cm) downline from the mark.

- Form a loop of line between the knot and the canopy.

- Thread this loop through the toggle grommet from the top and then draw it over the toggle.

- Pull the line tight. The black mark should now be just visible entering the top of toggle grommet.

Attach the Pilot Chute System to the Canopy

Depending on what type of Harness/Container you are using , it may be necessary to thread your bridle through a deployment bag or attach it to a shrivel flap (in the case of a Velcro-closed rig). In any case, the final method of attaching the pilot chute system to the canopy will be the same.

Form a larks-head knot (also known as a girth-hitch) between the bridle and bridle attachment point on the canopy. To do this, simply thread the appropriate end of the bridle through the bridle attachment on the canopy and then draw the rest of the bridle back through itself.

TIP! Consolidated Rigging does not recommend using a metal link of any kind to attach the bridle to the canopy. Metal links can damage the canopy, require tools to properly install or remove and have greater potential for misrigging.

Inspection

It is important to perform an inspection on your canopy before each use. The purpose of this inspection is to verify line continuity, identify damage or flaws and assess overall condition. You should perform these inspections before each use. Pay particular attention to line continuity, damage and / or failure of high-wear areas. Additionally, it is also important to perform periodic comprehensive inspections. Your pre-jump inspections should take 5 to 10 minutes. When you become comfortable with the procedure you may ”inspect as you pack” verifying the key points as you move through the packing procedure.

Allow up to 1 hour for comprehensive inspections. Comprehensive inspections involve the same key points but use a more thorough approach and address a few additional areas not usually covered in a routine pre-use inspection. It is wise to keep a record of your findings.

In the following section we have indicated those additional operations that should be included in a comprehensive inspection with an asterik (*). All other operations should be performed prior to each use. We encourage you to confer with your rigger or the manufacturer if you have any questions or concerns.

Additionally, please feel free to send your canopy to CR for inspection. We offer this service free of charge in an effort to encourage customers to keep their gear in the safest possible condition.

As with any procedure, greatest accuracy and efficiency are realized by following a prescribed order of operations. CR recommends starting at the bottom of the canopy and working your way up.

Connector Links

- Verify that all links are properly oriented (as described in the previous section). If they are not, this may be a clue to a potential misrigging.
- Verify that the links are properly tightened. If in doubt, loosen and then retorque the link. Do not simply tighten it further as this may crack the barrel and cause the link to fail.
- Verify that the silicone slider bumpers are in good condition and pulled far enough down as to ensure they cannot accidentally come off the links and travel up the lines.

Suspension Line Condition and Continuity

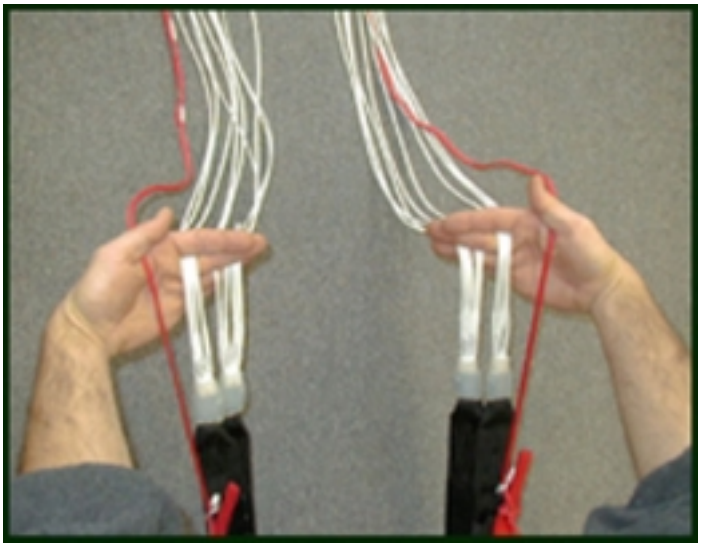
- Verify the connection between the lower control line and steering toggle.
- Check all lines for wear, damage or abrasion. Pay close attention to control lines, deployment brake settings and cascade junctions. Acceptable and unacceptable levels of wear are covered in section X.
- Check the condition of all bartack stitching at the link, cascade and canopy ends of each line.

♦ **Verify Suspension Line Continuity**

This operation may be performed with the canopy on its side, hanging from a rack or positioned nose-down on the ground. The following diagrams detail the procedure when the canopy is positioned nose-down on the ground as most users will not have easy access to a rack.

You are verifying that no lines or groups of lines are wrapped around any other lines. You are also verifying that individual lines do not have twists.

1) 4 - Line Walk Up
Grasp all suspension and control lines as shown and walk them up to the canopy. You should encounter no twists. If you do, they must be remedied. The most common problem is a flip through. In this case, simply flip the rig between the left and right hand line groups in the appropriate direction.



If the 4-line Walk Up was successful and the rig and canopy are properly oriented, we can be assured that all line groups have proper continuity relative to one another.

We will now verify that all individual lines within each group have proper continuity.

2) Control Line Check
Grasp the control lines at the canopy as shown and verify that they travel to the risers with no twists or braids. Also verify that they pass through the slider grommets and riser guide ring as required.

Verify that all upper control lines travel straight to the confluence of the heavier lower control line with no twists.

Repeat for opposite side.

2) A/B-Line Check

Grasp the outboard A/B line as shown and trace it to the connector link. It should be the most outboard line on the link. Working inboard, repeat this step for each A/B line.

When you reach the center cell, notice the A and B lines are continuous(not cascaded).

Continue to move across the span of the canopy at the A/B line. The center cell lines will be the most inboard and the end cell lines will be the most outboard on the links.

2) C/D Line Check

Grasp the outboard C/D line as shown and trace it to the connector link. It should be the most outboard line on the link. Working inboard, repeat this step for each C/D line.

Continue to move across the span of the canopy at the C/D line. The center cell lines will be the most inboard and the end cell lines will be the most outboard on the links.

Line Attachments *

- Check each suspension and upper steering line attachment at the canopy. Be sure that the bartack stitching is intact and that the adjacent material is free from tears or stress related damage.

Upper and Lower Surfaces and Stabilizers *

This step is best performed by suspending the canopy from it's tail. It is also acceptable to simply lay the canopy out flat exposing all upper or lower surfaces.

Try to hold up the panel up to a light source so you can see through the fabric. This will give a much better indication and help you identify any problems.

- Systematically check each panel looking for damage. Typical sources of damage include burns from deployment problems; tears, holes, abrasions and stains from the canopy contacting the ground during landing or during handling.

  Pay close attention to the (loaded) seams between each panel. These are high stress areas and may show fatigue through time.

- Areas most frequently damaged include the upper surface and stabilizers as these are the parts of the canopy that contact the ground after landing.

Ribs, Cross-Ports, Bridle Attachment and Internal Seams *

Again , this step is best performed with the canopy suspended.

- Enter each chamber of the canopy through the leading edge and examine both ribs and both surfaces. Pay particular attention to the condition of cross-ports and seams.

- When you reach the center-cell, examine all reinforcing tapes and stitching associated with the bridle attachment.

- If your canopy features PAC™ Valves. Verify the attachment and condition of each valve panel and mesh-to-nylon inlet seam.

Attachment of Pilot Chute System

- Verify that the knot connecting the pilot chute bridle to the canopy is proper and secure.

- Examine the bridle attachment from the outside to ensure it is securely attached to the canopy. Pay particular attention to the bartacks holding it in place.

Tail Pocket

- Check the condition of all Tail Pocket Velcro.
- Check the condition of the Tail Pocket opening. The top edge is subject to wear from the suspension lines.

Packing Guidelines

The following guidelines illustrate how to pack your canopy for most jumps. We recommend what is known as a “Standing Pro Pack” style. Although it is probably safe to use variations or alternate methods these variations have not necessarily been tested and may produce inconsistent or undesirable results.

The pack job detailed here is for a slider-up deployment. The next section will detail configuring and packing the parachute for slider down / removed deployments.

The canopy we used for these illustrations features our *Composite Upper Surface* Option. This is a partial zero porosity upper surface. Because this fabric is more slippery, especially when new, we have chosen to pack this canopy with the aid of clamps. The clamps are useful to stabilize the packjob as you move on to subsequent steps. They are not required for non-ZP canopies although you may wish to use them while your canopy is new.

If you elect to use tools and or clamps in your packing you must adhere to one simple rule:
COUNT YOUR TOOLS WHEN YOU ARE DONE.

Before you begin, be sure that the rig is secured or weighted in place so you can maintain proper tension throughout your pack job. Also ensure that both risers are even and secured in place. Always pack in a dry, level area with adequate lighting.

Set the Deployment Brakes

A few points about deployment brakes settings for BASE jumping:

Your new canopy is delivered from the factory with two different deployment brake settings. The shallowest of the two is intended for use when the canopy is packed with a slider. The deeper setting is for use when deploying with no slider. Both are positioned for a jumper who loads the system at .75 lbs/ft^2 . If your wing loading is excessively high or low you may find that only one of these settings is suitable for you. Please reference section X for information on determining your wing loading and information about deployment brake settings.

Brake settings are a very critical element in proper set up of canopies used for BASE. Many factors can influence the relevance of a deployment brake setting including: density altitude, winds, deployment speed, reefing, canopy age and condition, deployment attitude and wing loading.

For these reasons it is recommended that, regardless of your wing loading, you experiment with your brake settings to determine what works best for you.

Please reference section X for information on determining the ideal placement of your deployment brakes.

1) Draw the lower control line through the guide ring on the riser until the shallowest (furthest from the canopy) brake setting is past the guide ring. Insert the tip of the toggle through the brake setting.

2) Place the tip of the toggle into the elastic keeper. Set the toggle to the point that the Velcro on the toggle is even with the Velcro on the riser. Stow excess control line in the Velcro pouch provided. Firmly tug on the line to preload the toggle / line junction. This will minimize the wear on this junction.

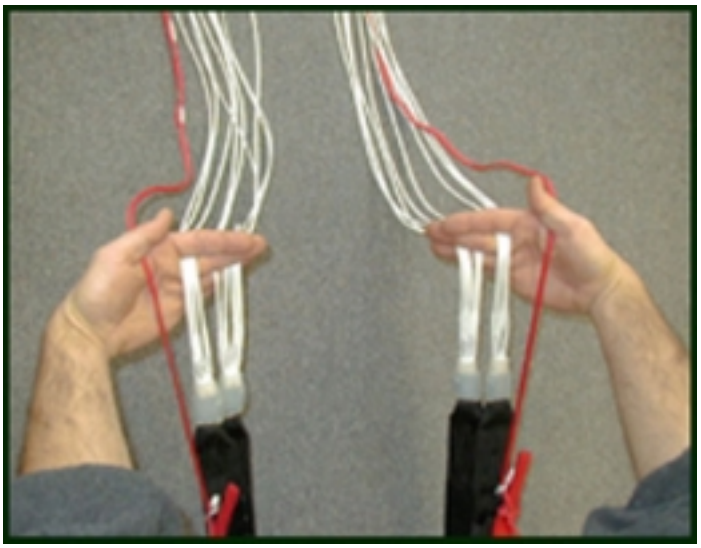
Tip! Since we do not use the brake set loop on the riser when deploying the canopy with a slider, it is cleaner to pull it to the side.

Flake the Canopy

During this phase we will create the general organization needed. Performing this phase as neatly as possible will make the subsequent steps significantly faster and easier.

1) Grasp each line group including the Control Lines above the slider as shown and walk them up to the canopy. Doing this will reveal any major problems with line continuity.

Assuming you have previously verified continuity, if you arrive at the canopy with no twists or flips in the lines you are ready to proceed.



2) Step back from the canopy and transfer all lines to one hand. Without letting go of the lines, use your free hand to locate the leading edge inlets. Flake each cell as shown

Grasp the entire leading edge and flap the canopy from front to rear. This will help the canopy assume it's natural orientation and make the following steps much easier.

3) Place the left line groups over your left shoulder and the right lines groups over your right shoulder. You will now be looking directly at the center cell lower surface of the canopy.

Place all leading edges inbetween your knees and hold them there.

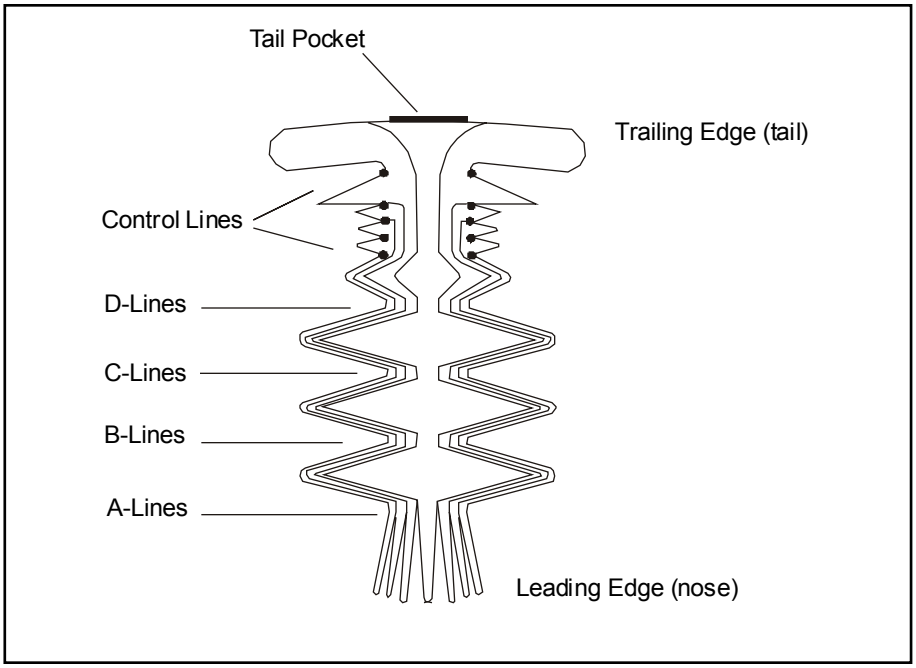
4) Reach inside the canopy and flake all the material between the A-lines and B-Lines to the outside. There will be 4 left hand A-lines and 4 right hand A-Lines. Each of these lines is associated with a seam. Use these seams as a guide to ensure you have the proper cells and that they are completely flaked.

5) Repeat this process for the material between the B and C lines , C and D lines and finally D-Lines and tail. Flake all seams on the tail and position the upper control lines on top of the previous line groups.

When you have flaked the first side, move to the opposite side of the canopy and repeat steps 4 and 5.

Tip! To make it easier to identify the material you are flaking, lift the rear most line group away from the canopy. For example: To better see the material between the B-Lines and C-Lines, lift the C-lines up and away from the canopy.

When you are finished the canopy should resemble the diagram.



Schematic view of the flaked canopy from the jumper's perspective.

6) Transfer all line groups to one hand and step to the side. Position your hand as close as possible to the canopy with your thumb on top, pointing toward the canopy.

7) Raise the canopy and clean up the outside of the packjob. Find the folds you just made and define them. Smooth the fabric from top to bottom.

8) Locate the three (7-cell) left hand inlets and draw them to the outside of the packjob. Repeat this for the right side.

9) Again using your free hand, place your arm across the canopy 2/3rd of the way down. Your arm should be at the top of the leading edge inlets.

Lower the canopy to the ground as you move to the side. Be careful not to let the canopy roll off your arm. It works best to squat down and lower the canopy gently to the ground.
Sweep your arm up towards the pilot chute and out from underneath the canopy.

Redressing the Canopy

During this phase you will clean up the work just performed and reestablish line tension and symmetry.

1) If any lines are slack, retension them. To retension the A-Lines, reach under the canopy from the top until you feel the leading edge tapes and pull them toward yourself.

2) Position yourself on one side of the canopy and flip up all folds as shown. Three cells of the nose should be visible. If they are not, reach under the packjob and draw them out. Maintain tension from the top of the cells in line with the A-lines.

3) Grasp the first set of packing tabs (B-tabs) and apply tension. Lay the first fold back into position being sure to keep the B-lines aligned with the A-lines and all the lines alinged with the respective riser.

4) Repeat step 3 for all material between the B and C-line groups and then again for all material between the C and D-line groups.

5) Starting from the D-lines, reach down inside of the canopy and ensure that all fabric between the respective line groups is folded to the outside. If your initial flaking was done neatly, the relationship will be easy to see.

You should be left with only the center cell visible between the left and right halfs of the canopy.

6) To redefine the fold between the D-lines and the tail, while holding the D-Lines in place with one hand and the tail in the other, draw all tail material to the outside and then using your other hand, create a fold as you bring the tail back on top of the D-Lines.

7) Flake the tail by placing each seam and each line on top of the existing lines. Each half-cell of the canopy will be folded.

Flake up to the center cell.

8) Repeat steps 2 through 7 for the other side of the canopy.

9) While performing the previous steps, always work toward the center to keep the packjob from growing too wide.

If however, you find yourself at this point with the flaked halves of the canopy a long way apart, this can be fixed as follows.
One side at a time, reach under the canopy, and while keeping tension on all lines, shift it toward the center. Be sure to remain centered between the risers.

10) Fetch the slider and seat the grommets against the slider stops. Quarter the slider into the packjob as shown. The rear slider grommets will be facing down and the front ones will be facing up. Be sure to seat all four slider grommets against the slider stops.

Slider Control

It is important to control the slider during deployment to ensure it does not prematurely descend the lines. Failure to control the slider can result in canopy damage and inconsistent openings.

There are two methods for controlling the slider: **Direct Control** and **Indirect Control**. They may be used together or independently.

Direct Control: To use direct control you must place a micro line™ style rubber band (cut in half length-wise) on the right hand center cell C-line tab as shown. These rubber bands are typically 1.25" (3.2cm) long when measured flat.

Once the slider is in place, draw its natural high point up to the rubber band and take a bight of the slider material. Use a double wrap on the rubber band. Depending on canopy size you will be able to put several inches of slider into the rubber band.

Indirect Control: To use indirect control simply place your first stow of suspension lines into the Primary Stow band provided in the Tail Pocket. CR recommends that you always use this Primary Stow regardless of whether or not you employ direct control as well. This process is detailed later in the packing sequence.

CR recommends that your initial jumps be made using **indirect** slider control only. Canopies reefed with direct slider control can open harder and have less consistent heading reliability.

Micro-Reefing and Width Adjustment

During this phase we will make small adjustments to the packjob and reestabilish the width according to our container dimensions.

1) Flip the tail toward the center of the packjob and tension the stabilizer material between the D-Line and tail upward.

2) Fold all canopy material, except the nose, toward the center as shown.Where to place this fold is determined by the width of your container.

Generally, you will fold the material in half so that the end result is slightly wider than the Tail Pocket.
If using clamps, you would place one clamp on each side of the pack job to stabilize these folds in position.

3) Flip the tail back into position and carefully draw it to the full width of the center cell and while maintaining tension on the D-Lines, draw it down until it is even with the bottom of the stabilizers.

4) Wrap all tail material, except the center cell, around itself as shown.

5) Draw the center cell of the tail around the entire packjob except the leading edge. Go no further than the A-lines. Be sure not to displace the suspension lines. All lines should remain in the middle of the packjob and taut. Allowing the lines to move around the packjob can result in a malfunction.

If you are using clamps you would reposition your first clamps to grasp the tail as well as all material previously clamped.
At this point you may also add a second set of clamps (L& R) to hold the top of the pack job.

6) Fold the nose as shown and flip it back under the pack job. Repeat this for the opposite side of the canopy.

With your knees on the canopy, purge all the air from the packjob. Purging the air from the canopy and making neat folds will help minimize the bulk and make it easier to properly fit the canopy into the container.

Tip! CR recommends you start by using the above method for treating the nose. If you later determine you would like to slow the openings, it is possible to do so by rolling the nose toward the center. Moderate rolling should have no negative effect on heading performance. The principal factors that effect heading performance have to do with overall packjob symmetry, container closing, body position, winds, pilot chute design and slider drag.

Stowing the Suspension Lines

1) Carefully sit down on the canopy, facing the container, and open the Tail Pocket. Grasp the suspension lines about 8.0” (20cm) below the slider grommets and take a bight of lines. Place a 2.0” (5.0cm) bight of lines into the Primary Stow band and secure with a double wrap. The goal is to have as short a length of line as possible between the slider grommets and the primary stow.

Place the Primary Stow into pocket provided.

Tip: A double-wrap of 2.0” (Dacron™ line) rubber band has proven to be appropriate for most freefall delays ranging from 1 second to terminal. A single-wrap will have virtually no effect and a triple-wrap can cause hesitations on very short freefalls.

2) With your palms facing up, grasp the lines and make your next stow. Place this at the top of the Tail Pocket.

With your other hand, also palm-up, grasp the lines and draw them into the Tail Pocket.

Repeat this process, alternating between right and left hands and gradually reducing the width of each stow until you are approximately 8.0 “ (20cm) from the links.

5) Ensure that your last stows are closest to the mouth of the Tail Pocket and close the Tail Pocket. Mate all velcro securely, being careful not to trap any lines as you do so.

Slider-Down or Slider-Off?

Typically, if (fixed object) freefall delays are to be less than 3 seconds, it is best to deploy the canopy without a slider. The terms slider-down and slider-off are synonymous. In either case the slider is removed from the deployment sequence.

For clarity, we will illustrate how to pack with the slider removed. If you elect to leave your slider on it must be secured to both front connector links. This is to prevent it from travelling up the lines during deployment.

We secure it to the front so that post-deployment heading corrections with the rear risers will not cause the slider to influence the front risers.

The easiest method of stowing the slider is to lift the silicone slider bumpers off the front links and pull the slider grommets over the links and down the riser about 2.0" (5.0cm). Replace the slider bumper and it will prevent the slider from travelling back up the lines.

Tip: Slider-down or slider-off has long been a point of debate within the BASE community. The fact is that there is no right or wrong choice, but there are right and wrong ways to execute that choice.
If you take it off, be sure of your rigging. If you leave it on, be sure to properly secure it.

The following list of positives and negatives associated with each method should help you decide your preference.

Slider-down:
Pros:

- Easy reconfigurations between slider-up and slider-down configurations.
- Minimal chance for misrigging.
- Slider can function as a cross-connector in grossly unstable deployments.

Cons:

- Adds bulk to pack job.
- Must be properly secured.

Slider-Off:
Pros:

- Less bulk and cleaner in the pack tray.
- Can allow canopy to spread further in flight, slightly improving glide.

Cons:

- More complex reconfigurationsbetween slider-up and slider-off.
- Greater chance for misrigging
- Must carry tools and slider to reconfigure.

Variations for Slider Down or Removed Deployments

This section of the manual will describe the required variations to the previously detailed packjob if you intend to deploy the canopy without a slider.

Except where noted, the packjob will be identical.

Reconfiguration

In this phase the canopy will be reconfigured with the Line Release Modification (LRM). This rigging setup will enable the jumper to clear a line-over malfunction by unstowing and discarding the steering toggles. The incidence of line over malfunction when deploying without a slider is relatively high. For this reason, you should always us the LRM when deploying without a slider.

Do not us the LRM when deploying with a slider. Doing so may damage your canopy and result in a malfunction.

- After inspection, pull the slider down to the connector links and lay the canopy out on its side.

- Remove the toggles from the lower control lines and pass the lower control lines back through the guide rings and slider grommets. Retie the toggles to the lower control lines.

- To remove the slider, follow the directions for the initial canopy assembly (page 8) in reverse order.

Be sure to remove only one line group at a time to minimize the chance for misrigging.

PERFORM A CONTINUITY CHECK!

Set the Deployment Brakes

Your new canopy is delivered from the factory with two different deployment brake settings. The shallowest of the two is intended for use when the canopy is packed with a slider. The deeper setting is for use when deploying with no slider. Both are positioned for a jumper who loads the system at .75 lbs/ft^2. Please reference section X for information on determining your wing loading.

Brake settings are a very critical element in proper set up of canopies used for BASE. Many factors can influence the relevance of a deployment brake setting including: density altitude, winds, deployment speed, reefing, canopy age and condition, deployment attitude and wing loading.

For these reasons it is recommended that, regardless of your wing loading, you experiment with your brake settings in a safe environment to determine what works best for you.

Please reference section X for information on determining the ideal placement of your deployment brakes.

1) Thread the brake set loop through the appropriate deployment brake setting on the steering line as shown.

2) Thread the brake set loop through the riser guide ring.

3) Thread the toggle tip through the brake set loop and into the elastic keeper .

Gently tug on the steering line to set the junction. This will help minimize wear on the steering line.

4) Stow the excess steering line in the Velcro pouch and mate the toggle to the riser.

Tail Gate

Canopies deployed without a slider will have virtually no reefing of the tail. This situation can lead to several different malfunctions.

The Tail Gate is a device first developed by Basic Research of Perris, California. It is intended to provide additional reefing to the tail of the canopy. It does this by actively trapping both center-cell C and D lines as well as all upper control lines. The Tail Gate is closed with a rubber band and the force of the spreading canopy pushes the rubber band off. It provides enough reefing of the tail to allow a nose-first inflation of the canopy's lower surface. The Tail Gate is intended to be used in conjunction with the LRM. It is not a substitute for the LRM.

The Tail Gate should be used when configuring your canopy for no-slider jumps. It is not necessary, nor has it been adequately tested for use in conjunction with a slider.

Do not use the Tail Gate when deploying the canopy with a slider.

Installation: Your new canopy is supplied with a loop for installing the Tail Gate and one Tail Gate. Replacements are available from Consolidated Rigging at a nominal charge.

On the left hand, center cell C-line you will notice a small white loop inserted in the line approximately 6.0" (15cm) below the canopy.

- Grasp the loop with your fingertips and open it up. It is intended to be tight so you don't lose the Tail Gate on deployment.
- Insert the Tail Gate into this loop up to the half way point.

When you are packing the canopy and are at the stage where you would normally be placing the slider into position you will instead close the Tail Gate.

1) Locate the C-line with the Tail Gate attached, it's corresponding D-line and the mating C and D-lines on the opposite side of the canopy and trace them from the connector links all the way to the canopy. Be sure they are not twisted or braided around any other lines.

Place all these lines into the Tail Gate. Be sure the Tail Gate is at the bottom so it is supporting the line to which it is attached- not the other way around.

2) Grasp all upper control lines and lift them up slightly to be sure they are clear and not wrapped around any other lines and place them into the Tail Gate.

3) To close the Tail Gate use a standard skydiving (for micro line™) rubber band cut in half length wise. These rubber bands are typically 1.25" (3.2cm) long when measured flat. Three wraps of the rubber band work best. If the Tail Gate is too loose it will have no effect. Too tight and the reefing of the canopy's aft section will be extreme. You will loose the rubber band when the canopy deploys.

Tip! Tying the rubber band to one side of the Tail Gate in an effort to avoid losing it can cause suspension or steering lines to become temporarily trapped in the Tail Gate on short freefalls or assisted deployments. This method will also give less consistent results.

Micro-Reefing and Width Adjustment- No Slider

During this phase we will make small adjustments to the packjob and reestabilish the width according to our container dimensions.

1) Flip the tail toward the center of the packjob and tension the stabilizer material between the D-Line and tail upward.

2) Fold all canopy material, except the nose, toward the center as shown.Where to place this fold is determined by the width of your container.

Generally, you will fold the material in half so that the end result is slightly wider than the Tail Pocket.
If using clamps, you would place 1 clamp on each side of the pack job to stabilize these folds in position.

3) Flip the tail back into position and carefully draw it to the full width of the center cell and while maintaining tension on the D-Lines, draw it down until it is even with the bottom of the stabilizers.

4) Wrap all tail material, except the center cell, around itself as shown.

5) Draw the center cell of the tail around the entire packjob except the leading edge. Go no further than the A-lines. Be sure not to displace the suspension lines. All lines should remain in the middle of the packjob and taut. Allowing the lines to move around the packjob can result in a malfunction.

If you are using clamps you would reposition your first clamps to grasp the tail as well as all material previously clamped.
At this point you may also add a second set of clamps (L& R) to hold the top of the pack job.

6) Fold the nose as shown and flip it back under the pack job. Repeat this for the opposite side of the canopy.

With your knees on the canopy, purge all the air from the packjob. Purging the air from the canopy and making neat folds will help minimize the bulk and make it easier to properly fit the canopy into the container.

Tip! Varying the treatment of the nose can influence opening speed but only when a slider is used.

In a slider removed deployment, the canopy's lower surface will spread (inflate) before any air enters the nose. For this reason, and others, nose treatment will have little effect on heading reliabilityor opening speed when deploying without a slider.

Proper Care

With proper care and basic maintenance your canopy will provide many years of reliable service.

Field-Packing

One of the best aids to packing is starting with an organized parachute. For this reason it is a good idea to field-pack your canopy after each use if you do not intend to reuse it immediately. A field-packed canopy will seem to "pack itself". Conversely a crumpled ball of fabric will be difficult and time consuming to pack properly.

To field-pack simply secure the container and lay the canopy out on its side. Grasp the front and rear most packing tabs for each cell and shake the canopy back and forth several times.

You should now have a canopy that is neatly flaked on it's side.

Fold the A-Lines onto the B-Lines and then fold that bundle toward the middle.

Flake the tail toward the middle. Bringing it all the way up to the first fold you made.

Fold the tail and the D-Lines toward the middle.

Make another fold in each half of the canopy and either daisy chain or coil your suspension lines on top.

Storage

If you need to store your canopy for an extended period of time be sure to field pack it. This is better than a "real" pack job because it is neutral and will introduce no memory into the canopy fabric.

Place the parachute into a plastic bag and store it in a cool, dry and dark place.

Handling and Packing

It is a known fact that canopies suffer more degredation from handling and packing than they do use.

To maximize the life of your new parachute, it is important to pack it in a clean area, preferably carpet or grass. Concrete or rough surfaces can prematurely wear the fabric and abraid the lines and cause damage to your container system.

Limit your motions when packing. Do not repeatedly handle the fabric or lay on it with sweaty skin. After landing, try to avoid dragging the canopy on the ground or allow it to sit in the sunshine.

These simple habits will greatly extend the life of your parachute.

Basic Maintenance

Things that can degrade or damage your parachute

Proper packing and handling practices will have a vast impact on how long your parachute lasts.

Do not get your parachute wet.

It has been estimated that a single water jump can cause as many as 25 jumps worth of wear. Additionally, although all reinforcing tapes in your parachute are preshrunk at the factory, if they get wet they may not return to their original dimensions and this can cause a significant degradation in performance. Also, your parachute is built from fabric that is chemically treated. These chemicals are water soluble. Therefore getting your canopy wet will increase the porosity of the fabric and you will lose performance.

If your parachute does get wet the best thing to do is promptly rinse it in fresh water. This will remove any salts or solids that were in the water and prevent them from doing microscopic damage after the canopy dries. Do not aggressively agitate the parachute; just let it soak in a tub of cool water. Use no soaps, mechanical agitators or high pressure water.

Hang the canopy to dry in a well ventilated area out of direct sunlght. Wipe all metal components dry so they will not corrode.

Sunlight

UV light will degrade the fabric in your parachute. Over time even short exposures will have a substantial effect . Minimize the canopy's expose to UV light by packing in the shade whenever possible. When you are finished packing place your container out of the sun.

Landing in Trees or Tall Brush

Although sometimes this may happen, be very careful about removing the canopy from the vegetation. Even small sticks and seed pods can inflict significant damage as you remove the canopy.

Stains

If your canopy becomes stained, mild soap and water will usually do the trick. Spot clean only. Do not immerse the canopy. Grease and tar can usually be blotted off the canopy using mineral spirits. Place a clean rag behind the stain and use another rag moist with the mineral spirits to "lift" the stain off the fabric.

Typical Wear Patterns and What to do About Them

There are several high-wear areas of your parachute that will require periodic maintenance. These are listed below along with what to do about them.
We are happy to take care of your repair and maintenance needs. However, most of these tasks can be handled by a properly rated rigger. In the next section we will discuss more substantial damage and what to do about it.

Tail Pocket.
Through time the Velcro that closes the Tail Pocket will begin to wear. Average life span is between 50 and 75 jumps. This is an area that should be well maintained. Worn Velcro on the Tail Pocket can lead to line dump which can cause malfuctions. The higher your deployment speed, the greater stress on the Velcro

After landing, if you notice that your Tail Pocket is closed but the flaps are displaced this is an indication that it burst open during deployment possibly causing line dump. This is also your clue to have new Velcro installed.

Control Lines
It is not uncommon to see occasional nicks and scrapes on the upper control lines. Although this is an indication of a deployment anomaly, it is not critical damage unless a carrier (strand) within the line is broken.

The Lower Control lines will fatigue at the deployment brakes setting. Typically, the wear is greatest at the deeper setting because this is used for slider removed deployments. The brakes are stowed differently when using the LRM and will wear the lines more rapidly than when using a slider (no LRM).
Fatigue at the junction of the Lower Control Line and inserted (white) line is typical but should be closely monitored. The line is unsafe to use when wear severs up to any one carrier. The Lower Control Line is a 16 carrier line. You can count them. Using the parachute beyond this point can result in control line failure.

Consolidated Rigging sells replacement Lower Control Line kits that any qualified rigger can install.

Suspension Lines
These will suffer normal wear. If you use a slider often, the wear will be more pronounced. Dimensionally, the lines remain stable. However, if you notice significant abrasions or damage it is best to replace the line.

Slider Grommets
These may become nicked or burred. Inspect them regularly. Very minor imperfections in a grommet can cause significant line damage. Small burrs can be sanded out, larger dents and nicks will require grommet replacement. Be sure to use the supplied silicone slider bumpers. These are intended to prevent slider grommet damage as well as to stabilize and prevent side-loading of the link.

Small Holes
These can occur for a variety of reasons but most often are related to landing. If the hole is .25" (~6mm) or less and there are not a number of them in close proximity, and it is not adjacent to a seam or line attachment, no immediate action is required. However, you should have the canopy properly repaired at your earliest convenience. As long as the repair does not cross any seams, line attachments or reinforcing tapes it may be performed by any properly rated rigger.

When to Seek Professional Help

Occasionally your canopy may suffer damage that is best left to the manufacturer to repair. Large repairs are best handled by the manufacturer as we have access to original patterns.

If you have concerns about the nature or severity of any canopy damage you find please do not hesitate to contact us.

Large Holes or Catastrophic Damage
These usually result from object strikes. If this is the case, be sure to send your canopy to Consolidated Rigging for inspection. Object strike scenarios can lead to less obvious internal damage of the canopy as well as externally visible damage.

Any hole, burn or tear that crosses a seam, reinforcing tape or line attachment should be sent to Consolidated Rigging.

Multiple Damaged Lines.
Although it is possible to replace several suspension lines. It is often a cheaper and better repair to have the entire line set replaced.
Consolidated Rigging sells replacement line kits that can be installed by a qualified rigger.

Appendix

Proper Canopy Selection - Wing Loading and Intended Uses

To best suit different jumper weights, experience levels and intended uses, the *Ace* and *Black Jack* canopies are offered in 6 different sizes ranging from 200 to 310 square feet.

Wing Loading
Wingloading is the ratio of the system weight (jumper, all clothes and equipment) to the canopy's planform area expressed in pounds per square foot.

To calculate your wing loading divide your weight (with all clothes and rig on) in pounds by the canopy surface area.

Example:
160# jumper on a 260sf canopy:
(Jumper) 160 + (clothes) 6 + (gear) 19 = 185 / 260= .71lbs/ft^2

Note: To convert your weight in kg to pounds multiply by 2.2.

The concept of wingloading is commonly used to relate a canopy's performance to other sizes of the same model canopy. This practice is not entirely accurate as a number of factors are not scaled when one makes this correlation. The error is such that we can slightly increase the wingloading on larger canopies relative to their smaller cousins. For the same reasons smaller canopies will perform their best at slightly lower wing loadings.

The *Ace* and *Black Jack* canopies are designed to operate at their best when loaded at .75lbs/ft^2. They can tolerate loadings as high as 1.0 and as low as .50. However, at these extremes you risk encountering compromises to performance. As a general rule the more demanding (tight) your landing areas are, and or the lower your experience, the lower wing loading you should select. As wingloading is reduced, the canopy will fly and descend more slowly and be less responsive in flight. This makes maneuvering into tight spaces, steep approaches and performing no-flare landings significantly easier and safer.

On the other hand, as wing loading increases, the canopy will have greater forward speed, a higher rate of descent, be more responsive in flight and have a more pronounced flare. However, the timing of the flare will also become more critical and stall characteristics will be more drastic. It is usually best to load your canopy at or below the .75 guideline. The only instances when a higher wing loading may be desirable is for heavier jumpers jumping large (280+) canopies or when jumping in high winds or turbulent conditions. However, generally if the winds are strong enough to call for a smaller canopy, they may also be strong enough to cancel the jump.

Deployment Brakes for BASE Jumping

There is no question that for BASE jumping it is desirable to pack your canopy in deeper deployment brakes than are generally used in skydiving. Deeper brake settings (DBS) on deployment reduce opening surge. This produces cleaner (slider down) openings, allows more time to react to an off-heading opening and effectively lessens the possibility of a line over malfunction. Be cautious with deeper brake settings. It is FAR more hazardous to deploy a canopy with brakes set too deep versus not deep enough.

Each Ace and Black Jack canopy comes from the factory with an intermediate and deeper brake setting. The deeper setting is conservatively placed based on a typical wing loading of .75lbs/ft^2.

However, each jumper has his own ideal DBS, dependent on jumper weight, canopy size, opening altitude and canopy reefing (slider up or down). The deeper of the two settings that come on your new Ace should be used for slider down jumping and the shallower one for slider up jumping.

Consolidated Rigging suggests you verify your ideal DBS before attempting to BASE jump your new canopy . Then, if needed, have a properly rated FAA rigger move them for you. We will be glad to provide this service free of labor or material charges.

An ideal deeper brake setting (DBS) will allow the canopy to open with very little forward speed while still being able to sufficiently pressurize. It is best not to set the brakes so deep that an increase in deployment altitude or use by a lighter jumper will induce a stall on deployment.

Brakes set too deep also increase the amount of altitude required to transition from an “open” canopy to one that is flying. More importantly, brakes set too deep can lead to off heading openings, post deployment stalls and a loss of control.

A DBS appropriate for slider down jumping will be too deep for slider up jumping and result in *lengthy* snivels and / or a stalled canopy on opening.

Suggested Method for Determining an Ideal DBS:

Before you begin you should make an estimate of where you think the deeper setting will eventually be. It will serve as a reference while testing. Usually this point will correspond with the deeper setting provided, assuming you are the canopy's first owner. If not, you may use a marker to place a reference mark on the lines. If you are unsure, contact Consolidated Rigging, Inc. for the best estimate on where to place this mark.

Skydive your canopy with the brakes set in their shallowest position; the steering lines through the guide rings and slider. You should plan on opening at least 8000' AGL.

Test A: Face into the wind and slowly pull the toggles until the canopy just enters a stall. You will recognize this by the lack of airspeed and the sensation of rocking backward.

Note the position of the mark relative to the guide ring. Repeat if necessary.

Test B: Repeat test A, only transition to the stall point abruptly rather than slowly. Note what the canopy does.

Tests C & D: Repeat tests A and B with canopy facing down wind. Note if the stall point changes.

Discontinue testing when you feel confident that you know the point in the control stroke at which the canopy will stall, or 2500'AGL which ever comes first. Never lose track of your altitude or location!

Remember, the canopy will stall at an earlier point in the control stroke during deployment than from flight.

Measure the distance from the bottom of the existing brake set loop to the lowest point on the steering line that corresponds with a stall. As a general rule, the bottom of the DBS loop will be half way between these points.

Contact us to have the DBS setting moved if necessary or have a properly rated rigger do the work.

REMEMBER, THE ONLY WAY TO "DIAL IN" A DBS IS WITH TRIAL AND ERROR.
ALWAYS BE CONSERVATIVE IN YOUR PLACEMENT.
A STALLED OR NEAR STALLED CONFIGURATION ON OPENING IS FAR MORE DANGEROUS THAN A LITTLE FORWARD SPEED.

Please Note:
This is the safest and most accurate method of determining a DBS. However, it is not, foolproof. Deployment brake settings are **VERY CRITICAL** to how your canopy opens. It is recommended that the first fixed object jumps attempted with a new DBS be bridges or other objects with sufficient vertical (altitude) and horizontal clearance to allow room for a potential stall on deployment

Pilot Chute Selection

Proper pilot chute selection is important. Too large and you risk deployment problems. Too small and you risk hesitations that can be fatal.

There are a number of considerations when selecting a pilot chute. The proper size pilot chute is a function of deployment speed, canopy weight, reefing (slider or no-slider), deployment altitude and distance to landing. Larger pilot chutes exert considerable drag on the canopy in flight and can reduce glide and flare.

This should not be a controlling factor in most decisions but it should be noted. For example; consider a scenario where you wish to jump form a low, but freefallable object, but must also cover a very long distance to landing. The increased glide that could be realized by utilizing a direct bag deployment may be a better choice than jumping with a pilot chute suited to the low freefall.

The following table lists the recommended pilot chute size with respect to freefall delays. Sizes listed are for pilot chutes that Consolidated Rigging manufactures. Other pilot chute manufacturers may have their own recommendations.

Consolidated Rigging offers two styles of pilot chutes: Standard and AV. The AV models utilize a unique profile and a mesh-covered vent at the apex. The AV style pilot chutes are noticeably more stable. This effect is most pronounced at higher speeds. Although the AV pilot chutes are vented, the reduction in drag is minimal. Therefore the size recommendations are valid for either style of pilot chute.

PILOT CHUTE SIZE (inches)	FREEFALL DELAY (seconds)
46	**1-2**
42	**2-4**
38	**4-7**
32	**8 to terminal**

You will notice that each size crosses into the other's size's recommended freefall range. As a rule, the less altitude you have to work with, the more you should err toward the larger PC choice. Conversly if you have more available altitude, you may err toward the smaller pilot chute choice.
For Example: On a 3 second free fall from 800 feet it is accepatble to use a 38" PC. However, 3 seconds from 400 feet, although possible, would dictate a 42" PC.

When and When Not to use a Slider

Typically when your planned freefall delay is 3 seconds or longer you should configure your parachute for use with a slider. ***At the 3 second threshold no-slider openings become quite hard and less reliable.***

Tip: Because of the slider's interaction with the lines and the momentary reefing of lower surface inflation, slider deployments will yield less consistent heading performance. The slower your deployment speed, the less reliable deployment heading you should anticipate. Freefall delays under 3 seconds with a slider are <u>not recommended</u> when jumping next to solid objects.

Typically, a mesh slider is used for delays ranging from 3 seconds to 8 seconds. Beyond 8 seconds it is acceptable to use a sail (solid) slider.

As with pilot chute selection, these numbers are not absolutes - but guidelines. Again, 3 seconds from 400 feet is a long delay but not unheard of. In this case no-slider is appropriate. Conversely, 3 seconds from 800' would dictate the use of a mesh slider. The same logic applies to mesh vs sail sliders. Opening at terminal 1000' above ground level; a sail slider is fine. Opening at terminal 200' above the ground would call for a mesh slider.

When installing a slider be sure it is the correct slider for your parachute. Consolidated Rigging manufactures different sized sliders for the 6 different sizes of *Aces* and *Black Jacks*.
A slider from a different sized Ace or Black Jack, or from a different manufacturer, may not be compatible with your parachute.

A Final Note About Gear Configuration

Proper configuration of your equipment is critical to your safety and the performance of your parachute.

It is beyond the scope of this manual to discuss every possible scenario or configuration. If you have questions pease feel free to contact us.

Thank you for taking the time to read this manual. It contains the most up to date information possible.
We consider it more than just an owner's manual but also a reference for many fundamental aspects of equipment use.
We feel it is important that it be as accurate and comprehensive as possible. If you any questions, comments or feedback to offer, please feel free to contact us.

